A QSP Model for Predicting Clinical Responses to Monotherapy, Combination and Sequential Therapy Following CTLA-4, PD-1, and PD-L1 Checkpoint Blockade

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Reaction Number	Reaction
1	[Blood-Lymph].CTLA4 mabB <-> Lymph Node.CTLA4 mab
2	[Blood-Lymph].CTLA4_mabB <-> Peripheral.CTLA4_mabP_leaky
3	[Blood-Lymph].CTLA4_mabB <-> Peripheral.CTLA4_mabP_tight
4 5	[Blood-Lymph].CTLA4_mabB <-> Tumor.CTLA4_mabt [Blood-Lymph].CTLA4_mabB -> null
6	[Blood-Lymph].Effector_T_TB -> [Blood-Lymph].Effector_T_TB + [Blood-Lymph].Effector_TB
7	[Blood-Lymph].Effector_TB -> Liv_Spln_GI.EffT_GI_f_Vasc
8	[Blood-Lymph].Effector_TB -> Liv_Spln_GI.EffT_Liver_f_Vasc
9	[Blood-Lymph].Effector_TB -> Liv_Spln_GI.EffT_Spleen_f_Vasc
10	[Blood-Lymph].Effector_TB -> Lymph_Node.EffT_LN_f_Vasc
11	[Blood-Lymph].Effector_TB -> null
12	[Blood-Lymph].Effector_TB -> Peripheral.EffT_P_f_Vasc
13	[Blood-Lymph].Effector_TB -> Tumor.EffT_f_Vasc
14	[Blood-Lymph].PD1_mabb <-> Lymph_Node.PD1_mab
15	[Blood-Lymph].PD1_mabb <-> Peripheral.PD1_mabP_leaky
16	[Blood-Lymph].PD1_mabb <-> Peripheral.PD1_mabP_tight
17	[Blood-Lymph].PD1_mabb <-> Tumor.PD1_mabt
18	[Blood-Lymph].PD1_mabb -> null
19	[Blood-Lymph].PDL1_mabb <-> Lymph_Node.PDL1_mab
20	[Blood-Lymph].PDL1_mabb <-> Peripheral.PDL1_mabP_leaky
21	[Blood-Lymph].PDL1_mabb <-> Peripheral.PDL1_mabP_tight
22	[Blood-Lymph].PDL1_mabb <-> Tumor.PDL1_mabt
23 24	[Blood-Lymph].PDL1_mabb -> null [Blood-Lymph].PDL1_mabb -> null
25	Liv_Spln_GI.EffT_GI_f_Vasc -> Liv_Spln_GI.EffT_Liver_f_Vasc
26 27	Liv_Spln_GI.EffT_GI_f_Vasc -> null Liv_Spln_GI.EffT_Liver_AR_Vasc -> Liv_Spln_GI.EffT_LiverEx
27	Liv_Spin_Gi.EffT_Liver_AR_Vasc -> null
29	Liv_Spln_GI.EffT_Liver_b_Vasc -> Liv_Spln_GI.EffT_Liver_AR_Vasc
30	Liv_Spln_Gl.EffT_Liver_b_Vasc -> Liv_Spln_Gl.EffT_Liver_f_Vasc
31	Liv_Spln_GI.EffT_Liver_b_Vasc -> null
32	Liv_Spln_GI.EffT_Liver_f_Vasc -> Lungs.EffT_f_LungsVasc
33	Liv_Spln_GI.EffT_Liver_f_Vasc -> null
34	Liv_Spln_GI.EffT_LiverEx -> Lymph_Node.EffT_LN_ExRec
35	Liv_Spln_GI.EffT_LiverEx -> null
36	Liv_Spln_GI.EffT_Spleen_AR_Vasc -> Liv_Spln_GI.EffT_SpleenEx
37	Liv_Spln_GI.EffT_Spleen_AR_Vasc -> null
38	Liv_Spln_GI.EffT_Spleen_b_Vasc -> Liv_Spln_GI.EffT_Spleen_AR_Vasc
39 40	Liv_Spln_GI.EffT_Spleen_b_Vasc -> Liv_Spln_GI.EffT_Spleen_f_Vasc Liv_Spln_GI.EffT_Spleen_b_Vasc -> null
40	Liv_Spin_GI.EffT_Spieen_f_Vasc +> null Liv_Spin_GI.EffT_Spieen_f_Vasc + Liv_Spin_GI.Spieen_Free_Sites -> Liv_Spin_GI.EffT_Spieen_b_Vasc + Liv_Spin_GI.Spieen_Free_Sites
42	Liv_Spin_Gi.EffT_Spieen_f_Vasc -> Liv_Spin_Gi.EffT_Liver_f_Vasc
42	Liv_Spin_GI.EffT_Spieen_f_Vasc -> Liv_Spin_GI.EffT_Liver_f_vasc
43	Liv_Spin_OLEHT_Spicen_1_vasc -> hun Liv_Spin_GLEffT_SpicenEx -> Lymph_Node.EffT_LN_ExRec
45	Liv_Spin_Gi.EffT_SpieenEx -> null
46	Liv_Spln_GLLiver_Free_Sites + Liv_Spln_GLEffT_Liver_f_Vasc -> Liv_Spln_GLEffT_Liver_b_Vasc + Liv_Spln_GLLiver_Free_Sites
47	Lungs.EffT_AR_LungsVasc -> Lungs.EffT_LungsEx
48	Lungs.EffT_AR_LungsVasc -> null
49	Lungs.EffT_AR_LungsVasc -> null
50	Lungs.EffT_f_LungsVasc + Lungs.Lung_Free_Sites -> Lungs.EffT_r_LungsVasc + Lungs.Lung_Free_Sites
51	Lungs.EffT_f_LungsVasc -> [Blood-Lymph].Effector_TB
52	Lungs.EffT_f_LungsVasc -> null
53	Lungs.EffT_LungsEx -> Lymph_Node.EffT_LN_ExRec
54	Lungs.EffT_LungsEx -> null
55	Lungs.EffT_r_LungsVasc -> Lungs.EffT_AR_LungsVasc

Reaction Number	Reaction
56	Lungs.EffT_r_LungsVasc -> Lungs.EffT_f_LungsVasc
57	Lungs.EffT_r_LungsVasc -> null
58	Lungs.EffT_r_LungsVasc -> null
59 60	Lymph_Node.[PNT-Tr_CD80] + Lymph_Node.[Tr-PNT_PDL1] <-> Lymph_Node.[TrPNT_PDL1-CD80] Lymph_Node.[PNT-Tr_CD80] -> null
61	Lymph_Node.[PNT-Tr_PD1] + Lymph_Node.[Tr-PNT_PDL1] <-> Lymph_Node.[TrPNT_PDL1-PD1]
62	Lymph_Node.[PNT-Tr_PD1] + Lymph_Node.PD1_mab <-> Lymph_Node.PNTTr_PD1_aPD1
63	Lymph_Node.[PNT-Tr_PD1] -> null
64	Lymph_Node.[PNT-Tr_PDL1] + Lymph_Node.PDL1_mab <-> Lymph_Node.PNTTr_PDL1_aPDL1
65	Lymph_Node.[PNT-Tr_PDL1] -> null Lymph_Node.[TregLN-NT] + Lymph_Node.Naive_T -> null
66 67	Lymph_Node.[TregLN-NT] -> null
68	Lymph_Node.[TregLN-PNT] + Lymph_Node.Primed_Naive_T -> null
69	Lymph_Node.[TregLN-PNT] -> null
70	Lymph_Node.[TregLN-PNT1] -> Lymph_Node.[PNT-Tr_CD80] + Lymph_Node.[TregLN-PNT1]
71	Lymph_Node.[TregLN-PNT1] -> Lymph_Node.[PNT-Tr_PD1] + Lymph_Node.[TregLN-PNT1]
72 73	Lymph_Node.[TregLN-PNT1] -> Lymph_Node.[PNT-Tr_PDL1] + Lymph_Node.[TregLN-PNT1] Lymph_Node.[TregLN-PNT1] -> Lymph_Node.[Tr-PNT_PD1] + Lymph_Node.[TregLN-PNT1]
74	Lymph_Node.[TregLN-PNT1] -> Lymph_Node.[Tr-PNT_PDL1] + Lymph_Node.[TregLN-PNT1]
75	Lymph_Node.[Tr-mAPC_CD80] -> null
76	Lymph_Node.[Tr-mAPC_CD86] -> null
77	Lymph_Node.[Tr-mAPC_CTLA4] + Lymph_Node.[Tr-mAPC_CD80] <-> Lymph_Node.TrALN_CT_CD80
78	Lymph_Node.[Tr-mAPC_CTLA4] + Lymph_Node.[Tr-mAPC_CD86] <-> Lymph_Node.TrALN_CT_CD86
79 80	Lymph_Node.[Tr-mAPC_CTLA4] + Lymph_Node.CTLA4_mab <-> Lymph_Node.TrALN_CT_aCT Lymph_Node.[Tr-mAPC_CTLA4] -> null
81	Lymph Node,[Tr-PNT PD1] + Lymph Node,[PNT-Tr PDL1] <-> Lymph Node,[TrPNT PD1-L1]
82	Lymph_Node.[Tr-PNT_PD1] + Lymph_Node.PD1_mab <-> Lymph_Node.TrPNT_PD1_aPD1
83	Lymph_Node.[Tr-PNT_PD1] -> null
84	Lymph_Node.[Tr-PNT_PDL1] + Lymph_Node.PDL1_mab <-> Lymph_Node.TrPNT_PDL1_aPDL1
85	Lymph_Node.[Tr-PNT_PDL1] -> null Lymph_Node.APCLN + Lymph_Node.C_DebrisLN -> Lymph_Node.mAPC
86 87	Lymph_Node.C_DebrisLN -> null
88	Lymph_Node.CTLA4_mab -> [Blood-Lymph].CTLA4_mabB
89	Lymph_Node.CTLA4_mab + Lymph_Node.PNT_CTLA4 <-> Lymph_Node.CTLA4_mAb_CTLA4
90	Lymph_Node.CTLA4_mAb_CTLA4 -> null
91	Lymph_Node.Effector_T -> null
92 93	Lymph_Node.EffT_LN_ExRec -> Lungs.EffT_f_LungsVasc Lymph_Node.EffT_LN_ExRec -> null
94	Lymph_Node.EffT_LN_f_Vasc -> Lungs.EffT_f_LungsVasc
95	Lymph_Node.EffT_LN_f_Vasc -> null
96	Lymph_Node.mAPC -> Lymph_Node.mAPC_CD80 + Lymph_Node.mAPC
97	Lymph_Node.mAPC -> Lymph_Node.mAPC_CD86 + Lymph_Node.mAPC
98 99	Lymph_Node.mAPC -> Lymph_Node.mAPC_PD1 + Lymph_Node.mAPC Lymph_Node.mAPC -> Lymph_Node.mAPC_PDL1 + Lymph_Node.mAPC
100	Lymph_Node.mAPC -> Lymph_Node.mAPC_PDL2 + Lymph_Node.mAPC
101	Lymph_Node.mAPC -> null
102	Lymph_Node.mAPC -> null
103	Lymph_Node.mAPC_CD80 -> null
104 105	Lymph_Node.mAPC_CD86 -> null Lymph_Node.mAPC_Int_P1 -> Lymph_Node.mAPC_Int_P1 + Lymph_Node.mAPC_Int_P1_CD80
105	Lymph_Node.mAPC_Int_P1 -> Lymph_Node.mAPC_Int_P1 + Lymph_Node.mAPC_Int_P1_CD80
107	Lymph_Node.mAPC_Int_P1_CD80 -> null
108	Lymph_Node.mAPC_Int_P1_CD86 -> null
109	Lymph_Node.mAPC_Int_P2 -> Lymph_Node.mAPC_Int_P2_CD80 + Lymph_Node.mAPC_Int_P2
110	Lymph_Node.mAPC_Int_P2 -> Lymph_Node.mAPC_Int_P2_CD86 + Lymph_Node.mAPC_Int_P2
111 112	Lymph_Node.mAPC_Int_P2 -> Lymph_Node.mAPC_Int_P2_PD1 + Lymph_Node.mAPC_Int_P2
112	Lymph_Node.mAPC_Int_P2 -> Lymph_Node.mAPC_Int_P2_PDL1 + Lymph_Node.mAPC_Int_P2 Lymph_Node.mAPC_Int_P2 -> Lymph_Node.mAPC_Int_P2_PDL2 + Lymph_Node.mAPC_Int_P2
113	Lymph_Node.mAPC_Int_P2_CD80 + Lymph_Node.PNT_CTLA4 <-> Lymph_Node.NEG_Sig_PNT_CD80
115	Lymph_Node.mAPC_Int_P2_CD80 + Lymph_Node.PNT_Int_PDL1 <-> Lymph_Node.[PNT_PDL1-CD80]
116	Lymph_Node.mAPC_Int_P2_CD80 -> null
117	Lymph_Node.mAPC_Int_P2_CD86 + Lymph_Node.PNT_CTLA4 <-> Lymph_Node.NEG_Sig_PNT_CD86
118 119	Lymph_Node.mAPC_Int_P2_CD86 + Lymph_Node.PNT_Int_CD28 <-> Lymph_Node.POS_Sig_PNT_CD86 Lymph_Node.mAPC_Int_P2_CD86 -> null
119	Lympn_Node.mAPC_Int_P2_CD86 -> null Lymph_Node.mAPC_Int_P2_PD1 + Lymph_Node.PD1_mab <-> Lymph_Node.PD1mAb_mAPC_PD1
120	Lymph_Node.mArC_Int_P2_PD1 -> null
122	Lymph_Node.mAPC_Int_P2_PDL1 -> null
123	Lymph_Node.mAPC_Int_P2_PDL2 + Lymph_Node.PNT_Int_PD1 <-> Lymph_Node.[PNT_PD1-PDL2]

Reaction Number	Reaction
124	Lymph_Node.mAPC_Int_P2_PDL2 -> null
125	Lymph_Node.mAPC_PD1 -> null
126	Lymph_Node.mAPC_PDL1 -> null
127	Lymph_Node.mAPC_PDL2 -> null
128	Lymph_Node.Naive_T -> Lymph_Node.Naive_T1
129	Lymph_Node.Naive_T -> null
130	Lymph_Node.Naive_T1 -> Lymph_Node.Naive_T
131	Lymph_Node.Naive_T1 -> Lymph_Node.Primed_Naive_T
132	Lymph_Node.NEG_Sig_PNT_CD80 -> null
133	Lymph_Node.NEG_Sig_PNT_CD86 -> null
134	Lymph_Node.NT_Int_CD28 + Lymph_Node.mAPC_Int_P1_CD80 <-> Lymph_Node.POS_Sig_NT_CD80
135 136	Lymph_Node.NT_Int_CD28 + Lymph_Node.mAPC_Int_P1_CD86 <-> Lymph_Node.POS_Sig_NT_CD86 Lymph_Node.NT_Int_CD28 -> null
137	Lymph_Node.NT1_Int1 -> Lymph_Node.NT1_Int1 + Lymph_Node.NT_Int_CD28
138	Lymph_Node.PD1_mab -> [Blood-Lymph].PD1_mabb
139	Lymph_Node.PDL1_mab -> [Blood-Lymph].PDL1_mabb
140	Lymph_Node.PDL1_mab + Lymph_Node.mAPC_Int_P2_PDL1 <-> Lymph_Node.[PDL1mAb-mAPC_PDL1]
140	Lymph_Node.PDL1_mab + Lymph_Node.PNT_Int_PDL1 <-> Lymph_Node.[PDL1mAb-PNT_PDL1]
141	Lymph_Node.PDL1_Initation + Lymph_Node.PN1_Init_PDL1 <-> Lymph_Node.[PDL1InitAtionN1_PDL1]
142	Lymph_Node.PNT_Int_CD28 + Lymph_Node.mAPC_Int_P2_CD80 <-> Lymph_Node.POS_Sig_PNT_CD80
143	Lymph_Node.PNT_Int_CD28 -> null
145	Lymph_Node.PNT_Int_CD80 + Lymph_Node.mAPC_Int_P2_PDL1 <-> Lymph_Node.[PNT_CD80-PDL1]
146	Lymph_Node.PNT_Int_CD80 -> null
147	Lymph_Node.PNT_Int_PD1 + Lymph_Node.mAPC_Int_P2_PDL1 <-> Lymph_Node.[PNT_PD1-PDL1]
148	Lymph_Node.PNT_Int_PD1 + Lymph_Node.PD1_mab <-> Lymph_Node.PD1mAb_PNT_PD1
149	Lymph_Node.PNT_Int_PD1 -> null
150	Lymph_Node.PNT_Int_PDL1 + Lymph_Node.mAPC_Int_P2_PD1 <-> Lymph_Node.[PNT_PDL1-PD1]
151	Lymph_Node.PNT_Int_PDL1 -> null
152	Lymph_Node.PNT1_Int -> Lymph_Node.PNT_CTLA4 + Lymph_Node.PNT1_Int
153	Lymph_Node.PNT1_Int -> Lymph_Node.PNT_Int_CD28 + Lymph_Node.PNT1_Int
154	Lymph_Node.PNT1_Int -> Lymph_Node.PNT_Int_CD80 + Lymph_Node.PNT1_Int
155	Lymph_Node.PNT1_Int -> Lymph_Node.PNT1_Int + Lymph_Node.PNT_Int_PD1
156	Lymph_Node.PNT1_Int -> Lymph_Node.PNT1_Int + Lymph_Node.PNT_Int_PDL1
157 158	Lymph_Node.Primed_Naive_T -> Lymph_Node.Primed_Naive_T1
158	Lymph_Node.Primed_Naive_T1 -> Lymph_Node.Anergic_Naive_T Lymph_Node.Primed_Naive_T1 -> Lymph_Node.Primed_Naive_T
160	Lymph Node.Primed Naive T1 -> Lymph Node.Prolif Naive T
160	Lymph_Node.Prolif_Naive_T -> Lymph_Node.Effector_T
161	Lymph_tode.htom_tonv_1 -> Lymph_tode.hteetor_1
162	Lymph_Node.TrALN_CT_aCT -> null
164	Lymph Node TrALN CT CD80 -> null
165	Lymph Node.TrALN CT CD86 -> null
166	Lymph_Node.TregLN -> Lymph_Node.TregLN + Lymph_Node.TrLN_CTLA4
167	Lymph_Node.TregLN + Lymph_Node.mAPC1 -> Lymph_Node.TregLN_mAPC + Lymph_Node.TregLN + Lymph_Node.mAPC1
168	Lymph_Node.TregLN + Lymph_Node.Naive_T2 -> Lymph_Node.[TregLN-NT] + Lymph_Node.TregLN + Lymph_Node.Naive_T2
169	Lymph_Node.TregLN + Lymph_Node.Primed_Naive_T2 -> Lymph_Node.[TregLN-PNT] + Lymph_Node.TregLN + Lymph_Node.Primed_Naive_T2
170	Lymph_Node.TregLN_mAPC + Lymph_Node.mAPC -> null
171	Lymph_Node.TregLN_mAPC -> null
172	Lymph_Node.TregLN_mAPC1 -> Lymph_Node.[Tr-mAPC_CD80] + Lymph_Node.TregLN_mAPC1
173	Lymph_Node.TregLN_mAPC1 -> Lymph_Node.[Tr-mAPC_CD86] + Lymph_Node.TregLN_mAPC1
174	Lymph_Node.TregLN_mAPC1 -> Lymph_Node.[Tr-mAPC_CTLA4] + Lymph_Node.TregLN_mAPC1
175	Lymph_Node.TrLN_CTLA4 + Lymph_Node.CTLA4_mab <-> Lymph_Node.TrLN_CT_aCT
176	Lymph_Node.TrLN_CTLA4 -> null
177	null -> [Blood-Lymph].CTLA4_mabB
178	null -> [Blood-Lymph].PD1_mabb
179	null -> [Blood-Lymph].PDL1_mabb
180 181	null -> Lymph_Node.Naive_T null -> Lymph_Node.Prolif_Naive_T
181 182	null -> Lympn_Node.Prolif_Naive_1 null -> Tumor.APC T
182 183	null -> Tumor.APC_1 null -> Tumor.Cancer
184	Peripheral.CTLA4_mabP_leaky <-> Lymph_Node.CTLA4_mab

Reaction Number	Reaction
186	Peripheral.EffT_P_f_Vasc -> Lungs.EffT_f_LungsVasc
187	Peripheral.EffT_P_f_Vasc -> null
188	Peripheral.PD1_mabP_leaky <-> Lymph_Node.PD1_mab
189	Peripheral.PD1_mabP_tight <-> Lymph_Node.PD1_mab
190	Peripheral.PDL1_mabP_leaky <-> Lymph_Node.PDL1_mab
191 192	Peripheral.PDL1_mabP_tight <-> Lymph_Node.PDL1_mab Tumor.[C{CD80}] -> Tumor.[C{CD80}] + Tumor.[C5=CD80]
192	$Tumor.[C{PD1}] \rightarrow Tumor.[C2=PD1] + Tumor.[C{PD1}]$
194	$Tumor.[C{PD1}{CD80}] \rightarrow Tumor.[C{PD1}{CD80}] + Tumor.[C9a=PD1]$
195	Tumor.[C{PD1}{CD80}] -> Tumor.[C{PD1}{CD80}] + Tumor.[C9b=CD80]
196	Tumor.[C{PD1}{PDL1}] -> Tumor.[C6a=PD1] + Tumor.[C{PD1}{PDL1}]
197	Tumor.[C{PD1}{PDL1}] -> Tumor.[C6b=PDL1] + Tumor.[C{PD1}{PDL1}]
198	$Tumor.[C{PD1}{PDL1}{CD80}] -> Tumor.[C{PD1}{PDL1}{CD80}] + Tumor.[C14a=PD1]$
199 200	$Tumor.[C{PD1}{PDL1}{CD80}] \rightarrow Tumor.[C{PD1}{PDL1}{CD80}] + Tumor.[C14b=PDL1]$ $Tumor.[C{PD1}{PDL1}{CD80}] \rightarrow Tumor.[C{PD1}{PDL1}{CD80}] + Tumor.[C14c=CD80]$
200	$Tumor.[C{PD1}{PDL1}{PDL2}] \rightarrow Tumor.[C{PD1}{PDL1}{PDL2}] + Tumor.[C{PD1}{PDL2}] + Tumor.[C$
202	$Tumor.[C{PD1}{PDL2}] \rightarrow Tumor.[C{PD1}{PDL2}] + Tumor.[C{PD1}{PDL2}]$
203	Tumor.[C{PD1}{PDL2}] -> Tumor.[C{PD1}{PDL1}] + Tumor.[C10c=PDL2]
204	Tumor.[C{PD1}{PDL2}{CD80}] -> Tumor.[C{PD1}{PDL2}{CD80}] + Tumor.[C16a=PD1]
205	$Tumor.[C{PD1}{PDL2}{CD80}] \rightarrow Tumor.[C{PD1}{PDL2}{CD80}] + Tumor.[C{16b=PDL1}]$ $Tumor.[C{PD1}{PDL2}{CD80}] \rightarrow Tumor.[C{PD1}{PDL2}{CD80}] + Tumor.[C{16b=PDL1}]$
206 207	Tumor.[C{PD1}{PDL2}{CD80}] -> Tumor.[C{PD1}{PDL2}{CD80}] + Tumor.[C16c=PDL2] Tumor.[C{PD1}{PDL2}{CD80}] -> Tumor.[C{PD1}{PDL2}{CD80}] + Tumor.[C16d=CD80]
207	$[C{PD1}{PDL2}] - Tumor.[C{PD1}{PDL2}] + Tum$
209	Tumor.[C{PD1}{PDL2}] -> Tumor.[C{PD1}{PDL2}] + Tumor.[C7b=PDL2]
210	Tumor.[C{PD1}{PDL2}{CD80}] -> Tumor.[C{PD1}{PDL2}{CD80}] + Tumor.[C15a=PD1]
211	$Tumor.[C{PD1}{PDL2}{CD80}] \rightarrow Tumor.[C{PD1}{PDL2}{CD80}] + Tumor.[C15b=PDL2]$
212	Tumor.[C{PD1}{PDL2}{CD80}] -> Tumor.[C{PD1}{PDL2}{CD80}] + Tumor.[C15c=CD80]
213 214	Tumor.[C{PDL1}] -> Tumor.[C{PDL1}] + Tumor.[C3=PDL1] Tumor.[C{PDL1}{CD80}] -> Tumor.[C{PDL1}{CD80}] + Tumor.[C11a=PDL1]
214	$[C{PDL1}{CD80}] \rightarrow Tumor.[C{PDL1}{CD80}] \rightarrow Tumor.[C{PDL1}{CD80}] + Tumor.[C11b=CD80]$
216	Tumor.[C{PDL1}{PDL2}] -> Tumor.[C{PDL1}{PDL2}] + Tumor.[C8a=PDL1]
217	Tumor.[C{PDL1}{PDL2}] -> Tumor.[C{PDL1}{PDL2}] + Tumor.[C8b=PDL2]
218	Tumor.[C{PDL1}{PDL2}{CD80}] -> Tumor.[C{PDL1}{PDL2}{CD80}] + Tumor.[C13a=PDL1]
219 220	Tumor.[C{PDL1}{PDL2}{CD80}] -> Tumor.[C{PDL1}{PDL2}{CD80}] + Tumor.[C13b=PDL2] Tumor.[C{PDL1}{PDL2}{CD80}] -> Tumor.[C{PDL1}{PDL2}{CD80}] + Tumor.[C13c=CD80]
220	$[C_{PDL2}(CD80] = Tumor.[C_{PDL2}(CD80]] = Tumor.[C_{PDL2}(CD80]] = Tumor.[C_{PDL2}] = $
222	Tumor.[C{PDL2}{CD80}] -> Tumor.[C{PDL2}{CD80}] + Tumor.[C12a=PDL2]
223	Tumor.[C{PDL2}{CD80}] -> Tumor.[C{PDL2}{CD80}] + Tumor.[C12b=CD80]
224	Tumor.[C10a=PD1] + Tumor.PD1_mabt <-> Tumor.[C10a=PD1:aPD1]
225	Tumor.[C10a=PD1] -> null
226 227	Tumor.[C10b=PDL1] + Tumor.PDL1_mabt <-> Tumor.[C10b=PDL1:aPDL1] Tumor.[C10b=PDL1] -> null
228	Tumor. $[C10c=PDL2] \rightarrow null$
229	Tumor.[C11a=PDL1] + Tumor.PDL1_mabt <-> Tumor.[C11a=PDL1:aPDL1]
230	Tumor.[C11a=PDL1] -> null
231	Tumor.[C11b=CD80] -> null
232 233	Tumor.[C12a=PDL2] -> null Tumor.[C12b=CD80] -> null
233 234	$Tumor.[C12b=CD80] \rightarrow null$ $Tumor.[C13a=PDL1] + Tumor.PDL1 mabt <-> Tumor.[C13a=PDL1:aPDL1]$
235	Tumor.[C13a=PDL1] -> null
236	Tumor.[C13b=PDL2] -> null
237	Tumor.[C13c=CD80] -> null
238	Tumor.[C14a=PD1] + Tumor.[T14a=PDL1] <-> Tumor.[T14a=PDL1:PD1=C14a]
239 240	Tumor.[C14a=PD1] -> null Tumor.[C14b=PDL1] + Tumor.[T14c=CD80] <-> Tumor.[T14c=CD80:PDL1=C14b]
240	[C14b=PDL1] + Tumor.[C14b=PDL1] + Tumor.[C14b=PDL1] applied and a constraint of the second
242	Tumor.[C14b=PDL1] -> null
243	Tumor.[C14c=CD80] + Tumor.[T14a=PDL1] <-> Tumor.[T14a=PDL1:CD80=C14c]
244	Tumor.[C14c=CD80] -> null
245	Tumor.[C15a=PD1] + Tumor.PD1_mabt <-> Tumor.[C15a=PD1:aPD1]
246 247	Tumor.[C15a=PD1] -> null Tumor.[C15b=PDL2] + Tumor.[T15b=PD1] <-> Tumor.[T15b=PD1:PDL2=C15b]
247	Tumor.[C15b=PDL2] + Tumor.[T15b=PD1] <-> Tumor.[T15b=PD1.PDL2=C15b] $Tumor.[C15b=PDL2] -> null$
249	Tumor.[C15c=CD80] + Tumor.[T15a=PDL1] <-> Tumor.[T15a=PDL1:CD80=C15c]
250	Tumor.[C15c=CD80] -> null
251	Tumor.[C16a=PD1] + Tumor.[T16a=PDL1] <-> Tumor.[T16a=PDL1:PD1=C16a]

Reaction Number	Reaction
252	Tumor.[C16a=PD1] + Tumor.PD1_mabt <-> Tumor.[C16a=PD1:aPD1]
253	Tumor.[C16a=PD1] -> null
254	Tumor.[C16b=PDL1] + Tumor.PDL1_mabt <-> Tumor.[C16b=PDL1:aPDL1]
255 256	Tumor.[C16b=PDL1] -> null Tumor.[C16c=PDL2] + Tumor.[T16b=PD1] <-> Tumor.[T16b=PD1:PDL2=C16c]
250	Tumor.[C16c=PDL2] + Tumor.[T160=PD1] <-> Tumor.[T160=PD1.PDL2=C16c]
258	Tumor. $[C16d=CD80] \rightarrow null$
259	Tumor.[C2=PD1] -> null
260	Tumor.[C3=PDL1] -> null
261	Tumor.[C4=PDL2] -> null
262	Tumor.[C5=CD80] -> null
263 264	Tumor.[C6a=PD1] + Tumor.PD1_mabt <-> Tumor.[C6a=PD1:aPD1] Tumor.[C6a=PD1] -> null
265	Tumor.[C6b=PDL1] + Tumor.[T6b=PD1] <-> Tumor.[T6b=PD1:PDL1=C6b]
266	Tumor.[C6b=PDL1] + Tumor.[T6c=CD80] <-> Tumor.[T6c=CD80:PDL1=C6b]
267	Tumor.[C6b=PDL1] + Tumor.PDL1_mabt <-> Tumor.[C6b=PDL1:aPDL1]
268	Tumor.[C6b=PDL1] -> null
269	Tumor.[C7a=PD1] -> null
270	Tumor.[C7b=PDL2] -> null
271 272	Tumor.[C8a=PDL1] + Tumor.[T8b=CD80] <-> Tumor.[T8b=CD80:PDL1=C8a] Tumor.[C8a=PDL1] + Tumor.PDL1 mabt <-> Tumor.[C8a=PDL1;aPDL1]
272	Tumor.[C8a=PDL1] -> null
274	Tumor.[C8b=PDL2] -> null
275	Tumor.[C9a=PD1] + Tumor.[T9=PDL1] <-> Tumor.[T9=PDL1-PD1=C9a]
276	Tumor.[C9a=PD1] -> null
277	Tumor.[C9b=CD80] -> null
278 279	Tumor.[CTLA4:CD80_TrAT] -> null Tumor.[CTLA4:CD86_TrAT] -> null
280	Tumor.[CTLA4_CTLA4-Trt] -> null
281	Tumor.[T{PD1}{80}-{PDL1}{PDL2}C] -> Tumor.[T{PD1}{80}-{PDL1}{PDL2}C] + Tumor.[T8a=PD1]
282	Tumor.[T{PD1}{80}-{PDL1}{PDL2}C] -> Tumor.[T{PD1}{80}-{PDL1}{PDL2}C] + Tumor.[T8b=CD80]
283	$Tumor.[T{PD1}{CD80}-{PDL1}C] \rightarrow Tumor.[T{PD1}{CD80}-{PDL1}C] + Tumor.[T3a=PD1]$
284	Tumor.[T{PD1}{CD80}-{PDL1}C] -> Tumor.[T{PD1}{CD80}-{PDL1}C] + Tumor.[T3b=CD80]
285	$eq:true_true_true_true_true_true_true_true_$
286	$Tumor.[T{PD1}{L1}{80}-{PD1}{80}{L1}{L2}C] \rightarrow Tumor.[T{PD1}{L1}{80}-{PD1}{80}{L1}{L2}C] +$
	Tumor.[T16b=PD1]
287	$\label{eq:tumor.[T{PD1}{L1}{80}-{PD1}{80}{L1}{L2}C] -> Tumor.[T{PD1}{L1}{80}-{PD1}{80}{L1}{L2}C] + Tumor.[T16c=CD80]$
288	$Tumor.[T{PD1}{L1}{80}-{PD1}{80}{L1}C] -> Tumor.[T{PD1}{L1}{80}-{PD1}{80}{L1}C] + Tumor.[T14a=PDL1]$
289	$Tumor.[T{PD1}{L1}{80}-{PD1}{80}{L1}C] - Tumor.[T{PD1}{L1}{80}-{PD1}{80}{L1}C] + Tumor.[T14b=PD1]$
290	$Tumor.[T{PD1}{L1}{80}-{PD1}{80}{L1}C] - Tumor.[T{PD1}{L1}{80}-{PD1}{80}{L1}C] + Tumor.[T14c=CD80]$
291	$Tumor.[T{PD1}{L1}{80}-{PD1}{L1}{L2}C] -> Tumor.[T{PD1}{L1}{80}-{PD1}{L1}{L2}C] + Tumor.[T10a=PDL1]$
292 293	$eq:true_true_true_true_true_true_true_true_$
293	$Tumor.[T{PD1}{L1}{80}-{PD1}{L1}C] > Tumor.[T{PD1}{L1}{80}-{PD1}{L1}C] + Tumor.[T{PD1}{L1}{C}] + Tumor.[T{B1}{L1}C] + Tumor.[T{B1}{L1}$
295	$\label{eq:transmitter} Tumor.[T{PD1}{L1}{80}-{PD1}{L1}C] -> Tumor.[T{PD1}{L1}{80}-{PD1}{L1}C] + Tumor.[T{6b=PD1}]$
296	$Tumor.[T{PD1}{L1}{80}-{PD1}{L1}C] -> Tumor.[T{PD1}{L1}{80}-{PD1}{L1}C] + Tumor.[T6c=CD80]$
297	$Tumor.[T{PD1}{L1}-{PD1}{80}{PDL2}C] \rightarrow Tumor.[T{PD1}{L1}-{PD1}{80}{PDL2}C] + Tumor.[T15a=PDL1]$
298 299	$Tumor.[T{PD1}{L1}-{PD1}{80}{PDL2}C] \rightarrow Tumor.[T{PD1}{L1}-{PD1}{80}{PDL2}C] + Tumor.[T15b=PD1]$ $Tumor.[T{PD1}{L1}-{PD1}{L2}C] + Tumor.[T7PD1}{L2}C] + Tumor.[T7PD1]{L2}C] + Tumo$
299 300	$[Tumor.[T{PD1}{L1}-{PD1}{L2}C] -> Tumor.[T{PD1}{L1}-{PD1}{L2}C] + Tumor.[T{PD1}{L2}C] + Tumor.[T7b=PD1]$
301	$Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C] \rightarrow Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C] \rightarrow Tumor.[T{PD1}{L1}-{PDL1}{80}{L1}-{PDL1}{80}{L1} \rightarrow Tumor.[T{PD1}{L1}-{PDL1}{80}{L1} \rightarrow Tumor.[T{PD1}{L1}-{PDL1}{80}{L1} \rightarrow Tumor.[T{PD1}{L1}-{PDL1}{80}{L1} \rightarrow Tumor.[T{PD1}{L1}-{PDL1}{80}{L1} \rightarrow Tumor.[T{PD1}{R1}-{PDL1}{80}{L1} \rightarrow Tumor.[T{PD1}{R1}-{PDL1}{80}{L1} \rightarrow Tumor.[T{PD1}{R1}-{PDL1}{80}{L1} \rightarrow Tumor.[T{PD1}{R1}-{PDL1}{80}{L1} \rightarrow Tumor.[T{PD1}{R1}-{PDL1}{80}{L1} \rightarrow Tumor.[T{PD1}{R1}-{PDL1}{80}{L1} \rightarrow Tumor.[T{PD1}{R1}-{PDL1}{80}{R1} \rightarrow Tumor.[T{PD1}{R1}-{PDL1}{80}{R1} \rightarrow Tumor.[T{PD1}{R1}-{PDL1}{80}{R1} \rightarrow Tumor.[T{PD1}{R1}-{PDL1}{80}{R1} \rightarrow Tumor.[T{PD1}{R1}-{PDL1}$
302	$\label{eq:runor.[T{PD1}{L1}-{PDL1}{80}{L2}C] -> Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C] + Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C] -> Tumor.[T{PD1}{L1}-{PDL1}{R0}{L2}C] -> Tumor.[T{PD1}{L1}-{PDL1}{R0}{R0}{L2}C] -> Tumor.[T{PD1}{L1}-{PDL1}{R0}{R0}{L2}C] -> Tumor.[T{PD1}{L1}-{PDL1}{R0}{R0}{L2}C] -> Tumor.[T{PD1}{L1}-{PDL1}{R0}{R0}{L2}C] -> Tumor.[T{PD1}{L1}-{PDL1}{R0}{R0}{R0}{L2}C] -> Tumor.[T{PD1}{L1}-{PDL1}{R0}{R0}{R0}{R0}{R0}{R0}{R0}{R0}{R0}{R0$
303	$Tumor.[T{PD1}{L1}-{PDL1}{80}C] \rightarrow Tumor.[T{PD1}{L1}-{PDL1}{80}C] + Tumor.[T11a=PDL1]$
304	$Tumor.[T{PD1}{L1}-{PDL1}{80}C] - Tumor.[T{PD1}{L1}-{PDL1}{80}C] + Tumor.[T11b=PD1]$
305	Tumor.[T{PD1}{L1}-{PDL2}{80}C] \rightarrow Tumor.[T{PD1}{L1}-{PDL2}{80}C] \rightarrow Tumor.[T{2a=PDL1}] Tumor.[T(PD1)(L1).(PDL2)(80)C] \rightarrow Tumor.[T(PD1)(L1).(PDL2)(80)C] \rightarrow Tumor.[T12b=PD1]
306 307	Tumor.[T{PD1}{L1}-{PDL2}{80}C] -> Tumor.[T{PD1}{L1}-{PDL2}{80}C] + Tumor.[T12b=PD1] Tumor.[T{PD1}-{PDL2}C] -> Tumor.[T{PD1}-{PDL2}C] + Tumor.[T4=PD1]
308	Tumor.[T{PDL1}-{CD80}{PD1}C] -> Tumor.[T{PDL1}-{CD80}{PD1}C] -
309	$Tumor.[T{PDL1}-{CD80}C] \rightarrow Tumor.[T{PDL1}-{CD80}C] \rightarrow Tumor.[T{PDL1}-{$
310	Tumor.[T{PDL1}-{PD1}C] -> Tumor.[T{PDL1}-{PD1}C] + Tumor.[T2=PDL1]
311	Tumor.[T10a=PDL1] + Tumor.[C10a=PD1] <-> Tumor.[T10a=PDL1:PD1=C10a]
312	Tumor.[T10a=PDL1] + Tumor.PDL1_mabt <-> Tumor.[T10a=PDL1:aPDL1]
313 314	Tumor.[T10a=PDL1] -> null Tumor.[T10b=PD1] + Tumor.[C10b=PDL1] <-> Tumor.[T10b=PD1:PDL1=C10b]
314	[1006=PD1] + 1006=PD1] < -> 1006=PD1:PD1=C100] Tumor.[T10b=PD1] + Tumor.[C10c=PDL2] <-> Tumor.[T10b=PD1:PDL2=C10c]
316	Tumor.[T10b=PD1] -> null
210	Transviltree 121] v nun

Reaction Number	Reaction
317	Tumor.[T10c=CD80] + Tumor.[C10b=PDL1] <-> Tumor.[T10c=CD80:PDL1=C10b]
318	Tumor.[T10c=CD80] -> null
319 320	Tumor.[T11a=PDL1] + Tumor.[C11b=CD80] <-> Tumor.[T11a=PDL1:CD80=C11b] Tumor.[T11a=PDL1] + Tumor.PDL1 mabt <-> Tumor.[T11a=PDL1:aPDL1]
320	$Tumor.[T11a=PDL1] + Tumor.PDL1_maot <-> Tumor.[T11a=PDL1.aPDL1]$ $Tumor.[T11a=PDL1] -> null$
322	Tumor.[T11b=PD1] + Tumor.[C11a=PDL1] <-> Tumor.[T11b=PD1:PDL1=C11a]
323	Tumor.[T11b=PD1] -> null
324	Tumor.[T12a=PDL1] + Tumor.[C12b=CD80] <-> Tumor.[T12a=PDL1:CD80=C12b]
325	Tumor.[T12a=PDL1] + Tumor.PDL1_mabt <-> Tumor.[T12a=PDL1:aPDL1] Tumor.[T12a=PDL1] -> null
326 327	Tumor.[T12b=PD1] + Tumor.[C12a=PDL2] <-> Tumor.[T12b=PD1:PDL2=C12a]
328	Tumor.[T12b=PD1] -> null
329	Tumor.[T13a=PDL1] + Tumor.[C13c=CD80] <-> Tumor.[T13a=PDL1:CD80=C13c]
330	Tumor.[T13a=PDL1] -> null
331	Tumor.[T13b=PD1] + Tumor.[C13a=PDL1] <-> Tumor.[T13b=PD1:PDL1=C13a]
332 333	Tumor.[T13b=PD1] + Tumor.[C13b=PDL2] <-> Tumor.[T13b=PD1:PDL2=C13b] Tumor.[T13b=PD1] + Tumor.PD1 mabt <-> Tumor.[T13b=PD1:aPD1]
334	Tumor.[T13b=PD1] -> null
335	Tumor.[T14a=PDL1] + Tumor.PDL1_mabt <-> Tumor.[T14a=PDL1:aPDL1]
336	Tumor.[T14a=PDL1] -> null
337	Tumor.[T14b=PD1] + Tumor.[C14b=PDL1] <-> Tumor.[T14b=PD1:PDL1=C14b]
338 339	Tumor.[T14b=PD1] -> null Tumor.[T14c=CD80] -> null
340	Tumor.[T15a=PDL1] + Tumor.[C15a=PD1] <-> Tumor.[T15a=PDL1:PD1=C15a]
341	Tumor.[T15a=PDL1] + Tumor.PDL1_mabt <-> Tumor.[T15a=PDL1:aPDL1]
342	Tumor.[T15a=PDL1] -> null
343	Tumor.[T15b=PD1] + Tumor.PD1_mabt <-> Tumor.[T15b=PD1:aPD1]
344	Tumor.[T15b=PD1] -> null Tumor.[T16a=PDL1] + Tumor.[C16d=CD80] <-> Tumor.[T16a=PDL1:CD80=C16d]
345 346	$Tumor.[T16a=PDL1] + Tumor.[C16d=CD80] <-> Tumor.[T16a=PDL1:CD80=C16d]$ $Tumor.[T16a=PDL1] + Tumor.PDL1_mabt <-> Tumor.[T16a=PDL1:aPDL1]$
347	Tumor.[T16a=PDL1] -> null
348	Tumor.[T16b=PD1] + Tumor.[C16b=PDL1] <-> Tumor.[T16b=PD1:PDL1=C16b]
349	Tumor.[T16b=PD1] + Tumor.PD1_mabt <-> Tumor.[T16b=PD1:aPD1]
350	Tumor.[T16b=PD1] -> null
351 352	Tumor.[T16c=CD80] + Tumor.[C16b=PDL1] <-> Tumor.[T16c=CD80:PDL1=C16b] Tumor.[T16c=CD80] -> null
353	Tumor.[T2=PDL1] + Tumor.[C2=PD1] <-> Tumor.[T2=PDL1:PD1=C2]
354	Tumor.[T2=PDL1] -> null
355	Tumor.[T3a=PD1] + Tumor.[C3=PDL1] <-> Tumor.[T3a=PD1:PDL1=C3]
356	Tumor.[T3a=PD1] + Tumor.PD1_mabt <-> Tumor.[T3a=PD1:aPD1]
357 358	Tumor.[T3a=PD1] -> null Tumor.[T3b=CD80] + Tumor.[C3=PDL1] <-> Tumor.[T3b=CD80:PDL1=C3]
359	Tumor.[T3b=CD80] -> null
360	Tumor.[T4=PD1] + Tumor.[C4=PDL2] <-> Tumor.[T4=PD1:PDL2=C4]
361	Tumor.[T4=PD1] + Tumor.PD1_mabt <-> Tumor.[T4=PD1:aPD1]
362	Tumor.[T4=PD1] -> null
363 364	Tumor.[T5=PDL1] + Tumor.[C5=CD80] <-> Tumor.[T5=PDL1:CD80=C5] Tumor.[T5=PDL1] + Tumor.PDL1 mabt <-> Tumor.[T5=PDL1:aPDL1]
365	Tumor.[15=PDL1] + Tumor.PDL1_mabt <-> Tumor.[15=PDL1:aPDL1]
366	Tumor.[T6a=PDL1] +> Tumor.[C6a=PD1] <-> Tumor.[T6a=PDL1:PD1=C6a]
367	Tumor.[T6a=PDL1] + Tumor.PDL1_mabt <-> Tumor.[T6a=PDL1:aPDL1]
368	Tumor.[T6a=PDL1] -> null
369	Tumor.[T6b=PD1] + Tumor.PD1_mabt <-> Tumor.[T6b=PD1:aPD1]
370 371	Tumor.[T6b=PD1] -> null Tumor.[T6c=CD80] -> null
372	Tumor. $[T7a=PDL1] + Tumor.[C7a=PD1] <-> Tumor.[T7a=PDL1:PD1=C7a]$
373	Tumor.[T7a=PDL1] -> null
374	Tumor.[T7b=PD1] + Tumor.[C7b=PDL2] <-> Tumor.[T7b=PD1:PDL2=C7b]
375	Tumor.[T7b=PD1] -> null
376	Tumor.[T8a=PD1] + Tumor.[C8a=PDL1] <-> Tumor.[T8a=PD1:PDL1=C8a]
377 378	Tumor.[T8a=PD1] + Tumor.[C8b=PDL2] <-> Tumor.[T8a=PD1:PDL2=C8b] Tumor.[T8a=PD1] -> null
379	Tumor.[T8b=CD80] -> null
380	Tumor.[T9=PDL1] + Tumor.[C9b=CD80] <-> Tumor.[T9=PDL1-CD80=C9b]
381	Tumor.[T9=PDL1] + Tumor.PDL1_mabt <-> Tumor.[T9=PDL1:aPDL1]
382	Tumor.[T9=PDL1] -> null
383	Tumor.APC_T -> null
384	Tumor.C_DebrisT + Tumor.APC_T -> Tumor.mAPC_T

Reaction Number	Reaction
385	Tumor.C_DebrisT -> Lymph_Node.C_DebrisLN
386	Tumor.C_DebrisT -> null
387	Tumor.C_DebrisT -> null
388 389	Tumor.C_DebrisT -> null Tumor.Cancer -> (AntSpread) Tumor.C_DebrisT
389	Tumor.Cancer -> (Antspread) Tumor.C_Debrist
390	Tumor.CD80_mAPCT -> null
391	Tumor.CD80_TeffT + Tumor.PDL1_TregT <-> Tumor.[PDL1:CD80_TrTeff]
392 393	Tumor.CD80_TeffT -> null Tumor.CD80 TeffT1 -> null
393 394	Tumor.CD86_mAPCT -> null
395	Tumor.CTLA4 mabt <-> Lymph Node.CTLA4 mab
396	Tumor.CTLA4_TregT + Tumor.CD80_mAPCT <-> Tumor.[CTLA4:CD80_TrAT]
397	Tumor.CTLA4_TregT + Tumor.CD86_mAPCT <-> Tumor.[CTLA4:CD86_TrAT]
398	Tumor.CTLA4_TregT + Tumor.CTLA4_mabt <-> Tumor.[CTLA4_CTLA4-Trt]
399 400	Tumor.CTLA4_TregT -> null Tumor.Effector_TT -> null
401	Tumor.Effector TT -> null
402	Tumor.Effector_TT -> Tumor.Effector_TT_Res
403	Tumor.Effector_TT_C_Eng + Tumor.Cancer1 -> Tumor.Effector_TT_C_Eng + Tumor.TC1 + Tumor.Cancer1
404	Tumor.EffT_AR_Vasc -> null
405 406	Tumor.EffT_AR_Vasc -> Tumor.Effector_TT Tumor.EffT_b_Vasc -> null
406 407	Tumor.EffT_b_Vasc -> Tumor.EffT_AR_Vasc
408	Tumor.EffT_b_Vasc -> Tumor.EffT_f_Vasc
409	Tumor.EffT_f_Vasc + Tumor.Tmr_Free_Sites -> Tumor.EffT_b_Vasc + Tumor.Tmr_Free_Sites
410	Tumor.EffT_f_Vasc -> Lungs.EffT_f_LungsVasc
411	Tumor.EffT_f_Vasc -> null
412 413	Tumor.mAPC_T -> Lymph_Node.mAPC Tumor.mAPC_T -> null
414	Tumor.mAPC_T -> null
415	Tumor.mAPCT_EngTregT -> Tumor.CD80_mAPCT + Tumor.mAPCT_EngTregT
416	Tumor.mAPCT_EngTregT -> Tumor.CD86_mAPCT + Tumor.mAPCT_EngTregT
417	Tumor.MDSC_T + Tumor.Effector_TT_MDSCs -> Tumor.MDSCsT_Teff + Tumor.Effector_TT_MDSCs +
418	Tumor.MDSC_T Tumor.MDSCsT_EngTeff -> Tumor.PD1_MDSCsT + Tumor.MDSCsT_EngTeff
419	Tumor.MDSCsT_EngTeff -> Tumor.PDL1_MDSCsT + Tumor.MDSCsT_EngTeff
420	Tumor.MDSCsT_Teff + Tumor.Effector_TT -> null
421	Tumor.MDSCsT_Teff -> null
422	Tumor.PD1_mabt <-> Lymph_Node.PD1_mab
423 424	Tumor.PD1_mabt + Tumor.[C14a=PD1] <-> Tumor.[C14a=PD1:aPD1] Tumor.PD1_mabt + Tumor.[C2=PD1] <-> Tumor.[C2=PD1:aPD1]
425	$Tumor.PD1_mabt + Tumor.[C7a=PD1] <-> Tumor.[C7a=PD1] aPD1]$
426	Tumor.PD1_mabt + Tumor.[C9a=PD1] <-> Tumor.[C9a=PD1]
427	Tumor.PD1_mabt + Tumor.[T10b=PD1] <-> Tumor.[T10b=PD1:aPD1]
428	Tumor.PD1_mabt + Tumor.[T11b=PD1] <-> Tumor.[T11b=PD1:aPD1]
429 430	Tumor.PD1_mabt + Tumor.[T12b=PD1] <-> Tumor.[T12b=PD1:aPD1] Tumor.PD1_mabt + Tumor.[T14b=PD1] <-> Tumor.[T14b=PD1:aPD1]
430	$Tumor.PD1_mabt + Tumor.[T14b=PD1] <-> Tumor.[T14b=PD1:aPD1]$ $Tumor.PD1_mabt + Tumor.[T7b=PD1] <-> Tumor.[T7b=PD1]$
432	$Tumor.PD1_mabt + Tumor.[T8a=PD1] <-> Tumor.[T8a=PD1]$
433	Tumor.PD1_mabt + Tumor.PD1_TeffT <-> Tumor.[PD1:aPD1_Teff]
434	Tumor.PD1_MDSCsT + Tumor.PD1_mabt <-> Tumor.[PD1:aPD1_MDSCs]
435	Tumor.PD1_MDSCsT + Tumor.PDL1_TeffT1 <-> Tumor.[PD1:PDL1_MDSCT]
436 437	Tumor.PD1_MDSCsT -> null Tumor.PD1_TeffT + Tumor.PDL1_TregT <-> Tumor.[PDL1:PD1_TrTeff]
437	Tumor.PD1_TeffT -> null
439	Tumor.PD1_TeffT1 + Tumor.PD1_mabt <-> Tumor.[PD1:aPD1_Teff1]
440	Tumor.PD1_TeffT1 -> null
441	Tumor.PD1_TregT + Tumor.PD1_mabt <-> Tumor.[PD1:aPD1_Treg]
442 443	Tumor.PD1_TregT -> null Tumor.PDL1_mabt <-> Lymph_Node.PDL1_mab
445	Tumor.PDL1_mabt <> Lympn_Node.PDL1_mab Tumor.PDL1_mabt + Tumor.[C3=PDL1] <-> Tumor.[C3=PDL1:aPDL1]
445	Tumor.PDL1_mabt + Tumor.[T13a=PDL1] <-> Tumor.[T13a=PDL1:aPDL1]
446	Tumor.PDL1_mabt + Tumor.[T2=PDL1] <-> Tumor.[T2=PDL1:aPDL1]
447	Tumor.PDL1_mabt + Tumor.[T7a=PDL1] <-> Tumor.[T7a=PDL1:aPDL1]
448	Tumor.PDL1_mabt + Tumor.PDL1_TeffT <-> Tumor.[PDL1:aPDL1_Teff]
417 418	Tumor.PDL1_mabt + Tumor.PDL1_TeffT1 <-> Tumor.[PDL1:aPDL1_Teff1] Tumor.PDL1_MDSCsT + Tumor.CD80_TeffT1 <-> Tumor.[PDL1:CD80_MDSCT]
+10	1 tunior. DET_WD5C81 + Tunior.CD60_101111 <-> Tunior.[FDE1:CD60_WD5C1]

Reaction Number	Reaction
419	Tumor.PDL1_MDSCsT + Tumor.PD1_TeffT1 <-> Tumor.[PDL1:PD1_MDSCT]
420	Tumor.PDL1_MDSCsT + Tumor.PDL1_mabt <-> Tumor.[PDL1:aPDL1_MDSCs]
421	Tumor.PDL1_MDSCsT -> null
422	Tumor.PDL1_TeffT + Tumor.PD1_TregT <-> Tumor.[PD1:PDL1_TrTeff]
423	Tumor.PDL1_TeffT -> null
424	Tumor.PDL1_TeffT1 -> null
425	Tumor.PDL1_TregT + Tumor.PDL1_mabt <-> Tumor.[PDL1:aPDL1_Treg]
426	Tumor.PDL1_TregT -> null
427	Tumor.T_Recover_Can_Dead -> null
428	Tumor.TC1 + Tumor.Cancer -> (AntSpread) Tumor.C_DebrisT
429	Tumor.TC1 -> Tumor.T_Recover_Can_Dead
430	Tumor.TC2 + Tumor.Effector_TT -> Tumor.TC2
431	Tumor.Teff_EngMDSC -> Tumor.Teff_EngMDSC + Tumor.CD80_TeffT1
432	Tumor.Teff_EngMDSC -> Tumor.Teff_EngMDSC + Tumor.PD1_TeffT1
433	Tumor.Teff_EngMDSC -> Tumor.Teff_EngMDSC + Tumor.PDL1_TeffT1
434	Tumor.Teff_EngTregT -> Tumor.CD80_TeffT + Tumor.Teff_EngTregT
435	Tumor.Teff_EngTregT -> Tumor.PD1_TeffT + Tumor.Teff_EngTregT
436	Tumor.Teff_EngTregT -> Tumor.PDL1_TeffT + Tumor.Teff_EngTregT
437	Tumor.TregT + Tumor.Effector_TT_TregT -> Tumor.TregT_Teff + Tumor.Effector_TT_TregT + Tumor.TregT
438	Tumor.TregT_EngAPC -> Tumor.CTLA4_TregT + Tumor.TregT_EngAPC
439	Tumor.TregT_EngTeff -> Tumor.PD1_TregT + Tumor.TregT_EngTeff
440	Tumor.TregT_EngTeff -> Tumor.PDL1_TregT + Tumor.TregT_EngTeff
441	Tumor.TregT_Teff + Tumor.Effector_TT -> null
442	Tumor.TregT_Teff -> null

Table S1 – Model Reactions (End)

Table S2 – Model Reaction Rates (Start)

Reaction Number	Reaction Rate
1	Kpa_LNB*S_LNB*VL*f_LN_CTLA4*([Blood-Lymph].CTLA4_mabB/Vc_CTLA4-Lymph_Node.CTLA4_mab/VL)
2	0.67*Q_L*[Blood-Lymph].CTLA4_mabB*(1-Sigma1_CTLA4)/Vc_CTLA4 -
	(Peripheral.CTLA4_mabP_leaky/(0.35*ISF*KP_CTLA4))*0.33*Q_L*(1-Sigma1_CTLA4)
3	0.33*Q_L*[Blood-Lymph].CTLA4_mabB*(1-Sigma2_CTLA4)/Vc_CTLA4-
	(Peripheral.CTLA4_mabP_tight/(0.65*ISF*KP_CTLA4))*0.33*Q_L*(1-Sigma2_CTLA4)
4	Kpa_TB*S_TB*Vt_avg_const*[Blood-Lymph].CTLA4_mabB/Vc_PD1-
-	Kpa_TB*S_TB*Vt_avg_const*Tumor.CTLA4_mabt/(Vex_Tmr)
5	Cl_CTLA4*[Blood-Lymph].CTLA4_mabB
6	EffT_Migrate*[Blood-Lymph].Effector_T_TB
7	QC_GI*[Blood-Lymph].Effector_TB/Vc_Teff
8	(QC_Liver-QC_GI-QC_Spleen+LC_GI+LC_Spleen)*[Blood-Lymph].Effector_TB/Vc_Teff
9	QC_Spleen * [Blood-Lymph].Effector_TB/Vc_Teff
10	QC_LN*[Blood-Lymph].Effector_TB/Vc_Teff
11	EffT_Turnover*[Blood-Lymph].Effector_TB
12	QC_Periph*[Blood-Lymph].Effector_TB/Vc_Teff
13	QC_Tmr*TCytokineHoming*[Blood-Lymph].Effector_TB/Vc_Teff
14	Kpa_LNB*S_LNB*VL*f_LN_PD1*([Blood-Lymph].PD1_mabb/Vc_PD1-Lymph_Node.PD1_mab/VL)
15	0.67*Q_L*PD1_mabb*(1-Sigma1_PD1)/Vc_PD1-(Peripheral.PD1_mabP_leaky/(0.35*ISF*KP_PD1))*0.33*Q_L*(1-Sigma1_PD1)
16	0.33*Q_L*[Blood-Lymph].PD1_mabb*(1-Sigma2_PD1)/Vc_PD1-
	(Peripheral.PD1_mabP_tight/(0.65*ISF*KP_PD1))*0.33*Q_L*(1-Sigma2_PD1)
17	Kpa_TB*S_TB*Vt_avg_const*[Blood-Lymph].PD1_mabb/Vc_PD1-
	Kpa_TB*S_TB*Vt_avg_const*Tumor.PD1_mabt/(Vex_Tmr)
18	(Cl_PD1/Vc_PD1)*[Blood-Lymph].PD1_mabb
19	Kpa_LNB*S_LNB*VL*f_LN_PD1*([Blood-Lymph].PDL1_mabb/Vc_PDL1-Lymph_Node.PDL1_mab/VL)
20	0.67*Q_L*PDL1_mabb*(1-Sigma1_PDL1)/Vc_PDL1-(Peripheral.PDL1_mabP_leaky/(0.35*ISF*KP_PDL1))*0.33*Q_L*(1-Sigma1_PDL1)
21	0.33*Q_L*[Blood-Lymph].PDL1_mabb*(1-Sigma2_PDL1)/Vc_PDL1-
	(Peripheral.PDL1_mabP_tight/(0.65*ISF*KP_PDL1))*0.33*Q_L*(1-Sigma2_PDL1)

Reaction Number	Reaction Rate
22	Kpa_TB*S_TB*Vt_avg_const*[Blood-Lymph].PDL1_mabb/Vc_PDL1-
	Kpa_TB*S_TB*Vt_avg_const*Tumor.PDL1_mabt/(Vex_Tmr)
23	(C1_PDL1/Vc_PDL1)*[Blood-Lymph].PDL1_mabb
24	(Vm/Durvalumab_MW)*[Blood-Lymph].PDL1_mabb/(Km*Vc_PDL1/Durvalumab_MW+[Blood-Lymph].PDL1_mabb)
25	(QC_GI - LC_GI)*Liv_Spln_GI.EffT_GI_f_Vasc/Vv_GI
26	EffT_Turnover*Liv_Spln_GI.EffT_GI_f_Vasc
27	J_Liver*Liv_Spln_GI.EffT_Liver_AR_Vasc
28	EffT_Turnover*Liv_Spln_GI.EffT_Liver_AR_Vasc
29	AR_Liver*[Liv_Spln_GI].EffT_Liver_b_Vasc
30	kr_Periph*Liv_Spln_GI.EffT_Liver_b_Vasc
31 32	EffT_Turnover*Liv_Spln_GI.EffT_Liver_b_Vasc (QC_Liver - LC_Liver)*Liv_Spln_GI.EffT_Liver_f_Vasc/Vv_Liver
32	EffT_Turnover*Liv_Spln_GI.EffT_Liver_f_Vasc
34	LC_Liver*Delta_Liver*Liv_Spln_GI.EffT_LiverEx/Vext_Liver
35	EffT_Turnover*Liv_Spln_GI.EffT_LiverEx
36	J_Spleen*Liv_Spln_G.EffT_Spleen_AR_Vasc
37	EffT_Turnover*Liv_Spln_GI.EffT_Spleen_AR_Vasc
38	AR_Spleen*[Liv_Spln_GI].EffT_Spleen_b_Vasc
39 40	kr_Periph*Liv_Spln_GI.EffT_Spleen_b_Vasc EffT_Turnover*Liv_Spln_GI.EffT_Spleen_b_Vasc
40	kf_Spleen*Liv_Spln_GI.Spleen_Free_Sites*[Liv_Spln_GI].EffT_Spleen_f_Vasc/Vv_Spleen
42	(QC_Spleen - LC_Spleen)*Liv_Spln_GI.EffT_Spleen_f_Vasc/Vv_Spleen
43	EffT_Turnover*Liv_Spln_GI.EffT_Spleen_f_Vasc
44	LC_Spleen*Delta_Spleen*Liv_Spln_GI.EffT_SpleenEx/Vext_Spleen
45	EffT_Turnover*Liv_Spln_GI.EffT_SpleenEx
46	kf_Liver*Liver_Free_Sites*[Liv_Spln_GI].EffT_Liver_f_Vasc/Vv_Liver
47 48	J_Lungs*Lungs.EffT_AR_LungsVasc EffT_Turnover*Lungs.EffT_AR_LungsVasc
40	E_Lungs*Lungs.EffT_AR_LungsVasc
50	kf_Lungs*Lung_Free_Sites*Lungs.EffT_f_LungsVasc/Vv_Lungs
51	(QC Lungs - LC Lungs)*Lungs.EffT f LungsVasc/Vv Lungs
52	EffT_Turnover*Lungs.EffT_f_LungsVasc
53	LC_Lungs*Delta_Lungs*Lungs.EffT_LungsEx/Vext_Lungs
54	EffT_Turnover*Lungs.EffT_LungsEx
55 56	AR_Lungs*Lungs.EffT_r_LungsVasc kr_Lungs*Lungs.EffT_r_LungsVasc
57	EffT_Turnover*Lungs.EffT_r_LungsVasc
58	E_Lungs*Lungs.EffT_r_LungsVasc
59	[kon_PDL1_CD80]*Lymph_Node.[PNT-Tr_CD80]*Lymph_Node.[Tr-PNT_PDL1]/[Vol_Cell-Rec_Tr-PNT] -
	[koff_PDL1_CD80]*Lymph_Node.[TrPNT_PDL1-CD80]
60	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.[PNT-Tr_CD80]+[TrPNT_PDL1-CD80])
61	[kon_PD1_PDL1]*Lymph_Node.[PNT-Tr_PD1]*Lymph_Node.[Tr-PNT_PDL1]/[Vol_Cell-Rec_Tr-PNT] -
62	[koff_PD1_PDL1]*Lymph_Node.[TrPNT_PDL1-PD1] [kon_PD1-PD1mAb]*Lymph_Node.[PNT-Tr_PD1]*Lymph_Node.PD1_mab/Vtdln - [koff_PD1-
02	PD1mAb]*Lymph_Node.PNTr_PD1_aPD1
63	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.[PNT-Tr_PD1]+PNTTr_PD1_aPD1+[TrPNT_PDL1-PD1])
64	[kon_PDL1-PDL1mAb]*Lymph_Node.[PNT-Tr_PDL1]*Lymph_Node.PDL1_mab/Vtdln - [koff_PDL1-
	PDL1mAb]*Lymph_Node.PNTTr_PDL1_aPDL1
65	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.[PNT-Tr_PDL1]+PNTTr_PDL1_aPDL1+[TrPNT_PD1-L1])
66 67	[Treg:T_IntTime]*Lymph_Node.[TregLN-NT] [Treg:T_IntTime]*Lymph_Node.[TregLN-NT]
67 68	[Treg:T_IntTime]*Lymph_Node.[TregLN-PNT]*[Sig_TrPNT=PD1/L1/CD80]
69	[Treg:T_IntTime]*Lymph_Node.[TregLN-PNT]*(1-[Sig_TrPNT=PD1/L1/CD80])
70	[Exp_CD28/80/86/PD1/L1/L2]*Lymph_Node.[TregLN-PNT1]*(([%CD80_receptor_level_PNT]*[CD80_receptors-per-
	Tcell])/[Avagadro's_Num])*(1/Tr_per_T_cell)
71	[Exp_CD28/80/86/PD1/L1/L2]*Lymph_Node.[TregLN-PNT1]*(([%PD1_receptor_level_PNT]*[PD1_receptors-per-
70	Tcell])/[Avagadro's_Num])*(1/Tr_per_T_cell)
72	[Exp_CD28/80/86/PD1/L1/L2]*Lymph_Node.[TregLN-PNT1]*(([%PDL1_receptor_level_PNT]*[PDL1_receptors-per-
73	Tcell])/[Avagadro's_Num])*(1/Tr_per_T_cell) [Exp_CD28/80/86/PD1/L1/L2]*Lymph_Node.[TregLN-PNT1]*([PD1_receptors-per-
13	Tcell/[Avagadro's_Num])*(1/T_per_Tr_cell)
74	[Exp_CD28/80/86/PD1/L1/L2]*Lymph_Node.[TregLN-PNT1]*([PDL1_receptors-per-
	Tcell]/[Avagadro's_Num])*(1/T_per_Tr_cell)
75	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.[Tr-mAPC_CD80]+TrALN_CT_CD80)
76	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.[Tr-mAPC_CD86]+TrALN_CT_CD86)
77	[kon_CTLA4_CD80]*Lymph_Node.[Tr-mAPC_CD80]*Lymph_Node.[Tr-mAPC_CTLA4]/[Vol_Cell-Rec_Tr-mAPC] -

Reaction Number	Reaction Rate
78	[kon_CTLA4_CD86]*Lymph_Node.[Tr-mAPC_CD86]*Lymph_Node.[Tr-mAPC_CTLA4]/[Vol_Cell-Rec_Tr-mAPC]- [koff_CTLA4_CD86]*Lymph_Node.TrALN_CT_CD86
79	kon_CTLA4_CDA0J*Lymph_Node.TrALN_CT_2Da0 kon_CTLA4mAb_CTLA4*Lymph_Node.[Tr-mAPC_CTLA4]*Lymph_Node.CTLA4_mab/Vtdln - koff_CTLA4mAb_CTLA4*Lymph_Node.TrALN_CT_aCT
80	[Exp_CTLA4]*(Lymph_Node,[Tr-mAPC_CTLA4]+[TrALN_CT_aCT]+[TrALN_CT_CD80]+[TrALN_CT_CD86])
81	[kon_PD1_PDL1]*Lymph_Node.[Tr-PNT_PD1]*Lymph_Node.[PNT-Tr_PDL1]/[Vol_Cell-Rec_Tr-PNT] - [koff_PD1_PDL1]*Lymph_Node.[TrPNT_PD1-L1]
82	[kon_PD1-PD1mAb]*Lymph_Node.[Tr-PNT_PD1]*Lymph_Node.PD1_mab/Vtdln - [koff_PD1- PD1mAb]*Lymph_Node.TrPNT_PD1_aPD1
83	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.[Tr-PNT_PD1]+TrPNT_PD1_aPD1+[TrPNT_PD1-L1])
84	[kon_PDL1-PDL1mAb]*Lymph_Node.[Tr-PNT_PDL1]*Lymph_Node.PDL1_mab/Vtdln - [koff_PDL1- PDL1mAb]*Lymph_Node.TrPNT_PDL1_aPDL1
85	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.[Tr-PNT_PDL1]+TrPNT_PDL1_aPDL1+[TrPNT_PDL1- PD1]+[TrPNT_PDL1-CD80])
86	Phago_Debris*Lymph_Node.APCLN*Lymph_Node.C_DebrisLN
87	Debris_Decay*Lymph_Node.C_DebrisLN
88 80	Q_L/VL*Lymph_Node.CTLA4_mab
89	kon_CTLA4mAb_CTLA4*Lymph_Node.CTLA4_mab*Lymph_Node.PNT_CTLA4/Vtdln- koff_CTLA4mAb_CTLA4*Lymph_Node.CTLA4_mAb_CTLA4
90	Endo_CTLA4*Lymph_Node.CTLA4_mAb_CTLA4
91	EffT_Migrate*Lymph_Node.Effector_T
92	LC_LN*Delta_LN*Lymph_Node.EffT_LN_ExRec/Vext_LN
93 94	EffT_Turnover*Lymph_Node.EffT_LN_ExRec (QC_LN - LC_LN)*Lymph_Node.EffT_LN_f_Vasc/Vy_LN
95	EffT_Turnover*Lymph_Node.EffT_LN_f_Vasc
96	Exp_All_mAPCLN*(Lymph_Node.mAPC*([CD80_receptors-per-mAPC]/[Avagadro's_Num]))
97	Exp_All_mAPCLN*(Lymph_Node.mAPC*([CD86_receptors-per-mAPC]/[Avagadro's_Num]))
98	Exp_All_mAPCLN*Lymph_Node.mAPC*([PD1_receptors-per-mAPC]/[Avagadro's_Num])
99	Exp_All_mAPCLN*Lymph_Node.mAPC*([PDL1_receptors-per-mAPC]/[Avagadro's_Num])
100 101	Exp_All_mAPCLN*Lymph_Node.mAPC*([PDL2_receptors-per-mAPC]/[Avagadro's_Num]) kf_APC_turnover*Lymph_Node.mAPC
101	kf_TregLNS_Inact*Lymph_Node.mAPC*CTLA4Sig_Secrete
103	Exp_All_mAPCLN*(Lymph_Node.mAPC_CD80)
104	Exp_All_mAPCLN*(Lymph_Node.mAPC_CD86)
105	[Exp_CD28/80/86/PD1/L1/L2]*((Lymph_Node.mAPC_CD80)*(Lymph_Node.mAPC_Int_P1/(Lymph_Node.mAPC+ 1E-100*mole)))*(1/T_cells_per_mAPC)
106	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.mAPC_CD86*(Lymph_Node.mAPC_Int_P1/(Lymph_Node.mAPC+ 1E-100*mole)))*(1/T_cells_per_mAPC)
107	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.mAPC_Int_P1_CD80 + POS_Sig_NT_CD80)
108 109	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.mAPC_Int_P1_CD86 + POS_Sig_NT_CD86) [Exp_CD28/80/86/PD1/L1/L2]*((Lymph_Node.mAPC_CD80)*(Lymph_Node.mAPC_Int_P2/(Lymph_Node.mAPC+1E-100*mole)))*(1/T_cells_per_mAPC)
110	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.mAPC_CD86*(Lymph_Node.mAPC_Int_P2/(Lymph_Node.mAPC+1E-100*mole)))*(1/T_cells_per_mAPC)
111	[Exp_CD28/80/86/PD1/L1/L2]*Lymph_Node.mAPC_PD1*(Lymph_Node.mAPC_Int_P2/(Lymph_Node.mAPC+1E- 100*mole))*(1/T_cells_per_mAPC)
112	[Exp_CD28/80/86/PD1/L1/L2]*Lymph_Node.mAPC_PDL1*(Lymph_Node.mAPC_Int_P2/(Lymph_Node.mAPC+1E-100*mole))*(1/T_cells_per_mAPC)
113	[Exp_CD28/80/86/PD1/L1/L2]*Lymph_Node.mAPC_PDL2*(Lymph_Node.mAPC_Int_P2/(Lymph_Node.mAPC+1E-100*mole))*(1/T_cells_per_mAPC)
114	[kon_CTLA4_CD80]*Lymph_Node.mAPC_Int_P2_CD80*Lymph_Node.PNT_CTLA4/([Volume_PNT-Receptor_Int])- [koff_CTLA4_CD80]*Lymph_Node.NEG_Sig_PNT_CD80
115	[kon_PDL1_CD80]*Lymph_Node.mAPC_Int_P2_CD80*Lymph_Node.PNT_Int_PDL1/[Volume_PNT-Receptor_Int]- [koff_PDL1_CD80]*Lymph_Node.[PNT_PDL1-CD80]
116 117	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.mAPC_Int_P2_CD80+NEG_Sig_PNT_CD80+POS_Sig_PNT_CD80+[PNT_FDL1-CD80]) [kon_CTLA4_CD86]*Lymph_Node.mAPC_Int_P2_CD86*Lymph_Node.PNT_CTLA4/([Volume_PNT-Receptor_Int])-
117	[kof_CTLA4_CD86]*Lymph_Node.NEG_Sig_PNT_CD86 [kof_CD28_CD86]*Lymph_Node.NEG_Sig_PNT_CD86 [kof_CD28_CD86]*Lymph_Node.mAPC_Int_P2_CD86*Lymph_Node.PNT_Int_CD28/([Volume_PNT-Receptor_Int])-
	[koff_CD28_CD86]*Lymph_Node.POS_Sig_PNT_CD86
119	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.mAPC_Int_P2_CD86+NEG_Sig_PNT_CD86+POS_Sig_PNT_CD86)
120	[kon_PD1-PD1mAb]*Lymph_Node.mAPC_Int_P2_PD1*Lymph_Node.PD1_mab/Vtdln-[koff_PD1-PD1mAb]*[PD1mAb_mAPC_PD1]
121	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.mAPC_Int_P2_PD1+PD1mAb_mAPC_PD1+[PNT_PDL1-PD1])
122 123	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.mAPC_Int_P2_PDL1+[PDL1mAb-mAPC_PDL1]+[PNT_PD1-PDL1]+[PNT_CD80-PDL1]) [kon_PD1_PDL2]*Lymph_Node.mAPC_Int_P2_PDL2*Lymph_Node.PNT_Int_PD1/[Volume_PNT-Receptor_Int]-
123	[kof_PD1_PDL2]*Lymph_Node.mAPC_int_P2_PDL2*Lymph_Node.PN1_int_PD1/[volume_PN1-Receptor_int]- [koff_PD1_PDL2]*Lymph_Node.[PNT_PD1-PDL2]

	Reaction Rate
Number 124	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.mAPC_Int_P2_PDL2+[PNT_PD1-PDL2])
125	Exp All mAPCLN*Lymph Node.mAPC PD1
126	Exp_All_mAPCLN*Lymph_Node.mAPC_PDL1
127	Exp_All_mAPCLN*Lymph_Node.mAPC_PDL2
128	PrimeNT_rate*Lymph_Node.Naive_T*[Prob_NT-mAPC_Interact]*[Sig_NT=CD28]
129	EffT_InOutLN*Lymph_Node.Naive_T
130	PrimeNT1_rate*Lymph_Node.Naive_T1*(1/Antigen_Intensity)*((mAPC_Int_P1)/(mAPC_Int_P1+Naive_T1*mAPC50_per_T cell+0.001*mole))
131	PrimeNT1_rate*Lymph_Node.Naive_T1*Antigen_Intensity*((mAPC_Int_P1)/(mAPC_Int_P1+Naive_T1*mAPC50_per_T_cell+0.001*mole))
132	Endo_CTLA4*Lymph_Node.NEG_Sig_PNT_CD80
133	Endo_CTLA4*Lymph_Node.NEG_Sig_PNT_CD86
134	[kon_CD28_CD80]*Lymph_Node.NT_Int_CD28*Lymph_Node.mAPC_Int_P1_CD80/[Volume_NT-Receptor_Int] - [koff_CD28_CD80]*Lymph_Node.POS_Sig_NT_CD80
135	[kon_CD28_CD86]*Lymph_Node.NT_Int_CD28*Lymph_Node.mAPC_Int_P1_CD86/[Volume_NT-Receptor_Int] - [koff_CD28_CD86]*Lymph_Node.POS_Sig_NT_CD86
136	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.NT_Int_CD28+POS_Sig_NT_CD80+POS_Sig_NT_CD86)
137	[Exp_CD28/80/86/PD1/L1/L2]*(([CD28_receptors-per-Tcell]/[Avagadro's_Num]))*(mAPC_Int_P1/(mAPC_per_T_cell))
138	Q_L/VL*Lymph_Node.PD1_mab
139	Q_L/VL*Lymph_Node.PDL1_mab
140	[kon_PDL1-PDL1mAb]*Lymph_Node.PDL1_mab*Lymph_Node.mAPC_Int_P2_PDL1/Vtdln - [koff_PDL1- PDL1mAb]*Lymph_Node.[PDL1mAb-mAPC_PDL1]
141	[kon_PDL1-PDL1mAb]*Lymph_Node.PDL1_mab*Lymph_Node.PNT_Int_PDL1/Vtdln - [koff_PDL1- PDL1mAb]*Lymph_Node.[PDL1mAb-PNT_PDL1]
142	[Exp_CTLA4]*(Lymph_Node.PNT_CTLA4+NEG_Sig_PNT_CD80+[NEG_Sig_PNT_CD86]+[CTLA4_mAb_CTLA4])
143	[kon_CD28_CD80]*Lymph_Node.PNT_Int_CD28*Lymph_Node.mAPC_Int_P2_CD80/([Volume_PNT-Receptor_Int])- [koff_CD28_CD80]*Lymph_Node.POS_Sig_PNT_CD80
144	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.PNT_Int_CD28+POS_Sig_PNT_CD80+POS_Sig_PNT_CD86)
145	[kon_PDL1_CD80]*Lymph_Node.PNT_Int_CD80*Lymph_Node.mAPC_Int_P2_PDL1/[Volume_PNT-Receptor_Int]- [koff_PDL1_CD80]*Lymph_Node.[PNT_CD80-PDL1]
146	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.PNT_Int_CD80+[PNT_CD80-PDL1])
147	[kon_PD1_PDL1]*Lymph_Node.PNT_Int_PD1*Lymph_Node.mAPC_Int_P2_PDL1/[Volume_PNT-Receptor_Int]- [koff_PD1_PDL1]*Lymph_Node.[PNT_PD1-PDL1]
148	[kon_PD1-PD1mAb]*Lymph_Node.PNT_Int_PD1*Lymph_Node.PD1_mab/Vtdln-[koff_PD1- PD1mAb]*[PD1mAb_PNT_PD1]
149	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.PNT_Int_PD1+PD1mAb_PNT_PD1+[PNT_PD1-PDL2]+[PNT_PD1-PDL1])
150	[kon_PD1_PDL1]*Lymph_Node.PNT_Int_PDL1*Lymph_Node.mAPC_Int_P2_PD1/[Volume_PNT-Receptor_Int]- [koff_PD1_PDL1]*Lymph_Node.[PNT_PDL1-PD1]
151	[Exp_CD28/80/86/PD1/L1/L2]*(Lymph_Node.PNT_Int_PDL1+[PDL1mAb-PNT_PDL1]+[PNT_PDL1-CD80]+[PNT_PDL1-PD1])
152	[Exp_CTLA4]*(([CTLA4_receptors-Int-PNT]/[Avagadro's_Num]))*(mAPC_Int_P2/(mAPC_per_T_cell))
153	[Exp_CD28/80/86/PD1/L1/L2]*(([CD28_receptors-per-Tcell]/[Avagadro's_Num]))*(mAPC_Int_P2/(mAPC_per_T_cell))
154	[Exp_CD28/80/86/PD1/L1/L2]*((([%CD80_receptor_level_PNT]*[CD80_receptors-per- Tcell])/[Avagadro's_Num]))*(mAPC_Int_P2/(mAPC_per_T_cell))
155	[Exp_CD28/80/86/PD1/L1/L2]*((([%PD1_receptor_level_PNT]*[PD1_receptors-per- Tcell])/[Avagadro's_Num]))*(mAPC_Int_P2/(mAPC_per_T_cell))
156	[Exp_CD28/80/86/PD1/L1/L2]*((([%PDL1_receptor_level_PNT]*[PDL1_receptors-per- Tcell])/[Avagadro's_Num]))*(mAPC_Int_P2/(mAPC_per_T_cell))
157	kf_Phase2P*Lymph_Node.Primed_Naive_T*[Prob_PNT-mAPC_Interact]
158 159	kf_no_prolif*Lymph_Node.Primed_Naive_T1*[Sig_PNT=CTLA4/PD1/L1/CD80] PrimeTLN2_rate*Lymph_Node.Primed_Naive_T1*(1/Antigen_Intensity)*((mAPC_Int_P2)/(mAPC_Int_P2+Primed_Naive_T1)*(mAPC_Int_P2)/(mAPC_I
160	*mAPC50_per_T_cell+0.001*mole)) PrimeTLN2_rate*Lymph_Node.Primed_Naive_T1*(1-
	[Sig_PNT=CTLA4/PD1/L1/CD80])*Antigen_Intensity*((mAPC_Int_P2)/(mAPC_Int_P2 +Primed_Naive_T1* mAPC50_per_T_cell +0.001*mole))
161	kf_Prolif_end*Lymph_Node.Prolif_Naive_T
162	Lymph_Node.Prolif_Naive_T*[Prolif_Thresh]
163	Endo_CTLA4*Lymph_Node.TrALN_CT_aCT
164	Endo_CTLA4*Lymph_Node.TrALN_CT_CD80
165	Endo_CTLA4*Lymph_Node.TrALN_CT_CD86
166	[Exp_CTLA4]*Lymph_Node.TregLN*([CTLA4_receptors-Tr]/[Avagadro's_Num])
167	TregLN_Engage*Lymph_Node.mAPC1*((Lymph_Node.TregLN /(Lymph_Node.mAPC1 + 1E- 100*mole))^gamma_TC_Assoc)/(s_Assoc + (Lymph_Node.TregLN /(Lymph_Node.mAPC1 + 1E- 100*mole))^gamma_TC_Assoc)

Reaction Number	Reaction Rate
168	TregLN_Engage*Lymph_Node.Naive_T2*((Lymph_Node.TregLN /(Lymph_Node.Naive_T2 + 1E-
	100*mole))^gamma_TC_Assoc)/(s_Assoc + (Lymph_Node.TregLN /(Lymph_Node.Naive_T2 + 1E-
	100*mole))^gamma_TC_Assoc)
169	TregLN_Engage* Lymph_Node.Primed_Naive_T2*((Lymph_Node.TregLN /(Lymph_Node.Primed_Naive_T2+1E-
	100*mole))^gamma_TC_Assoc)/(s_Assoc + (Lymph_Node.TregLN /(Lymph_Node.Primed_Naive_T2+1E- 100*mole))^gamma_TC_Assoc)
170	[Treg:mAPC_IntTime]*Lymph_Node.TregLN_mAPC*(1-[CTLA4Sig_TrLN-mAPC])
171	[Treg:mAPC_IntTime]*Lymph_Node.TregLN_mAPC*([CTLA4Sig_TrLN-mAPC])
172	[Exp_CD28/80/86/PD1/L1/L2]*Lymph_Node.TregLN_mAPC1*([CD80_receptors-per-
150	mAPC]/[Avagadro's_Num])*(1/Tr_cells_per_mAPC)
173	[Exp_CD28/80/86/PD1/L1/L2]*Lymph_Node.TregLN_mAPC1*([CD86_receptors-per- mAPC]/[Avagadro's_Num])*(1/Tr_cells_per_mAPC)
174	[Exp_CTLA4]*Lymph_Node.TregLN_mAPC1*([CTLA4_receptors-Tr]/[Avagadro's_Num])*(1/mAPC_per_Tr_cell)
175	kon_CTLA4mAb_CTLA4*Lymph_Node.TrLN_CTLA4*Lymph_Node.CTLA4_mab/Vtdln -
	koff_CTLA4mAb_CTLA4*Lymph_Node.TrLN_CT_aCT
176	[Exp_CTLA4]*(Lymph_Node.TrLN_CTLA4+[TrLN_CT_aCT])
177	(k_DoseAdmin_AntiCTLA4*[BodyWeight (kg)]*CTLA4mAb)/(Ipilimumab_MW)
178 179	([BodyWeight (kg)]*PD1mAb)/(Nivolumab_MW)/T_IVinject (k_DoseAdmin_AntiPDL1*[BodyWeight (kg)]*PDL1mAb)/(Durvalumab_MW)
179	EffT_InOutLN*Lymph_Node.Naive_T0
181	Lymph_Node.Prolif_Naive_T*[Prolif_Fract]
182	kf_Monocytes_intoT*Monocytes
183	Rate_Tumor_Growth*Tumor.Cancer
184	(Peripheral.CTLA4_mabP_leaky/(0.35*ISF*KP_PD1))*0.67*Q_L*(1-SigmaL)-Lymph_Node.CTLA4_mab*0.67*Q_L*(1-SigmaL)/VL
185	(Peripheral.CTLA4_mabP_tight/(0.65*ISF*KP_PD1))*0.33*Q_L*(1-SigmaL)-Lymph_Node.CTLA4_mab*0.33*Q_L*(1-
105	SigmaL)/VL
186	(QC_Periph - LC_Periph)*Peripheral.EffT_P_f_Vasc/Vv_Periph
187	EffT_Turnover*Peripheral.EffT_P_f_Vasc
188	(Peripheral.PD1_mabP_leaky/(0.35*ISF*KP_PD1))*0.67*Q_L*(1-SigmaL)-Lymph_Node.PD1_mab*0.67*Q_L*(1-
189	SigmaL)/VL (Peripheral.PD1_mabP_tight/(0.65*ISF*KP_PD1))*0.33*Q_L*(1-SigmaL)-Lymph_Node.PD1_mab*0.33*Q_L*(1-
109	SigmaL)/VL
190	(Peripheral.PDL1_mabP_leaky/(0.35*ISF*KP_PDL1))*0.67*Q_L*(1-SigmaL)-Lymph_Node.PDL1_mab*0.67*Q_L*(1-
101	SigmaL)/VL
191	(Peripheral.PDL1_mabP_tight/(0.65*ISF*KP_PDL1))*0.33*Q_L*(1-SigmaL)-Lymph_Node.PDL1_mab*0.33*Q_L*(1-SigmaL)/VL
192	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{CD80}]*([CD80_receptors_per_C_Cl]/[Avagadro's_Num])*([T_per_Cancer_Cell_I
	nt]/[T_per_Cancer_Cell_max])
193	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}]*([PD1_receptors_per_C_Cl]/[Avagadro's_Num])*([T_per_Cancer_Cell_Int]/
104	[T_per_Cancer_Cell_max])
194	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{CD80}]*([PD1_receptors_per_C_Cl]/[Avagadro's_Num])*([T_per_Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
195	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{CD80}]*([CD80_receptors_per_C_Cl]/[Avagadro's_Num])*([T_per_Cancer
270	_Cell_Int]/[T_per_Cancer_Cell_max])
196	$[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{PDL1}]*([PD1_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_Cance$
107	Cell_Int]/[T_per_Cancer_Cell_max])
197	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{PDL1}]*([PDL1_receptors_per_C_Cl]/[Avagadro's_Num])*([T_per_Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
198	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{PDL1}{CD80}]*([PD1_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_
	Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
199	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{PDL1}{CD80}]*([PDL1_receptors_per_C_C]/[Avagadro's_Num])*([T_per
200	_Cancer_Cell_Int]/[T_per_Cancer_Cell_max]) [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{PDL1}{CD80}]*([CD80 receptors per_C_Cl]/[Avagadro's Num])*([T_per_
200	[Exp_CD28/80/86/PD1/L1/L2]*1umor.[C{PD1}{PDL1}{CD80}^([CD80_receptors_per_C_C1]/[Avagadros_Num])*([1_per Cancer Cell Int]/[T per Cancer Cell max])
201	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{PDL1}{PDL2}]*([PD1_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_
	Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
202	$[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{PDL1}{PDL2}]*([PDL1_receptors_per_C_C1]/[Avagadro's_Num])*([T_per]))*([T_per])*([T_$
202	_Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
203	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{PDL1}{PDL2}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
204	$[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{PDL1}{PDL2}{CD80}]*([PD1_receptors_per_C_C1]/[Avagadro's_Num])*([PD1_receptors_Per_C_C1]/[Avagadro's_Num])*([PD1_receptors_Per_C_C1]/[Avagadro's_Num])*([PD$
	T_per_Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
205	$\label{eq:cds} \end{tabular} \end{tabular}$
207	([T_per_Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
206	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{PDL1}{PDL2}{CD80}]*([PDL2_receptors_per_C_Cl]/[Avagadro's_Num])* ([T_per_Cancer_Cell_Int]/[T_per_Cancer_Cell_max])

Reaction Number	Reaction Rate
207	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{PDL1}{PDL2}{CD80}]*([CD80_receptors_per_C_Cl]/[Avagadro's_Num])*
• • • •	([T_per_Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
208	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{PDL2}]*([PD1_receptors_per_C_Cl]/[Avagadro's_Num])*([T_per_Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
209	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{PDL2}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_Cancer
	_Cell_Int]/[T_per_Cancer_Cell_max])
210	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{PDL2}{CD80}]*([PD1_receptors_per_C_Cl]/[Avagadro's_Num])*([T_per_Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
211	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{PDL2}{CD80}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per
	_Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
212	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PD1}{PDL2}{CD80}]*([CD80_receptors_per_C_Cl]/[Avagadro's_Num])*([T_per_Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
213	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PDL1}]*([PDL1_receptors_per_C_Cl]/[Avagadro's_Num])*([T_per_Cancer_Cell_I
	nt]/[T_per_Cancer_Cell_max])
214	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PDL1}{CD80}]*([PDL1_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
215	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PDL1}{CD80}]*([CD80_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_Cance
	r_Cell_Int]/[T_per_Cancer_Cell_max])
216	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PDL1}{PDL2}]*([PDL1_receptors_per_C_Cl]/[Avagadro's_Num])*([T_per_Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
217	$[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PDL1}{PDL2}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_Canceptors_per_CAnceptors$
210	r_Cell_Int]/[T_per_Cancer_Cell_max])
218	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PDL1}{PDL2}{CD80}]*([PDL1_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
219	$[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PDL1}{PDL2}{CD80}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL1}{PDL2}{CD80}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL1}{PDL2}{CD80}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL1}{PDL2}{CD80}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL1}{PDL2}{CD80}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL1}{C}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL1}{C}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL1}{C}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL1}{C}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL1}{C}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL1}{C}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL2}{C}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL2}{C}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL2}{C}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL2}{C}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL2}{C}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL2}{C}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_CP1/L1/L2]*Tumor.[C{PDL2}{C}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([PDL2]*CECP1/L2)*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([PDL2_receptors_per_CP1/L1]*([PDL2]*CECP1/L2)*([PDL2]*CECP1/L2)*([PDL2]*([PDL2_receptors_per_CP1/L2)*([PDL2]*CECP1/L2)*([PDL2_receptors_per_CP1/L2)*([PDL2_receptors_per_CP1/L2)*([PDL2_receptors_per_CP1/L2)*([PDL2_receptors_per_CP1/L2)*([PDL2_receptors_per_CP1/L2)*([PDL2_receptors_per_CP1/L2)*([PDL2_receptors_per_CP1/L2)*([PDL2_receptors_per_CP1/L2)*([PDL2_receptors_per_CP1/L2)*([PDL2_receptors_per_CP1/L2)*([PDL2_receptors_per_CP1$
220	r_Cancer_Cell_Int]/[T_per_Cancer_Cell_max]) [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PDL1}{PDL2}{CD80}]*([CD80_receptors_per_C_Cl]/[Avagadro's_Num])*([T_pe
<i>44</i> 0	r_Cancer_Cell_Int]/[T_per_Cancer_Cell_max])
221	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PDL2}]*([PDL2_receptors_per_C_Cl]/[Avagadro's_Num])*([T_per_Cancer_Cell_I
222	nt]/[T_per_Cancer_Cell_max]) [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PDL2}{CD80}]*([PDL2_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_Canc
	r_Cell_Int]/[T_per_Cancer_Cell_max])
223	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[C{PDL2}{CD80}]*([CD80_receptors_per_C_C1]/[Avagadro's_Num])*([T_per_Cance
224	r_Cell_Int]/[T_per_Cancer_Cell_max]) [kon_PD1-PD1mAb]*Tumor.[C10a=PD1]*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[C10a=PD1:aPD1]
225	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C10a=PD1]+[C10a=PD1]aPD1]+[T10a=PDL1:PD1=C10a])
226	[kon_PDL1-PDL1mAb]*Tumor.[C10b=PDL1]*Tumor.PDL1_mabt/Vt - [koff_PDL1- PDL1mAb]*Tumor.[C10b=PDL1:aPDL1]
227	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C10b=PDL1]+[C10b=PDL1:aPDL1]+ [T10b=PD1:PDL1=C10b]+
•••	[T10c=CD80:PDL1=C10b])
228 229	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C10c=PDL2] + [T10b=PD1:PDL2=C10c]) [kon_PDL1-PDL1mAb]*Tumor.[C11a=PDL1]*Tumor.PDL1_mabt/Vt - [koff_PDL1-
	PDL1mAb]*Tumor.[C11a=PDL1:aPDL1]
230	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C11a=PDL1]+[C11a=PDL1:aPDL1]+ [T11b=PD1:PDL1=C11a])
231 232	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C11b=CD80]+ [T11a=PDL1:CD80=C11b]) [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C12a=PDL2]+ [T12b=PD1:PDL2=C12a])
233	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C12b=CD80]+[T12a=PDL1:CD80=C12b])
234	[kon_PDL1-PDL1mAb]*Tumor.[C13a=PDL1]*Tumor.PDL1_mabt/Vt - [koff_PDL1-
235	PDL1mAb]*Tumor.[C13a=PDL1:aPDL1] [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C13a=PDL1]+[C13a=PDL1:aPDL1]+ [T13b=PD1:PDL1=C13a])
236	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C13b=PDL2]+[T13b=PD1:PDL2=C13b])
237 238	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C13c=CD80]+ [T13a=PDL1:CD80=C13c]) [kon PD1 PDL1]*Tumor.[C14a=PD1]*Tumor.[T14a=PDL1]/[V T:C 14] -
430	[koff_PD1_PDL1]*Tumor.[T14a=PDL1:PD1=C14a]
239	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C14a=PD1]+[C14a=PD1:aPD1]+[T14a=PDL1:PD1=C14a])
240	[kon_PDL1_CD80]*Tumor.[C14b=PDL1]*Tumor.[T14c=CD80]/[V_T:C_14] - [koff_PDL1_CD80]*Tumor.[T14c=CD80:PDL1=C14b]
241	[kon_PDL1-PDL1mAb]*Tumor.[C14b=PDL1]*Tumor.PDL1_mabt/Vt - [koff_PDL1-
2.42	PDL1mAb]*Tumor.[C14b=PDL1:aPDL1]
242	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C14b=PDL1]+[C14b=PDL1:aPDL1]+ [T14b=PD1:PDL1=C14b]+ [T14c=CD80:PDL1=C14b])
243	[kon_PDL1_CD80]*Tumor.[C14c=CD80]*Tumor.[T14a=PDL1]/[V_T:C_14] -
244	[koff_PDL1_CD80]*Tumor.[T14a=PDL1:CD80=C14c]
244 245	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C14c=CD80]+ [T14a=PDL1:CD80=C14c]) [kon_PD1-PD1mAb]*Tumor.[C15a=PD1]*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[C15a=PD1:aPD1]
246	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C15a=PD1]+[C15a=PD1:aPD1]+[T15a=PDL1:PD1=C15a])
247	[kon_PD1_PDL2]*Tumor.[C15b=PDL2]*Tumor.[T15b=PD1]/[V_T:C_15] -
2 - 77	[koff_PD1_PDL2]*Tumor.[T15b=PD1:PDL2=C15b]

Reaction Number	Reaction Rate
248	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C15b=PDL2] + [T15b=PD1:PDL2=C15b])
249	[kon_PDL1_CD80]*Tumor.[C15c=CD80]*Tumor.[T15a=PDL1]/[V_T:C_15] -
	[koff_PDL1_CD80]*Tumor.[T15a=PDL1:CD80=C15c]
250	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C15c=CD80]+ [T15a=PDL1:CD80=C15c]) [kon PD1 PDL1]*Tumor.[C16a=PD1]*Tumor.[T16a=PDL1]/[V T:C 16] -
251	$[kon_PD1_PDL1]^{1}umor.[C16a=PD1]^{1}umor.[116a=PDL1]/[V_1:C_16] - [koff_PD1_PDL1]^{T}umor.[T16a=PDL1:PD1=C16a]$
252	[kon_PD1-PD1mAb]*Tumor.[C16a=PD1]*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[C16a=PD1:aPD1]
253	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C16a=PD1]+[C16a=PD1]+[T16a=PDL1:PD1=C16a])
254	[kon_PDL1-PDL1mAb]*Tumor.[C16b=PDL1]*Tumor.PDL1_mabt/Vt-[koff_PDL1-PDL1mAb]*Tumor.[C16b=PDL1:aPDL1]
255	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C16b=PDL1]+[C16b=PDL1:aPDL1]+ [T16c=CD80:PDL1=C16b]+ [T16b=PD1:PDL1=C16b])
256	[kon_PD1_PDL2]*Tumor.[C16c=PDL2]*Tumor.[T16b=PD1]/[V_T:C_16] - [koff_PD1_PDL2]*Tumor.[T16b=PD1:PDL2=C16c]
257	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C16c=PDL2]+ [T16b=PD1:PDL2=C16c])
258	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C16d=CD80]+[T16a=PDL1:CD80=C16d])
259	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C2=PD1]+[C2=PD1:aPD1]+[T2=PDL1:PD1=C2])
260	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C3=PDL1]+[C3=PDL1:aPDL1]+[T3a=PD1:PDL1=C3]+[T3b=CD80:PDL1=C3])
261	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C4=PDL2]+[T4=PD1:PDL2=C4])
262 263	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C5=CD80]+[T5=PDL1:CD80=C5]) [kon_PD1-PD1mAb]*Tumor.[C6a=PD1]*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[C6a=PD1:aPD1]
263	$[kon_PD1-PD1hAb]^{+1uhot}.[coa=PD1]^{+1uhot}.PD1_hablev(vt - [kon_PD1-PD1hAb]^{+1uhot}.[coa=PD1.aPD1]$ $[Exp_CD28/80/86/PD1/L1/L2]^{*}(Tumor.[C6a=PD1]+[C6a=PD1]+[T6a=PD1]+[T6a=PDL1:PD1=C6a])$
265	[kon_PD1_PDL1]*Tumor.[C6b=PDL1]*Tumor.[T6b=PD1]/[V_T:C_6] - [koff_PD1_PDL1]*Tumor.[T6b=PD1:PDL1=C6b]
266	[kon_PDL1_CD80]*Tumor.[C6b=PDL1]*Tumor.[T6c=CD80]/[V_T:C_6] -
	[koff_PDL1_CD80]*Tumor.[T6c=CD80:PDL1=C6b]
267	[kon_PDL1-PDL1mAb]*Tumor.[C6b=PDL1]*Tumor.PDL1_mabt/Vt - [koff_PDL1-PDL1mAb]*Tumor.[C6b=PDL1:aPDL1]
268	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C6b=PDL1]+[C6b=PDL1:aPDL1]+[T6b=PD1:PDL1=C6b]+[T6c=CD80:PDL1=C6b])
269	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C7a=PD1]+[C7a=PD1:aPD1]+[T7a=PDL1:PD1=C7a])
270	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C7b=PDL2]+[T7b=PD1:PDL2=C7b])
271	[kon_PDL1_CD80]*Tumor.[C8a=PDL1]*Tumor.[T8b=CD80]/[V_T:C_8] - [koff_PDL1_CD80]*Tumor.[T8b=CD80:PDL1=C8a]
272	[kon_PDL1-PDL1mAb]*Tumor.[C8a=PDL1]*Tumor.PDL1_mabt/Vt - [koff_PDL1-PDL1mAb]*Tumor.[C8a=PDL1:aPDL1]
273	$[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C8a=PDL1]+[C8a=PDL1:aPDL1]+[T8a=PD1:PDL1=C8a]+[T8b=CD80:PDL1=C8a])$
274 275	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C8b=PDL2]+[T8a=PD1:PDL2=C8b]) [kon_PD1_PDL1]*Tumor.[C9a=PD1]*Tumor.[T9=PDL1]/[V_T:C_9] - [koff_PD1_PDL1]*Tumor.[T9=PDL1-PD1=C9a]
275	$[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C9a=PD1]+[C9a=PD1]+[C9a=PD1]+[T9=PDL1-PD1=C9a])$
277	$[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[C9b=CD80]+[T9=PDL1-CD80=C9b])$
278	Endo_CTLA4*Tumor.[CTLA4:CD80_TrAT]
279	Endo_CTLA4*Tumor.[CTLA4:CD86_TrAT]
280	Endo_CTLA4*Tumor.[CTLA4_CTLA4-Trt]
281	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{80}-{PDL1}{PDL2}C]*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])
282	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{80}-{PDL1}{PDL2}C]*([CD80_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])
283	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{CD80}-{PDL1}C]*([PD1_receptors-per-
	Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])
284	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{CD80}-{PDL1}C]*([CD80_receptors-per- Tcell]/[Avagadro's Num])*([Cancer per T Cell Int]/[Cancer per T Cell max])
285	$[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}{80}-{PD1}{80}{L1}{L2}C]*([PDL1_receptors-per-$
	Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])
286	$eq:linear_line$
287	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}{80}-{PD1}{80}{L1}{L2}C]*([CD80_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])
288	$[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}{80}-{PD1}{80}{L1}C]*([PDL1_receptors-per-$
	Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])
289	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}{80}-{PD1}{80}{L1}C]*([PD1_receptors-per-
••••	Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])
290	$[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}{80}-{PD1}{80}{L1}C]*([CD80_receptors-per-Te-ll/(Lambda lambda lamb$
291	Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])
291	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}{80}-{PD1}{L1}{L2}C]*([PDL1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])
292	$[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}{80}-{PD1}{L1}{L2}C]*([PD1_receptors-per-$
	Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])
293	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}{L0}-{PD1}{L1}{L2}C]*([CD80_receptors-per-
	Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])
294	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}{80}-{PD1}{L1}C]*([PDL1_receptors-per-
	Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])

Number Iteration Nutce 295 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}{80}-{PD1}{L1}C]*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 296 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}{80}-{PD1}{L1}C]*([CD80_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 297 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{80}{PDL2}C]*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 298 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{80}{PDL2}C]*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 299 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{L2}C]*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 300 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{L2}C]*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 301 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{L2}C]*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 302 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{80}{L2}C]*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 302 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{80}{L2}C]*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 296 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}{80}-{PD1}{L1}C]*([CD80_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 297 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{80}{PDL2}C]*([PDL1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 298 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{80}{PDL2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 299 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 300 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 301 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 301 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 301 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 302 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
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297 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}[L1]-{PD1}[80]{PDL2}C]*([PDL1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 298 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}[L1]-{PD1}[80]{PDL2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 299 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}[L1]-{PD1}[L2]C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 300 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}[L1]-{PD1}[L2]C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 301 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}[L1]-{PD1}[80]{L2}C]*([PDL1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 301 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}[1]-{PD1}[80]{L2}C]*([PDL1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 302 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 302 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 298 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{80}{PDL2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 299 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 300 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 301 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{80}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 301 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 302 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 302 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 299 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{L2}C]*([PDL1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 300 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{L2}C]*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 301 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PDL1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 302 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/{Eancer_per_T_Cell_max]) 302 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/{Cancer_per_T_Cell_max])	
299 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}[L1]-{PD1}[L2]C]*([PDL1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 300 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 301 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PDL1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 301 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PDL1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 302 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 300 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PD1}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 301 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 301 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 302 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 301 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PDL1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 302 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 302 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
301 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}[L1]-{PDL1}{80}{L2}C]*([PDL1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) 302 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])302[Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
$ \begin{array}{l} \textbf{302} \qquad [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}{L2}C]*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max]) \end{array} $	
303 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}C]*([PDL1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
304 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL1}{80}C]*([PD1_receptors-per-	
Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
305 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL2}{80}C]*([PDL1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
306 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}{L1}-{PDL2}{80}C]*([PD1_receptors-per-	
Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
307 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PD1}-{PDL2}C]*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
308 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PDL1}-{CD80}{PD1}C]*([PDL1_receptors-per-	
Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
309 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PDL1}-{CD80}C]*([PDL1_receptors-per- Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
310 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.[T{PDL1}-{PD1}C]*([PDL1_receptors-per-	
Tcell]/[Avagadro's_Num])*([Cancer_per_T_Cell_Int]/[Cancer_per_T_Cell_max])	
311 [kon_PD1_PDL1]*Tumor.[T10a=PDL1]*Tumor.[C10a=PD1]/[V_T:C_10] -	
 [koff_PD1_PDL1]*Tumor.[T10a=PDL1:PD1=C10a] 312 [kon_PDL1-PDL1mAb]*Tumor.[T10a=PDL1]*Tumor.PDL1_mabt/Vt-[koff_PDL1-PDL1mAb]*Tumor.[T10a=PDL1]*Tumor.PDL1_mabt/Vt-[koff_PDL1-PDL1mAb]*Tumor.[T10a=PDL1]*Tumo	10a=PDL1:aPDL11
313 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T10a=PDL1]+[T10a=PDL1:aPDL1]+[T10a=PDL1:PD1=C10a])	
314 [kon_PD1_PDL1]*Tumor.[T10b=PD1]*Tumor.[C10b=PDL1]/[V_T:C_10] -	
[koff_PD1_PDL1]*Tumor.[T10b=PD1:PDL1=C10b] 315 [kon_PD1_PDL2]*Tumor.[T10b=PD1]*Tumor.[C10c=PDL2]/[V_T:C_10] -	
[koff_PD1_PDL2]*Tumor.[T10b=PD1:PDL2=C10c]	
316 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T10b=PD1]+[T10b=PD1:aPD1]+ [T10b=PD1:PDL1=C10b]+	
[T10b=PD1:PDL2=C10c]) 317 [kon PDL1 CD80]*Tumor.[T10c=CD80]*Tumor.[C10b=PDL1]/[V T:C 10] -	
[koff_PDL1_CD80]*Tumor.[T10c=CD80:PDL1=C10b]	
318 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T10c=CD80]+[T10c=CD80:PDL1=C10b])	
319 [kon_PDL1_CD80]*Tumor.[T11a=PDL1]*Tumor.[C11b=CD80]/[V_T:C_11] - [koff PDL1 CD80]*Tumor.[T11a=PDL1:CD80=C11b]	
320 [kon_PDL1-PDL1mAb]*Tumor.[T11a=PDL1]*Tumor.PDL1_mabt/Vt - [koff_PDL1-	
PDL1mAb]*Tumor.[T11a=PDL1:aPDL1]	
321 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T11a=PDL1]+[T1a=PDL1]+[T11a=PDL1]+[)
[koff_PD1_PDL]*Tumor.[T11b=PD1:PDL1=C11a]	
323 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T11b=PD1]+[T11b=PD1]+[T11b=PD1:PDL1=C11a])	
324 [kon_PDL1_CD80]*Tumor.[T12a=PDL1]*Tumor.[C12b=CD80]/[V_T:C_12] - [koff_PDL1_CD80]*Tumor.[T12a=PDL1:CD80=C12b]	
325 [kon_PDL1-PDL1mAb]*Tumor.[T12a=PDL1]*Tumor.PDL1_mabt/Vt - [koff_PDL1-	
PDL1mAb]*Tumor.[T12a=PDL1:aPDL1]	
326 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T12a=PDL1]+[T12a=PDL1:aPDL1]+ [T12a=PDL1:CD80=C12b]) 327 [kon_PD1_PDL2]*Tumor.[T12b=PD1]*Tumor.[C12a=PDL2]/[V_T:C_12] -)
$[koff_PD1_PDL_2]$ *Tumor.[T12b=PD1:PDL2=C12a]	
328 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T12b=PD1]+[T12b=PD1]+[T12b=PD1:PDL2=C12a])	
329 [kon_PDL1_CD80]*Tumor.[T13a=PDL1]*Tumor.[C13c=CD80]/[V_T:C_13] - [koff_PDL1_CD80]*Tumor.[T13a=PDL1:CD80=C13c]	
330 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T13a=PDL1]+[T)
331 [kon_PD1_PDL1]*Tumor.[T13b=PD1]*Tumor.[C13a=PDL1]/[V_T:C_13] -	
[koff_PD1_PDL1]*Tumor.[T13b=PD1:PDL1=C13a] 332 [kon_PD1_PDL2]*Tumor.[T13b=PD1]*Tumor.[C13b=PDL2]/[V_T:C_13] -	
[koff_PD1_PDL2]*Tumor.[T13b=PD1:PDL2=C13b] [koff_PD1_PDL2=C13b] [koff_PD1_PDL2=C13b] [koff_PD1_PDL2=C13b] [koff_PD1_PD1_PDL2=C13b] [koff_PD1_PDL2=C13b] [koff_PD1_PDL2=C13b] [koff_PD1_PDL2=C13b] [koff_PD1_PDL2=C13b] [koff_PD1_PD1_PDL2=C13b] [koff_PD1_PD1_PD1_PD1_PD1_PD1_PD1_PD1_PD1_PD1	

Reaction Number	Reaction Rate
333	[kon_PD1-PD1mAb]*Tumor.[T13b=PD1]*Tumor.PD1_mabt/Vt-[koff_PD1-PD1mAb]*Tumor.[T13b=PD1:aPD1]
334	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T13b=PD1]+[T13b=PD1:aPD1]+ [T13b=PD1:PDL2=C13b]+ [T13b=PD1:PDL1=C13a])
335	[kon_PDL1-PDL1mAb]*Tumor.[T14a=PDL1]*Tumor.PDL1_mabt/Vt - [koff_PDL1- PDL1mAb]*Tumor.[T14a=PDL1:aPDL1]
336	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T14a=PDL1]+[T14a=PDL1:aPDL1]+ [T14a=PDL1:PD1=C14a]+ [T14a=PDL1:CD80=C14c])
337	[kon_PD1_PDL1]*Tumor.[T14b=PD1]*Tumor.[C14b=PDL1]/[V_T:C_14] - [koff_PD1_PDL1]*Tumor.[T14b=PD1:PDL1=C14b]
338	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T14b=PD1]+[T14b=PD1:aPD1]+[T14b=PD1:PDL1=C14b])
339	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T14c=CD80]+ [T14c=CD80:PDL1=C14b])
340	[kon_PD1_PDL1]*Tumor.[T15a=PDL1]*Tumor.[C15a=PD1]/[V_T:C_15] - [koff_PD1_PDL1]*Tumor.[T15a=PDL1:PD1=C15a]
341	[kon_PDL1-PDL1mAb]*Tumor.[T15a=PDL1]*Tumor.PDL1_mabt/Vt -[koff_PDL1-PDL1mAb]*Tumor.[T15a=PDL1:aPDL1]
342	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T15a=PDL1]+[T15a=PDL1:aPDL1]+ [T15a=PDL1:CD80=C15c]+ [T15a=PDL1:PD1=C15a])
343	[kon_PD1-PD1mAb]*Tumor.[T15b=PD1]*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[T15b=PD1:aPD1]
344	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T15b=PD1]+[T15b=PD1:aPD1]+[T15b=PD1:PDL2=C15b])
345	[kon_PDL1_CD80]*Tumor.[T16a=PDL1]*Tumor.[C16d=CD80]/[V_T:C_16] - [koff_PDL1_CD80]*Tumor.[T16a=PDL1:CD80=C16d]
346	[kon_PDL1-PDL1mAb]*Tumor.[T16a=PDL1]*Tumor.PDL1_mabt/Vt - [koff_PDL1-
347	PDL1mAb]*Tumor.[T16a=PDL1:aPDL1] [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T16a=PDL1]+[T16a=PDL1:aPDL1]+ [T16a=PDL1:PD1=C16a]+
	[T16a=PDL1:CD80=C16d])
348	[kon_PD1_PDL1]*Tumor.[T16b=PD1]*Tumor.[C16b=PDL1]/[V_T:C_16] - [koff_PD1_PDL1]*Tumor.[T16b=PD1:PDL1=C16b]
349	[kon_PD1-PD1mAb]*Tumor.[T16b=PD1]*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[T16b=PD1:aPD1]
350	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T16b=PD1]+[T16b=PD1:aPD1]+ [T16b=PD1:PDL2=C16c]+ [T16b=PD1:PDL1=C16b])
351	[kon_PDL1_CD80]*Tumor.[T16c=CD80]*Tumor.[C16b=PDL1]/[V_T:C_16] - [koff_PDL1_CD80]*Tumor.[T16c=CD80:PDL1=C16b]
352	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T16c=CD80]+ [T16c=CD80:PDL1=C16b])
353	[kon_PD1_PDL1]*Tumor.[T2=PDL1]*Tumor.[C2=PD1]/[V_T:C_2] - [koff_PD1_PDL1]*Tumor.[T2=PDL1:PD1=C2]
354	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T2=PDL1]+[T2=PDL1:aPDL1]+[T2=PDL1:PD1=C2])
355 356	[kon_PD1_PDL1]*Tumor.[T3a=PD1]*Tumor.[C3=PDL1]/[V_T:C_3] - [koff_PD1_PDL1]*Tumor.[T3a=PD1:PDL1=C3] [kon_PD1-PD1mAb]*Tumor.[T3a=PD1]*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[T3a=PD1:aPD1]
350 357	$[\text{kon}_PD1-PD1\text{mAd}]^{+1}\text{fumor}, [13a=PD1]^{+1}\text{fumor}, [2a=PD1]^{+1}\text{fumor}, [13a=PD1]^{+1}\text{fumor}, [13a=PD1]^{+1}$
358	[kon_PDL1_CD80]*Tumor.[T3b=CD80]*Tumor.[C3=PDL1]/[V_T:C_3] - [koff PDL1_CD80]*Tumor.[T3b=CD80:PDL1=C3]
359	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T3b=CD80]+[T3b=CD80:PDL1=C3])
360	[kon_PD1_PDL2]*Tumor.[T4=PD1]*Tumor.[C4=PDL2]/[V_T:C_4] - [koff_PD1_PDL2]*Tumor.[T4=PD1:PDL2=C4]
361	[kon_PD1-PD1mAb]*Tumor.[T4=PD1]*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[T4=PD1:aPD1]
362	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T4=PD1]+[T4=PD1:aPD1]+[T4=PD1:PDL2=C4])
363	[kon_PDL1_CD80]*Tumor.[T5=PDL1]*Tumor.[C5=CD80]/[V_T:C_5] - [koff_PDL1_CD80]*Tumor.[T5=PDL1:CD80=C5]
364	[kon_PDL1-PDL1mAb]*Tumor.[T5=PDL1]*Tumor.PDL1_mabt/Vt - [koff_PDL1-PDL1mAb]*Tumor.[T5=PDL1:aPDL1]
365 266	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T5=PDL1]+[T5=PDL1:aPDL1]+[T5=PDL1:CD80=C5]) [kon_PD1_PDL1]*Tumor.[T6a=PDL1]*Tumor.[C6a=PD1]/[V_T:C_6] - [koff_PD1_PDL1]*Tumor.[T6a=PDL1:PD1=C6a]
366 367	$[kon_PD1_PDL1]^Tunior.[Toa=PDL1]^Tunior.[Coa=PD1]/[v_1r.c_0] - [kon_PD1_PDL1]^Tunior.[Toa=PDL1:PD1=Coa]$
368	[Exp CD28/80/86/PD1/L1/L2]*(Tumor.[T6a=PDL1]+[T6a=PDL1]
369	[kon_PD1-PD1mAb]*Tumor.[T6b=PD1]*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[T6b=PD1:aPD1]
370	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T6b=PD1]+[T6b=PD1:aPD1]+[T6b=PD1:PDL1=C6b])
371	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T6c=CD80]+[T6c=CD80:PDL1=C6b])
372	[kon_PD1_PDL1]*Tumor.[T7a=PDL1]*Tumor.[C7a=PD1]/[V_T:C_7] - [koff_PD1_PDL1]*Tumor.[T7a=PDL1:PD1=C7a]
373 374	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T7a=PDL1]+[T7a=PDL1]+[T7a=PDL1]+[T7a=PDL1]PD1=C7a]) [kon_PD1_PDL2]*Tumor.[T7b=PD1]*Tumor.[C7b=PDL2]/[V_T:C_7] - [koff_PD1_PDL2]*Tumor.[T7b=PD1:PDL2=C7b]
374 375	[kon_PD1_PDL2]*Tumor.[17b=PD1]*Tumor.[C7b=PD12]/[v_1.C_7] - [kon_PD1_PDL2]*Tumor.[17b=PD1.PDL2=C7b] [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T7b=PD1]+[T7b=PD1:aPD1]+[T7b=PD1:PDL2=C7b])
376	[kon_PD1_PDL1]*Tumor.[T8a=PD1]*Tumor.[C8a=PDL1]/[V_T:C_8] - [koff_PD1_PDL1]*Tumor.[T8a=PD1:PDL1=C8a]
377	[kon_PD1_PDL2]*Tumor.[T8a=PD1]*Tumor.[C8b=PDL2]/[V_T:C_8] - [koff_PD1_PDL2]*Tumor.[T8a=PD1:PDL2=C8b]
378	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T8a=PD1]+[T8a=PD1:aPD1]+[T8a=PD1:PDL1=C8a]+[T8a=PD1:PDL2=C8b])
379	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T8b=CD80]+[T8b=CD80:PDL1=C8a])
380	[kon_PDL1_CD80]*Tumor.[T9=PDL1]*Tumor.[C9b=CD80]/[V_T:C_9] - [koff_PDL1_CD80]*Tumor.[T9=PDL1-CD80=C9b]
381	[kon_PDL1-PDL1mAb]*Tumor.[T9=PDL1]*Tumor.PDL1_mabt/Vt - [koff_PDL1-PDL1mAb]*Tumor.[T9=PDL1:aPDL1]
382	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.[T9=PDL1]+[T9=PDL1:aPDL1]+[T9=PDL1-PD1=C9a]+[T9=PDL1-CD80=C9b])
383	kf_RestingMacrophage*Tumor.APC_T
384 385	Phago_Debris*Tumor.C_DebrisT*Tumor.APC_T Debris_Transport*Tumor.C_DebrisT*(1/[Num_TDLN_Considered])*(1-[mAPC_Debis_T_Inact])
385 386	Debris Decay*Tumor.C DebrisT

Number Constraint 387 Debris Transport*Tumor.C. Debris T*[InAPC. Debris.T. Inarci] 388 Debris Transport*Tumor.C. Debris T*[InAPC. Debris.T. Inarci] 388 Iten support*Tumor.C. Debris T*[InAPC. Debris.T. Inarci] 388 Iten support*Tumor.C. Debris T*[InAPC. Debris.T. Inarci] 388 Iten Support 391 Iten Debris.T. Canace 392 Iten Debris.T. Canace 393 Iten Debris.T. Canace 394 Iten Debris.T. Canace 395 Iten Debris.T. Canace 396 Iten Debris.T. Canace 397 Iten Debris.T. Canace 398 Kon, C. TLA AL. CDS0] Thurner.C. TLA A. Teng T* Thurner.C. TLA A. mab/ Y1- 497 Iten C. TLA A. CDS0] Thurner.C. TLA A. Teng T* Thurner.C. TLA A. mab/ Y1- 498 Kon, C. TLA A* Thurner.C. TLA A* Teng T* Thurner.C. TLA A* cDS0 TATI] 597 Iten C. TLA A* CDS0] Thurner.C. TLA A* Teng T* Thurner.C. TLA A* cDS0 TATI] 598 Kon, C. TLA A* Thurner.C. TLA A* Teng T* Thurner.C. TLA A* cDS0 TATI] 599 Iten S* conversion Thurner.Effector. T* 1* (-1. TheEnd)* 1 590 Iten Thurner.C. TLA * Teng T* Thurner.C. TLA * teng T* ten S* conversion Thurn	
 Debris Transport*Tumor.C. Debris T*(1-1/Kum, TDLN, Considered)) KanDeay Tumor.C. Cancer (Exp. CD28.80368/PD1/L.12]*(Tumor.CD80_mAPCT+(CTLA4:CD80_TrATI) (Exp. CD28.80368/PD1/L.12]*(Tumor.CD80_TeTT+[PD1.1CD80_TrFefT]) (Exp. CD28.80366 PD1/L.12]*(Tumor.CD80_TeTT+[PD1.1CD80_TrFefT]) (Exp. CD28.80366 PD1/L.12]*(Tumor.CD80_TeTT+[PD1.1CD80_TrFefT]) (Exp. CD28.80366 PD1/L.12]*(Tumor.CD80_TeTT+[PD1.1CD80_TFFefT]) (Exp. CD28.80366 PD1/L.12]*(Tumor.CD80_mAPCT+(Vol_Cell-Rec_Tr-APCT])- (Kpa, TB*S, TB*VLawg_ const*(1.431.63)*Upmph Audo CTLA4_mabt/VL_TeT*Tumor.Void_Fraction)- (Kpa, TB*S, TB*VLawg_ const*(1.431.63)*Upmph Audo CTLA4_mabt/VL_ (Ion, CTLA4_CD80)*Tumor.CTLA4_TregT*Tumor.CD80_mAPCT/(Vol_Cell-Rec_Tr-APCT] - (Ion, CTLA4_CD80)*Tumor.CTLA4_TregT*Tumor.CD80_mAPCT/(Vol_Cell-Rec_Tr-APCT] - (Ion, CTLA4_CD86)*Tumor.CTLA4_TregT*Tumor.CD80_mAPCT/(Vol_Cell-Rec_Tr-APCT] - (Ion, CTLA4_CD86)*Tumor.CTLA4_TregT*Tumor.CD80_mAPCT/(Vol_Cell-Rec_Tr-APCT] - (Ion, CTLA4_CD86)*Tumor.CTLA4_TregT*Tumor.CD80_mAPCT/(Vol_Cell-Rec_Tr-APCT] - (Ion, CTLA4_CD86)*Tumor.CTLA4_TregT+(Tumor.CTLA4_mabt/V : (Ion, CTLA4_CD86)*Tumor.CTLA4_TregT+(Tumor.CD80_mAPCT)/Vol_Cell-Rec_Tr-APCT] - (Ion CTLA4_CD86)*Tumor.CTLA4_TregT+(Tumor.CD80_mAPCT)/Vol_Cell-Rec_TrAPCT] - (Ion CTLA4_CD86)*Tumor	
 kf CanDeavy*Tumor.Cancer Tumor.Cancer Tumor.Chancer <l< th=""><td></td></l<>	
 [koi, PDL, LC80]*Tumor, CD80, Teff]*Tumor,PDL, Trgp [/[Vol, Cell-Rec, Tr-Teff] . [koi, PDL, LC80]*Tumor, CD80, Teff] [Exp, CD238086PDL/LL2]*(Tumor,CD80, TeffT1 PDL, LC80, MDSCT)) [Exp, CD238086PDL/LL2]*(Tumor,CD80, TefT1 PDL, LC80, MDSCT)) [Exp, CD238086PDL/LL2]*(Tumor,CD80, TaPCT+(CTLA4-CD86, TrAT)) [Kon, CTLA4, CD80]*Tumor,CTLA4, TegT*Tumor,CD80, TaPCT+(Vol, Cell-Rec, Tr-APCT) - [koff, CTLA4, CD80]*Tumor,CTLA4, TegT*Tumor,CD80, TaPCT+(Vol, Cell-Rec, Tr-APCT) - [koff, CTLA4, CD80]*Tumor,CTLA4, TegT*Tumor,CD80, TaPCT+(Vol, Cell-Rec, Tr-APCT) - [koff, CTLA4, CD86]*Tumor,CTLA4, TegT+Tumor,CD80, TaPCT+(Vol, Cell-Rec, Tr-APCT) - [koff, CTLA4, CD86]*Tumor,CTLA4, TegT+Tumor,CD80, TaPC+(Vol, Cell-Rec, Tr-APCT) - [koff, CTLA4, CD86]*Tumor,CTLA4, TegT+Tumor,CD80, TaPC+(Vol, Cell-Rec, Tr-APCT) - [koff, CTLA4, CD86]*Tumor,CTLA4, TegT+Tumor,CTA4, TaPA+(TTUA4, CD86, TaT1) 400 EffT, Res, Conversion*Tumor,Effector, TT*(1-TheEnd)*9 EffT, Res, Conversion*Tumor,Effector, TT*(1-TheEnd)*1. EffT, Tumover*Tumor,CHTLA4, Nasc 417 Tumover*Tumor,CHTLA4, Nasc 418 [Tumover*Tumor,EffT_A, Vasc 417 Tumover*Tumor,EffT_A, Vasc 418 418 Tumor,EffT_L, Vasc 419 421 421 Tumover*Tumor,EffT_L, Vasc/Vv, Tum 411 421 Tumover*Tumor,EffT_L, Vasc/Vv, Tum 411 411 Tumover*Tumor,EffT_L, Vasc/Vv, Tum 412 411 Tumover*Tumor,EffT_L, Vasc/Vv, Tum	
 Isoff PDL I, CD80(PTunoc,IPDL I, CD80, TrTeff) Exp. CD28 8086 PDL /L12(PTUnor,CD80, Teff) = PDL I, CD80, TNFeff) Exp. CD28 8086 PDL /L12(PTUnor,CD80, Teff) = PDL I, CD80, MDSCT) Exp. CD28 8086 PDL /L12(PTUnor,CD80, Teff) = PDL I, CD80, MDSCT) FpL TB*S, TB*V, avg. const(1 4371, 63)*upmor,CTL /A, mabt/VL, Teff*Tumor, Void Fraction)- Kpp, TB*S, TB*V, avg. const(1 4371, 63)*upmor,CTL /A, mabt/VL, Teff*Tumor, Void Fraction)- Kpp, TB*S, TB*V, avg. const(1 4371, 63)*upmor,CTL /A, mabt/VL - Konf, CTL /A, CD80(PTunor,CTL /A, TregT*Tumor,CD80, mAPCT/Vol Cell-Rec, Tr-APCT] - Ikoff, CTL /A, CD80(PTunor,CTL /A, TregT*Tumor,CD80, mAPCT/Vol Cell-Rec, Tr-APCT] - Ikoff, CTL /A, CD80(PTunor,CTL /A, TregT*Tumor,CTL /A, mabt/VL - konf, CTL /A, MD80(PTUnor,CTL /A, TregT*Tumor,CTL /A, mabt/VL - konf, CTL /A, MD80(PTUnor,CTL /A, TregT*Tumor,CTL /A, mabt/VL - konf, CTL /A, MD8, CTL /A *Tumor,CTL /A, TregT*Tumor,CTL /A, mabt/VL - konf, CTL /A, MD8 (PTL /A, CTL /A *TUMOr,CTL /A, TregT+(TL /A +CD80, TATI)+(CTL /A +CD86, TATI)+(CTL /A +CTL /A +Trl) Exp. CTL /A + (TUmor,CTL /A, TregT+(TL /A +CD80, TATI)+(CTL /A +CD86, TATI)+(CTL /A +CD80, TATI)+(CTL /A +CD80,	
 [Exp. CD288086PD1/L1/2]*(Tumor.CD80_TeTT+[PD1:LCD80_MDSCT)) [Exp. CD288086PD1/L1/2]*(Tumor.CD80_TETT+[PD1:LCD80_MDSCT)) [Exp. CD288086PD1/L1/2]*(Tumor.CD86_mAPCT+(CTLA4-CD86_TAT)) [Exp. CD280086PD1/L1/2]*(Tumor.CD86_mAPCT+(V)_TeTf*Tumor.Void_Fraction)- Kpa TB*S, TB*V, avg. const(1.4371.63)*(Jumph Node.CTLA4_mab(VL) [Kon CTLA4_CD80]*Tumor.CTLA4_TEgT*Tumor.CD80_mAPCT/[Vol_Cel-Rec_Tr-APCT] - [Koft CTLA4_CD86]*Tumor.CTLA4_TEgT*Tumor.CD86_mAPCT/[Vol_Cel-Rec_Tr-APCT] - [Koft CTLA4_CD86]*Tumor.CTLA4_TEgT*Tumor.CD86_mAPCT/[Vol_Cel-Rec_Tr-APCT] - [Koft CTLA4_CD86]*Tumor.CTLA4_TEgT*Tumor.CD86_mAPCT/[Vol_Cel-Rec_Tr-APCT] - [Koft CTLA4_CD86]*Tumor.CTLA4_TEgT*Tumor.CD86_mAPCT/[Vol_Cel-Rec_Tr-APCT] - [Koft CTLA4_CD86]*Tumor.CTLA4_TEgT*Tumor.CTB4_mapCV1 - [Koft CTLA4_CD86]*Tumor.CTLA4_TEgT*Tumor.CTB4_mapCV1 - [Koft CTLA4_CD86]*Tumor.CTLA4_TEgT*Tumor.CTB4_mapCV1 - [Koft Res_Conversion*Tumor.Effector, TT*(1-TheEnd)* 9 [Eff Res_Conversion*Tumor.Effector, TT*(1-TheEnd)* 9 [Eff T. Res_Conversion*Tumor.Effector, TT*(1-TheEnd)* 9 [Eff T. Tumover*Tumor.Effector, TT*(1-TheEnd)* 9 [Eff T. Tumover*Tumor.Eff A. Vasc [Eff T. Tumover*Tumor.Eff A. Vasc [Eff T. Tumover*Tumor.Eff A. Vasc [Eff T. Tumover*Tumor.Eff J. Vasc [Eff T. Tumover*Tumor.Eff J. Vasc [Eff T. Tumover*Tumor.Eff J. Vasc [Eff T. Tumover*Tumor.Eff J. Vasc [Eff T. Tumover*Tumor.Eff J. Vasc [Eff T. Tumover*Tumor.Eff J. Vasc [Eff T. Tumover*Tumor.Eff J. Vasc [Eff T. Tumover*Tumor.Eff J. Vasc [Eff T. Tumover*Tumor.Eff J. Vasc [Eff T. Tumover*Tumor.Eff J. Vasc [Eff T. Tumover*Tumor.Eff J. Vasc [Eff T. Tumover	
 [Exp. CD28/08/6PD1/L.1/2]*(Tumor.CD80_TeTT1 i-IPD1.ICD80_MDSCT)) [Sp. CD28/08/6PD1/L.1/2]*(Tumor.CD80_TAPCT+ICTLA-4CD86_TAT1)) [Sp. TB*S, TB*V_Lay2_const(143/1.63)*[JumPACT-ICTLA/LD86_TAT1)) [Kon_CTLA, CD80]*Tumor.CTLA4_TregT*Tumor.CD80_mAPCT/Vol_Coll-Rec_Tr-APCT]- [Kon_CTLA4_CD80]*Tumor.CTLA4_TregT*Tumor.CD80_mAPCT/Vol_Coll-Rec_Tr-APCT]- [Kon_CTLA4_CD80]*Tumor.CTLA4_TregT*Tumor.CD80_mAPCT/Vol_Coll-Rec_Tr-APCT]- [Kon_CTLA4_CD80]*Tumor.CTLA4_TregT*Tumor.CD80_mAPCT/Vol_Coll-Rec_Tr-APCT]- [Kon_CTLA4_MD80]*Tumor.CTLA4_TregT*Tumor.CD80_mAPCT/Vol_Coll-Rec_Tr-APCT]- [Kon_CTLA4_MD80]*Tumor.CTLA4_TregT*Tumor.CTLA4_mab/V1- [Kon_CTLA4]*Tumor.ETLA4_CD80_TAT1]-(CTLA4-CD86_TAT1)+(CTLA4_CTLA4-Trn)) [Exp. CTLA4]*(Tumor.Effector_TT*(1-TheEnd)*.9 [Exp. CTLA4]*(Tumor.Effector_TT*(1-TheEnd)*.9 [Eff_T_Res_Conversion*Tumor.Effector_TT*(1-TheEnd)*.9 [Eff_T_Res_Conversion*Tumor.Effector_TT*(1-TheEnd)*.9 [Eff_T_TumoreTT_AR_Vasc [Eff_T_TumoreTT_AR_Vasc [Eff_T_TumoreTT_AR_Vasc [Eff_T_TumoreTT_AR_Vasc [Eff_T_TumoreTT_AR_Vasc [Eff_T_TumoreTT_B_Vasc [Eff_T_TumoreTT_B_Vasc [Eff_T_TumoreTT_B_Vasc [Eff_T_TumoreTT_B_Vasc [Eff_T_TumoreTT_B_Vasc [Eff_T_TumoreTT_B_Vasc [Eff_T_TumoreTT_B_Vasc [Eff_T_TumoreTT_B_Vasc [Eff_T_TumoreTT_B_Vasc [Eff_TumoreT_B_Vasc [Eff_T_TumoreTT_B_Vasc [Eff_TumoreT_B_VASC [Eff_T_TumoreT_B_VASC [Eff_T_TumoreT_B_VASC [Eff_T_TumoreT_B_VASC [Eff_T_TumoreT_B_VASC [Eff_T_TUmoreT_B_VASC [Eff_T_TUmoreT_B_A_SUSC [Eff_T_TUMORET_B_S_SUSC [Eff_T_TUMORET_B_S_SUSC [Eff_T_TUMORET_B_S_SUSC [Eff_T_TUMORET_B_S_SUSC<	
 [Exp. CD282036(PD1L1/L2)*(Tumor.CD86, mAPCT+(CTLA4-CD86, TrAT)) [Sp. TB*S, TB*Y, avg. const?(1437).6371ymph Node.CTLA4. mab/VL) [Kon, CTLA4. CD80]*Tumor.CTLA4. TrgeT*Tumor.CD80, mAPCT/Vol_Cell-Rec_Tr-APCT] - [Kon, CTLA4. CD80]*Tumor.CTLA4. TrgeT*Tumor.CD80, mAPCT/Vol_Cell-Rec_Tr-APCT] - [Kon, CTLA4. CD86]*Tumor.CTLA4. TrgeT*Tumor.CTLA4. mab/V1 - [Kon, CTLA4. MD00, CTLA4. TrgeT+CTLA4.CD80, TrAT1+(CTLA4-CD86, TrAT]+(CTLA4_CTLA4-Trq)) [EfT] Res. Conversion*Tumor.Effector, TT*(1-TheEnd)* 9 [EfT] Tumore*TIT.AF. Yasc [EfT] Tumore*TimorEAFT.AF. Yasc <li< th=""><td></td></li<>	
995 Kpa_TPS_TB*VLay_const*(143/.63)*Tumor CTLA4_mab/(VL_Telt*Tumor_Void_Fraction)- Kpa_TPS_TB*VLay_const*(143/.63)*Tumor CTLA4_mab/(VL_A_mab/VL) 976 [kon_CTLA4_CD80]*Tumor_CTLA4_TregT*Tumor_CD80_mAPCT/[Vol_Cell-Rec_Tr-APCT] - [kof_CTLA4_CD80]*Tumor_CTLA4_TregT*Tumor_CD85_mAPCT/[Vol_Cell-Rec_Tr-APCT] - [kof_CTLA4_mAb_CTLA4*Tumor_CTLA4_TregT*Tumor_CD85_mAPCT/[Vol_Cell-Rec_Tr-APCT] - [kof_CTLA4_mAb_CTLA4*Tumor_CTLA4_TregT*Tumor_CD85_mAPCT/[Vol_Cell-Rec_Tr-APCT] - [kof_CTLA4mAb_CTLA4*Tumor_CTLA4_TregT*Tumor_CD85_mAPCT/[Vol_Cell-Rec_Tr-APCT] - [kof_CTLA4mAb_CTLA4*Tumor_CTLA4_TregT*Tumor_CTLA4_mab/Vt- kof_CTLA4mAb_CTLA4*Tumor_CTLA4_TregT*Tumor_CTLA4_mab/Vt- kof_CTLA4mAb_CTLA4*Tumor_CTLA4_TregT*Tumor_CD85_mAPCT/[Vol_Cell-Rec_Tr-APCT] - [kof_CTLA4mAb_CTLA4*Tumor_CTLA4_TregT*Tumor_CD86_mAPCT] - [Exp_CTLA4]*Tumor_CB1Cetor_TT*(1-TheEnd)*.9 901 EffT_Res_Conversion*Tumor_Effector_TT*(1-TheEnd)*.9 901 EffT_Res_Conversion*Tumor_Effector_TT*(1-TheEnd)*.9 901 EffT_Res_Conversion*Tumor_Effector_TT*(1-TheEnd)*.9 901 EffT_Res_Conversion*Tumor_Effector_TT*(1-TheEnd)*.9 901 EffT_Res_Conversion*Tumor_Effector_TT*(1-TheEnd)*.9 902 EffT_Tumor_EffT_A_Vasc 903 K1_Tumor_EffT_A_Vasc 904 K1_Tumor_EffT_A_Vasc 905 K1_Tumor_EffT_G_Vasc 907 K1_Tumor_EffT_G_Vasc 908 K1_Tumor_EffT_G_Vasc 907 K1_Tumor_EffT_G_Vasc	
 Kya, TB*, TB*VL avg. const*(1.43/1.63)*Lymph. Node, CTLA4 mab/V(L) Kon, CTLA4, CD80)*Tumor, CTLA4, TregT*Tumor, CD80, mAPCT/Vol, Cell-Rec, Tr-APCT] - Kon, CTLA4, CD80)*Tumor, CTLA4, TregT*Tumor, CD80, mAPCT/Vol, Cell-Rec, Tr-APCT] - Kon, CTLA4, CD80)*Tumor, CTLA4, TregT*Tumor, CTLA4, mab/Vt- Kon, CTLA4, CD80)*Tumor, CTLA4, TregT*Tumor, CTLA4, mab/Vt- Kon, CTLA4, CD80, TTumor, CTLA4, TregT*Tumor, CTLA4, mab/Vt- Kon, CTLA4mAb, CTLA4*Tumor, CTLA4, TregT*Tumor, CTLA4, CTLA4-Tri) Exp. CTLA4]*Tumor, Effector, TT*(1-TheEnd)*9 EffT, Res, Conversion*Tumor, Effector, TT*(1-TheEnd)*9 EffT, Res, Conversion*Tumor, Effector, TT*(1-TheEnd)*9 EffT, Res, Conversion*Tumor, Effector, TT*(1-TheEnd)*9 EffT, Tumover*Tumor, Effector, TT*(1-TheEnd)*9 EffT, Tumover*Tumor, EffT, AR, Vasc EffT, Tumover*Tumor, EffT, AR, Vasc EffT, Tumover*Tumor, EffT, AR, Vasc EffT, Tumover*Tumor, EffT, L, Vasc/Vv, Tum EffT, Tumover*Tumor, EffT, L, Vasc MAPC, Migrate*Tumor, MAPC, T*(Li)Num, TDLN, Considered))*(1-ImAPC, Debis, T_Inacl) MAPC, Migrate*Tumor, MAPC, T*(Li)Num, TDLN, Considered) Eps, CD28:80:86(PD)/L1/L2]*Tumor, MAPC, Teng TregT*((CD86, receptors-per- mAPC]/Avagadros, Num)*(1/T); cells, per, mAPC) Eps, CD28:80:86(PD)/L1/L2]*Tumor, MAPC, Teng TregT*(CD86, receptor	
 [kon_CTLA4_CD80]*Tumor.CTLA4_TregT*Tumor.CD80_mAPCT/[Vol_Cell-Rec_Tr-APCT] - [kon_CTLA4_CD80]*Tumor.CTLA4_TregT*Tumor.CD85_mAPCT/[Vol_Cell-Rec_Tr-APCT] - [kon_CTLA4_CD86]*Tumor.CTLA4_TregT*Tumor.CTLA4_mabt/Vt - kon_CTLA4mAb_CTLA4*Tumor.CTLA4_TregT*Tumor.CTLA4_mabt/Vt - kon_CTLA4mAb_CTLA4*Tumor.CTLA4_TregT*Tumor.CTLA4_mabt/Vt - kon_CTLA4mAb_CTLA4*Tumor.CTLA4_TregT*Tumor.CTLA4_mabt/Vt - kon_CTLA4mAb_CTLA4*Tumor.CTLA4_TregT*Tumor.CTLA4_mabt/Vt - kon_CTLA4mAb_CTLA4*Tumor.CTLA4_TregT*Tumor.CTLA4_mabt/Vt - kon_CTLA4mAb_CTLA4*Tumor.CTLA4_TregT*Tumor.CTLA4_mabt/Vt - kon_CTLA4mAb_CTLA4*Tumor.CTLA4_TregT*TumACADS0_TATH+(CTLA4-CD86_TAT]+(CTLA4-CD86_TAT]+(CTLA4-CTLA4_Trt]) [Exp_CTLA4]*Tumor.Effector_TT*([-ThEEnd)*] [EffT_Res_Conversion*Tumor.Effector_TT*([-ThEEnd)*] [EffT_Res_Conversion*Tumor.Effector_TT*([-ThEEnd)*] [EffT_Tumor.EffT_AR_Vasc [IffT_Tumor.EffT_AR_Vasc [IffT_Tumor.EffT_AR_Vasc [IffT_Tumor.EffT_AR_Vasc [IffT_Tumor.EffT_AR_Vasc [IffT_Tumor.EffT_AR_Vasc [IffT_Tumor.EffT_AR_Vasc [Iff_Tumor.EffT_AR_Vasc [Iff_Tumo	
 [koff_CTLA4_CD80]*Tumor.CTLA4. TrcgT*Tumor.CD86_mAPCT/Vol_Cell-Rec_Tr-APCT] - [koff_CTLA4_CD86]*Tumor.CTLA4. TrcgT*Tumor.CD86_mAPCT/Vol_Cell-Rec_Tr-APCT] - [koff_CTLA4_CD86]*Tumor.CTLA4_TrcgT*Tumor.CTLA4_mab/V1-	
997 [kon_CTLA4_CD86]*Tumor_CTLA4_TregT*Tumor_CD86_mAPCT/[Vol_Cell-Rec_Tr-APCT] - [kof: CTLA4_CD86]*Tumor_CTLA4_TregT*Tumor.CTLA4_mabt/V1 - kof: CTLA4_CD86]*Tumor_CTLA4_TregT*Tumor.CTLA4_mabt/V1 - kof: CTLA4mAb. CTLA4*Tumor.CTLA4_TegT*Tumor.CTLA4_mabt/V1 - kof: CTLA4mAb. CTLA4*Tumor.CTLA4_TegT+CTLA4-CD80_TrAT]+[CTLA4-CD86_TrAT]+[CTLA4_CTLA4-Trt]) 199 [Exp_CTLA4]*Tumor.CTLA4_TegT+CTLA4-CD80_TrAT]+[CTLA4-CD86_TrAT]+[CTLA4_CTLA4-Trt]) 190 [Exp_CTLA4]*Tumor.Effector_TT*(1-TheEnd)*.9 101 [EffT_Res_Conversion*Tumor.Effector_TT*(1-TheEnd)*.1 103 CaccerTEng**Tumor.Effector_TT*(1-TheEnd)*.9 104 [EffT_rumor.effT_R_R_Vasc 105 J_Tm*Tumor.EffT_AR_Vasc 106 [EffT_rumor.effT_R_R_Vasc 107 AR_Tm*Tumor.EffT_b_Vasc 108 kr_Tm*Tumor.EffT_b_Vasc 109 [K_Tm*Tumor.EffT_b_Vasc 111 [EffT_rumor.effT_b_Vasc 112 [EffT_rumor.effT_b_Vasc 113 mAPC_Migrate*Tumor.MPC_T*(1/Num_TDLN_Considered])*(1-[mAPC_Debis_T_Inact]) 114 mAPC_Migrate*Tumor.MPC_T*[mAPC_Debis_T_Inact] 115 [Eff_cD20280056PD1/L1.2]*Tumor.MPCC_EngTregT*(CD80_receptors-per- mAPC]/(Avagado's_Num)*(1/Tr_cells_per_mAPC) 116 [Esf_cD20280056PD1/L1.2]*Tumor.MPSCT_EngTregT*(CD80_receptors-per- mAPC]/(Avagado's_Num)*(1/Tr_	
 [koff_CTLA4_CD86]*Tumor_CTLA4_Tcp3*Tumor_CTLA4_mabt/Vt- koff_CTLA4mAb_CTLA4*Tumor_CTLA4_Tcp3*Tumor_CTLA4_mabt/Vt- koff_CTLA4mAb_CTLA4*Tumor_CTLA4_Tcp3*Tumor_CTLA4_cD86_TrAT]+[CTLA4_CTLA4_CTLA4_TrI]) [EfT_Res_Conversion*Tumor_Effector_TT*(1-TheEnd)*9 [EfT_Res_Conversion*Tumor_Effector_TT*(1-TheEnd)*9 [EfT_Res_Conversion*Tumor_Effector_TT*(1-TheEnd)*9 [EfT_Res_Conversion*Tumor_Effector_TT*(1-TheEnd)*9 [Cumor_Cflcctor_TT_C_Eng/(Tumor_Cancer1+1E-100*mole))*gamma_TC_Assoc) + (Tumor_Effector_TT_C_Eng/(Tumor_Cancer1+1E-100*mole))*gamma_TC_Assoc) + (Tumor_Effector_TT_C_Eng/(Tumor_Cancer1+1E-100*mole))*gamma_TC_Assoc) [EfT_Tumover*Tumor_EffT_AR_Vase [GG_TMT_TLC_TMP_Vase [GG_TMT_TLC_TMP_Vase [GG_TMT_TLC_TMP_Vase [GG_TMT_TLC_TMP_Vase [GG_TMT_TLC_TMP_Vase [GG_TMT_TLC_TMP_Vase]*Tumor_EffT_f_Vase/Vv_Tmr [GC_Tmr_TLC_TMP_Vase]*Tumor_APC_T*(1/1Num_TDLN_Considered])*(1-[mAPC_Debis_T_Inact]) mAPC_Migrate*Tumor.mAPC_T*(1/1Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact]) mAPC_Migrate*Tumor.mAPC_T*(1/1Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact]) mAPC_Migrate*Tumor.mAPC_T*(1/1Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact]) mAPC_Migrate*Tumor.mAPC_T*(1/1Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact]) mAPC_Migrate*Tumor.mAPC_T*(1/1Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact]) [Fap_CD28808/06/DU1.11/2]*Tumor_MAPCT_EngTregT*(1(CD8_receptors-per- mAPC)[/Avagadro's.Num)*(1/Tr_cells, per_mAPC) [Fap_CD28808/06/DU1.11/2]*Tumor_MDSC3T_EngT*(1[CD16_cereptors-per- maPC][/Avagadro's.Num)*(1/Tr_cells, per_mAPC) [Fap_CD28808/06/DU1.11/2]*Tumor_MDSC3T_EngT*(1[PD1_receptors-per- Teall/[/Avagadro's.Num)*(1/Tr_cells, per_mAPC) [Fap_CD28808/05/DU1.11/2]*Tumor_MDSC3T_EngT*(1[PD1_receptors-per- Teall/[/Avagadro's.Num)*(1/Tr_cells, per_mAPC) [Fap_CD28	
 kofi_CTLA4mAb_CTLA4*Tqmor.[CTLA4_CTLA4*Tr] EFA_CTLA4*[CTumor.CTLA4+Tqrg]+[CTLA4CDS0_TrAT]+[CTLA4CDS6_TrAT]+[CTLA4_CTLA4_CTLA4_Tr]) EfT_Res_Conversion*Tumor.Effector_TT*(1-TheEnd)*.9 EfT_Res_Conversion*Tumor.Effector_TT*(1-TheEnd)*.9 CancerTEng *Tumor.Cancer1 * ([Tumor.Effector_TT_C_Eng/(Tumor.Cancer1+1E-100*mole)/*gamma_TC_Assoc)/ + (Tumor.Effector_TT_C_Eng/(Tumor.Cancer1+E1-00*mole)/*gamma_TC_Assoc) EfT_Tumover*Tumor.EfT_AR_Vasc JTma*Tumor.EfT_AR_Vasc EfT_Tumover*Tumor.EfT_b_Vasc AR_Tma*Tumor.EfT_b_Vasc AR_Tma*Tumor.EfT_b_Vasc AR_Tma*Tumor.EfT_b_Vasc AR_Tma*Tumor.EfT_b_Vasc AR_Tma*Tumor.EfT_b_Vasc AR_C_Tarnet*Tumor.EfT_LAV K_Tma*Tumor.EfT_b_Vasc MARC_Migrate*Tumor.mAPC_T*(1-I/Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact)) mAPC_Migrate*Tumor.mAPC_T*(1-I/Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact)) mAPC_Migrate*Tumor.mAPC_T*(1-I/Num_TDLN_Considered)) MAPC_Migrate*Tumor.mAPC_T*(1-I/Num_TDLN_Considered)) MAPC_Migrate*Tumor.mAPC_T*(1-I/Num_TDLN_Considered)) mAPC_Migrate*Tumor.mAPC_T*(1-I/Num_TDLN_Considered)) mAPC_Migrate*Tumor.mAPC_T*(1-I/Num_TDLN_COnsidered)) mAPC_Migrate*Tumor.mAPC_T*(1-I/Num_TDLN_COnsidered)) TregTMDSCEng*Tumor.Eff.com_TT_MDSCs*(Tumor.MBSC_T/(Tumor.Effector_TT_MDSCs+1E-100*mole)/*gamma_TC_Assoc) Eff_CD_CD28/80/80FDL1.1/12(*Tumor.MDSCST_EngT*(1CD86_receptors-per-mAPC) TregTMDSCEng*Tumor.Effector_TT_MDSCs*[EngTeff*([PD1_receptors-per-Tcell]/(Avagadro's_Num])*(1/T_per_HS_DSCST_EngT*(IPD1_receptors-per-Tcell]/(Avagadro's_Num])*(1/T_per_HS_DSCST_EngT*(IPD1_receptors-per-Tcell]/(Avagadro's_Num])*(1/T_per_HS_DSCST_EngT*(IPD1_receptors-per-Tcell]/(Avagadro's_Num])*(1/T_per_HS_DSCST_EngT*(IPD1_receptors-per-Tcell]/(Avagadro's_NUM))*(1/T_per_HS_DSCST_EngT*(IPD1_rEceptorS	
999 [Exp_CTLA4]*[Tumor.CTLA4_TregT+(CTLA4:CD80_TrAT]+[CTLA4:CD86_TrAT]+[CTLA4:CTLA4-CTLA4-TrI]) 901 EffT_kes_Conversion*Tumor.Effector_TT*(1-TheEnd)*.9 902 EffT_kes_Conversion*Tumor.Effector_TT*(1-TheEnd)*.1 903 CancerfEng*TumorCancer1 * (TumorChector_TT*(1-TheEnd)*.1 904 EffT_kes_Conversion*Tumor.Effector_TT*(1-TheEnd)*.1 905 EffT_tumove*Tumor.EffT_rowner 906 EffT_tumove*Tumor.EffT_AR_Vasc 907 AR_Tmr*Tumor.EffT_b_Vasc 908 kr_Tmr*Tumor.EffT_b_Vasc 907 AR_Tmr*Tumor.EffT_b_Vasc 907 AR_Tmr*Tumor.EffT_b_Vasc 908 kr_Tmr*Tumor.EffT_b_Vasc 907 AR_Tmr*Tumor.EffT_b_Vasc 908 kr_Tmr*Tumor.EffT_b_Vasc 909 kf_Tmr*Tumor.EffT_b_Vasc 901 EffT_trumove*Tumor.EffT_f_Vasc/Vv_Tmr 911 EffT_Tmrwe*Tumor.EffT_b_Vasc 912 mAPC_Migrate*Tumor.MAPC_T*[Vasc/Vv_Tmr 913 mAPC_Migrate*Tumor.MAPC_T*[Vasc/Vv_Tmr 914 MAPC_Migrate*Tumor.MAPC_T*[Vasc/Vv_Tmr 915 [Fsp_CD28:N08(PD1L1/L2]*Tumor.MAPCT_EngTregT*([CD80_receptors-per-mach]) 914	
 EffT Tumover*Tumor.Effector_TT* EffT Res_Conversion*Tumor.Effector_TT*(1-TheEnd)*.9 EffT_Res_Conversion*Tumor.Effector_TT*(1-TheEnd)*.1 CancerTEng *Tumor.Cancert * (Tumor.Effector_TT_C_Eng/(Tumor.Cancer1+1E-100*mole))*gamma_TC_Assoc)/ (+ Tumor.EffCtor_TT_C_Eng/(Tumor.Cancer1+1E-100*mole))*gamma_TC_Assoc) EffT_Tumover*Tumor.EffT_AR_Vasc J.Tm**Tumor.EffT_b_Vasc EffT_Tumover*Tumor.EffT_b_Vasc (C_Tm*-LC_Tm)*Tumor.EffT_b_Vasc (C_Tm*Tumor.EffT_b_Vasc (C_Tm*Lo_C_Tmr)*Tumor.MPC_T*(1/Num_TDLN_Considered))*(1-(mAPC_Debis_T_Inact)) mAPC_Migrate*Tumor.mAPC_T*(1/Num_TDLN_Considered)) (Exp_CD28/08/06PD1/L1/L2)*Tumor.MAPCT_EngT*((CD80_receptors-per-mAPC)(1Avagadro's Num))*(1/T_refls_per_mAPC) (Exp_CD28/08/06PD1/L1/L2)*Tumor.MAPCT_Set_(Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E-100*mole))*gamma_TC_Assoc)(s_Assoc + (Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E-100*mole))*gamma_TC_Assoc)(s_Assoc) (Exp_CD28/08/06PD1/L1/L2)*Tumor.MDSCST_EngTeff*([PD1_receptors-per-Tcell]/(Avagadro's_Num])*(1/T_refls_per_Tcell) (Exp_CD28/08/06PD1/L1/L2)*Tumor.MDSCST_EngTeff*([PD1_receptors-per-Tcell]/(Avagadro's_Num])*(1/T_refls_per_Tcell) (Exp	
401 EffT_Res_Conversion*Tumor.Effector_TT*(1-TheEnd)*.9 402 EffT_Res_Conversion*Tumor.Effector_TT*(1-TheEnd)*.1 403 CancerTEng* Tumor.Cancer1 * (Tumor.Cancer1+1E-100*mole)/*gamma_TC_Assoc)/ + (Tumor.Effector_TT_C_Eng/Tumor.Cancer1+1E-100*mole)/*gamma_TC_Assoc) 404 EffT_Tumover*Tumor.EffT_AR_Vasc 405 J_Tmr*Tumor.EffT_A_Vasc 406 EffT_Tumover*Tumor.EffT_b_Vasc 407 A.R_Tmr*Tumor.EffT_b_Vasc 408 kr_Tmr*Tumor.EffT_b_Vasc 409 kf_Tmr*Tumor.EffT_f_Vasc/Vv_Tmr 410 (QC_Tmr-LC_Tmr)*Tumor.EffT_f_Vasc/Vv_Tmr 411 EffT_Sumover*Tumor.EffT_f_Vasc/Vv_Tmr 412 mAPC_Migrate*Tumor.mAPC_T*(1/Num_TDLN_Considered))*(1-(mAPC_Debis_T_Inact)) 413 mAPC_Migrate*Tumor.mAPC_T*[mAPC_Debis_T_Inact] 414 mAPC_Migrate*Tumor.mAPC_T*[mAPC_Debis_T_Inact] 415 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD80_receptors-per- mAPC)[/Avagadro's_Num])*(1/Tr_cels per_mAPC) 416 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per-Teell]/[Avagadro's_Num])*(1/T_per_ TregTMDSC4s+1E-100*molb)*gamma_TC_Assoc) 417 [TregT_InTime]*Tumor.MDSCST_EngTeff*([PD1_receptors-per-Teell]/[Avagadro's_Num])*(1/T_per_ TregTMDSC4s+1E-100*molb)*[Numor.PD1_mabV:Tumor.PD1_mabV(V_LEff*Tumor_Vo	
 Eff T, Res_Conversion*Tumor.Effector_TT*(1-fheEnd)*.1 CancertEng **Tumor.Cancert * (Tumor.Effector_TT_C_Eng/(Tumor.Cancert + IE-100*mole))*gamma_TC_Assoc)/ * (Tumor.Efft_cor_TT_C_Eng/(Tumor.Cancert + IE-100*mole))*gamma_TC_Assoc) EffT_Tumove*Tumor.EffT_AR_Vasc J.Tm**Tumor.EffT_A_Vasc AR_Tm**Tumor.EffT_A_Vasc AR_Tm**Tumor.EffT_A_Vasc Conversion*Tumor.EffT_A_Vasc Conversion*Tumor.EffT_A_Vasc AR_Tm*Tumor.EffT_A_Vasc Conversion*Tumor.EffT_A_Vasc Ka_Tm**Tumor.EffT_A_Vasc Conversion*Tumor.EffT_A_Vasc Conversion*Tumor.EffT_A_Vasc Conversion*Tumor.EffT_A_Vasc MAPC_Migrate*Tumor.MC_T*(1/Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact]) mAPC_Migrate*Tumor.MC_T*(1/Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact]) mAPC_Migrate*Tumor.MC_T*(1/Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact]) Exp_CD2880/86/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD80_receptors-per- mAPC)/[Avagadro's.Num])*(1/Tr_cells_per_mAPC) Exp_CD2880/86/PD1/L1/L2]*Tumor.MAPCT_EngTregT*([CD86_receptors-per- mAPC)/[Avagadro's.Num])*(1/Tr_cells_per_mAPC) TregTMDSCEng*Tumor.Effector_TT_MDSCs+TengTeff*([PD1_receptors-per- mAPC)/[Avagadro's.Num])*(1/T_per_rcells) Exp_CD2880/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per- Teell]/Avagadro's.Num])*(1/T_per_rcell) TregT_InSTEnder'S.MMSCST_EngTeff*([PD1_receptors-per- Teell]/Avagadro's.Num])*(1/T_per_rcell) Exp_CD2880/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per- Teell]/Avagadro's.Num])*(1/T_per_rcell) Kon_PD1=PD1mAbf*Tumor.PD1_mabf*Tumor.CaPED1_mabf/YL_feff*Tumor_YOid_Fraction)- Kpa_TB*S_TB*YL_avg_const*(1.43/1.63)*Tumor.PD1_mabf/YL_feff*Tumor_YOid_Fraction)- Kpa_TB*S_TB*YL_avg_const*(1.43/1.63)*Tumor.PD1_mabf/YL_feff*Tumor_YOid_Fraction)- Kpa_TB*S_TB*YL_avg_const*(1.43/1.63)*Tumor.PD1_mabf/YL_feff*Tumor_(
 403 CancerTEng * Tumor.Cancert * (Tumor.Effector_TT_C_Eng.(Tumor.Cancert+1E-100*mole))*gamma_TC_Assoc)/ + (Tumor.Effector_TT_C_Eng/(Tumor.Cancert+1E-100*mole))*gamma_TC_Assoc) 404 EffT_Tumor.EffT_AR_Vasc 405 J_Tm*Tumor.EffT_AR_Vasc 406 EffT_Tmrover*Tumor.EffT_b_Vasc 407 AR_Tm*Tumor.EffT_b_Vasc 408 kr_Tmr*Tumor.EffT_b_Vasc 409 Kf_Tmr*Tumor.EffT_b_Vasc 409 Kf_Tmr*Tumor.EffT_f_vasc/Vv_Tmr 410 (QC_Tmr -LC_Tmr)*Tumor.EffT_f_Vasc/Vv_Tmr 411 EffT_Tmnver*Tumor.EffT_f_Vasc 412 mAPC_Migrate*Tumor.mAPC_T*(1/Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact)) 413 mAPC_Migrate*Tumor.mAPC_T*(1/Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact)) 414 mAPC_Migrate*Tumor.mAPC_T*(1/Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact)) 415 [Exp_CD28/80/86PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD80_receptors-per- mAPC]/(Avagadro's_Num)*(1/T_cells_per_mAPC) 416 [Exp_CD28/80/86PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD86_receptors-per- mAPC]/(Avagadro's_Num)*(1/T_cells_per_mAPC) 417 TregTMDSCEng*Tumor.Effector_TT_MDSCs*(1Cumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole)/*gamma_TC_Assoc)(s_Assoc + (Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole)/*gamma_TC_Assoc)(s_Assoc + (Tumor.MDSC_T(Tumor.Effector_TT_MDSCs + 1E- 100*mole)/*gamma_TC_Assoc)(s_Assoc + (Tumor.MDSCT_T(Tumor.Effector_TT_MDSCs + 1E- 100*mole)/*gamma_TC_Assoc)(s_Assoc + (Tumor.MDSCT_TCT_Tumor.File(1/Avagadro's_Num))*(1/T_per. Tcell)/(Avagadro's_Num)*(1/T_per.Tr_cell) 419 [Exp_CD28/80/86PD1/L1/L2]*Tumor.MDSCST_EngTeff*((PD1_receptors-per-Tcell)/[Avagadro's_Num])*(1/T_per. Tcell)/(Avagadro's_Num))*(1/T_per.Tr_cell) 418 [Exp_CD28/80/86PD1/L1/L2]*Tumor.MDSCST_EngTeff*(CP1_PD1_mDImA)*Tumor.[Cla=PD1:aPD1] 424 [kon_PD1-PD1mAb]*Tumor.PD1_mab*Tumor.[Cla=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[Cla=PD1:aPD1] 425 [kon_PD1-PD1mAb]*Tumor.PD1_mab*Tumor.[C	
 + (Tumor.Effector_TT_C_Eng/Tumor.Cancer1+1E-100*mole)/sgamma_TC_Assoc) 404 EffT_Tumove.FfT_AR_Vasc J_Tm*Tumor.EffT_AR_Vasc 406 EffT_Tumover*Tumor.EffT_b_Vasc 407 AR_Tm*Tumor.EffT_b_Vasc 408 kr_Tmr*Tumor.EffT_b_Vasc 409 kf_Tmr*Tumor.EffT_f_Vasc/Vv_Tmr 410 (QC_Tmr + LC_Tmr)*Tumor.EffT_f_Vasc/Vv_Tmr 411 EffT_Tumover*Tumor.EffT_f_Vasc 412 mAPC_Migrate*Tumor.mAPC_T*(1/Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact]) 413 mAPC_Migrate*Tumor.mAPC_T*(1/Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact]) 414 mAPC_Migrate*Tumor.mAPC_T*(1/Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact]) 415 [Exp_CD28/08/69/D1/L1/2]*Tumor.mAPCT_EngTregT*([CD80_receptors-per- mAPC)/[Avagadro's_Num])*(1/Tr_cells_per_mAPC) 416 [Exp_CD28/08/68/D1/L1/2]*Tumor.MAPCT_EngTregT*([CD86_receptors-per- mAPC)/[Avagadro's_Num])*(1/Tr_cells_per_mAPC) 417 TregTMDSCEng*Tumor.Effector_TT_MDSCs*(Tumor.Effector_TT_MDSCs + 1E- 100*mole)/*gamma_TC_Assoc) 418 [Exp_CD28/08/68/D1/L1/L2]*Tumor.MDSCT_IngTefT*([CD80_receptors-per- Tcell/[Avagadro's_Num])*(1/Tr_cells_per_mAPC) 419 [Exp_CD28/08/68/D1/L1/L2]*Tumor.MDSCT_TEngTefT*([PDL1_receptors-per- Tcell/[Avagadro's_Num])*(1/Tr_per_Tr_cell) 410 [TregT_L_fittime]*Tumor.MDSCT_TEngTefT*([PDL1_receptors-per- Tcell/[Avagadro's_Num])*(1/Tr_per_Tr_cell) 420 [TregT_L_fittime]*Tumor.MDSCT_T_fitsjg_MDSCTeff=Total] 421 [TregT_L_fittime]*Tumor.MDSCT_T_fitsjg_MDSCTeff=Total] 422 [Kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C14=PD1]Vt_! [koff_PD1-PD1mAb]*Tumor.[C14=PD1]:aPD1] 423 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]Vt_! [koff_PD1-PD1mAb]*Tumor.[C14=PD1]:aPD1] 424 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]Vt_! [koff_PD1-PD1mAb]*Tumor.[C14=PD1]:aPD1] 425 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]Vt_! [koff_PD1-PD1mAb]*Tumo	$(a \Lambda a a a a$
404 EffT_Turnover*Tumor.EffT_ÅR_Vasc 405 J_Tme*Tumor.EffT_b_Vasc 406 EffT_Turnover*Tumor.EffT_b_Vasc 407 AR_Tme*Tumor.EffT_b_Vasc 408 kr_Tme*Tumor.EffT_b_Vasc 409 kf_Tum*Tumor.EffT_b_Vasc 409 kf_Tum*Tumor.EffT_f_Vasc/Vv_Tmr 411 EffT_Tumover*Tumor.EffT_f_Vasc/Vv_Tmr 412 mAPC_Migrate*Tumor.mAPC_T*(1/Num_TDLN_Considered))*(1-[mAPC_Debis_T_Inact)) 413 mAPC_Migrate*Tumor.mAPC_T*(1/Num_TDLN_Considered)) 414 mAPC_Migrate*Tumor.mAPC_T*(1/Num_TDLN_Considered)) 415 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD80_receptors-per- mAPC]/Avagadro's_Num)*(1/T_reals_per_mAPC) 416 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MAPCT_EngTregT*([CD86_receptors-per- mAPC]/Avagadro's_Num)*(1/T_rent_per_mAPC) 417 TregTMDSCEng*Tumor.Effector_TT_MDSCs*(1Cumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole)/gamma_TC_Assoc)(s_Assoc + (Tumor.MDSCST_IngTeff*([PD1_receptors-per-Teell]/[Avagadro's_Num])*(1/T_per_tr_cell) 419 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCST_EngTeff*([PD1_receptors-per-Teell]/[Avagadro's_Num])*(1/T_per_tr_cell) 420 [TregT_InfTme]*Tumor.MDSCST_EngTeff*([PD1_receptors-per-Teell]/[Avagadro's_Num])*(1/T_per_tr_cell) 430 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCS	c)/(s_Assoc
 J_Tmr*Tumor.EffT_AR_Vasc	
 Eff T_Turnover*Tumor.EffT_b_Vasc AR_Tim*Tumor.EffT_b_Vasc kr_Tim*Tumor.EffT_b_Vasc kr_Tim*Tumor.EffT_b_Vasc kf_Tim*Tumor.EffT_b_Vasc (QC_Tim - LC_Timr)*Tumor.EffT_f_Vasc/Vv_Timr EffT Turnover*Tumor.EffT_f_Vasc (QC_Tim - LC_Timr)*Tumor.EffT_f_Vasc/Vv_Timr EffT Turnover*Tumor.EffT_f_Vasc mAPC_Migrate*Tumor.mAPC_T*(1[Num_TDLN_Considered])*(1-[mAPC_Debis_T_Inact]) mAPC_Migrate*Tumor.mAPC_T*(1[Num_TDLN_Considered]) mAPC_Migrate*Tumor.mAPC_T*(1[Num_TDLN_Considered]) mAPC_Migrate*Tumor.mAPC_T*[mAPC_Debis_T_Inact] [Exp_CD2880/86/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD86_receptors-per- mAPC]/(Avagadro's_Num)*(1/Tr_cells_per_mAPC) (Exp_CD2880/86/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD86_receptors-per- mAPC]/(Avagadro's_Num)*(1/Tr_cells_per_mAPC) TregTMDSCEng*Tumor.Effector_TT_MDSCs*([Cumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole)/*gamma_TC_Assoc)('s_Assoc + fumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole)/*gamma_TC_Assoc)('s_Assoc + fumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole)/*gamma_TC_Assoc)('s_Assoc + fumor.MDSCsT_EngTeff*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*(1/Tr_cell; Exp_CD2880/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*(1/Tr_cell) (TregT_IntTime)*Tumor.MDSCsT_Teff*[isg_MDSCTeff=Total]) (Kon_PD1-PD1mAb]*Tumor.PD1_mab/(VL)_Teff*Tumor_Void_Fraction)- kpa_TB*S_TB*VL_avg_const*(1.431.63)*Tump1.Node_PD1_mab/(VL)_Eff*Tumor_[C1a=PD1] (kon_PD1-PD1mAb]*Tumor.PD1_mab*Tumor.[C1a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C1a=PD1] (kon_PD1-PD1mAb]*Tumor.PD1_mab*Tumor.[C1a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C1a=PD1] (kon_PD1-PD1mAb]*Tumor.PD1_mab*Tumor.[C1a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C1a=PD1] (kon_PD1-PD1mAb]*Tumor.PD1_mab*Tumor.[C1a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C1a=PD1].aPD1]<td></td>	
 408 kr_Tmr*Tumor.EffT_b_Vasc 409 kr_Tmr*Tum*Tree_Sites*Tumor.EffT_f_Vasc/Vv_Tmr 410 (QC_Tmr + LC_Tmr)*Tumor.EffT_f_Vasc/Vv_Tmr 411 EffT_Tumover*Tumor.EffT_f_Vasc 412 mAPC_Migrate*Tumor.mAPC_T*(1/[Num_TDLN_Considered])*(1-[mAPC_Debis_T_Inact]) 414 mAPC_Migrate*Tumor.mAPC_T*(1/[Num_TDLN_Considered]) 414 mAPC_Migrate*Tumor.mAPC_T*(1/[Num_TDLN_Considered]) 415 [Exp_CD28:808:66/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD80_receptors-per- mAPC]/[Avagadro's_Num])*(1/T_cells_per_mAPC) 416 [Exp_CD28:808:66/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD86_receptors-per- mAPC]/[Avagadro's_Num])*(1/T_cells_per_mAPC) 417 TregTMDSCEng*Tumor.Effector_TT_MDSCs*((Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole)/sgamma_TC_Assoc) 418 [Exp_CD28:808:66/PD1/L1/L2]*Tumor.MDSCST_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_ Tcell]/[Avagadro's_Num])*(1/T_per_Tr_cell) 419 [Exp_CD28:808:66/PD1/L1/L2]*Tumor.MDSCST_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_Tcell) 420 [TregT_InTime]*Tumor.MDSCST_Teff*(]Sig_MDSCTeff=Total] 421 [TregT_InTime]*Tumor.MDSCST_Teff*(]Sig_MDSCTeff=Total] 422 Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Umor.PD1_mabt/(Vt_Teff*Tumor_Void_Fraction)- Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Umor.PD1_mabt/(Vt_l_koff_PD1-PD1mAb]*Tumor.[C14a=PD1:aPD1] 424 [kon_PD1-PD1mAb]*Tumor.PD1_mab*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C2=PD1:aPD1] 425 [kon_PD1-PD1mAb]*Tumor.PD1_mab*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C2=PD1:aPD1] 426 [kon_PD1-PD1mAb]*Tumor.PD1_mab*Tumor.[C3=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14=PD1:aPD1] 427 [kon_PD1-PD1mAb]*Tumor.PD1_mab*Tumor.[C14=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14=PD1:aPD1] 438 [kon_PD1-PD1mAb]*Tumor.PD1_mab*Tumor.[T14=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14=PD1:aPD1] 434 [kon_PD1-PD1mAb]*Tumor.PD	
 kf_Tmr*Tmr_Free_Sites*Tumor.EffT_f_Vasc/Vv_Tmr (QC_Tmr + LC_Tmr)*Tumor.EffT_f_Vasc/Vv_Tmr EffT_Tumover*Tumor.EffT_f_Vasc mAPC_Migrate*Tumor.mAPC_T*(1/[Num_TDL_Considered])*(1-[mAPC_Debis_T_Inact]) mAPC_Migrate*Tumor.mAPC_T*(1-1/[Num_TDL_Considered])*(1-[mAPC_Debis_T_Inact]) mAPC_Migrate*Tumor.mAPC_T*[nAPC_Debis_T_Inact] mAPC_Migrate*Tumor.mAPC_T*[nAPC_Debis_T_Inact] Exp_CD28/80/86/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD80_receptors-per- mAPC]/[Avagadro's_Num])*(1/Tr_cells_per_mAPC) [Exp_CD28/80/86/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD86_receptors-per- mAPC]/[Avagadro's_Num])*(1/Tr_cells_per_mAPC) TregTMDSCEng*Tumor.Effector_TT_MDSCs*((Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole))*gamma_TC_Assoc) (Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTef*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_ H20 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTef*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_ Tcell]/[Avagadro's_Num])*(1/T_per_Tcell) [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTef*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_ Tcell]/[Avagadro's_Num])*(1/T_per_Tcell) [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTef*(PD1_PD1_mAb/*Tumor.[C14a=PD1:APD1] [Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PD1_mabt(Vt_Tef*Tumor_Void_Fraction)- Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PD1_mabt(Vt_L] [Kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C14a=PD1.PD1mAb]*Tumor.[C14a=PD1:aPD1] [Kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C12=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14=PD1:aPD1] [Kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C12=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14=PD1:aPD1] [Kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14=PD1:aPD1] [Kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14=PD1:aPD1] [K	
 410 (QC_Tmr - LC_Tmr)*Tumor.EffT_f_Vasc/Vv_Tmr 411 EffT_Tumover*Tumor.EffT_f_Vasc 412 mAPC_Migrate*Tumor.mAPC_T*(1/[Num_TDLN_Considered])*(1-[mAPC_Debis_T_Inact]) 413 mAPC_Migrate*Tumor.mAPC_T*(1/[Num_TDLN_Considered]) 414 mAPC_Migrate*Tumor.mAPC_T*(1/[Num_TDLN_Considered]) 415 [Exp_CD288/08/6PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD80_receptors-per- mAPC]/[Avagadro's_Num])*(1/T_cells_per_mAPC) 416 [Exp_CD288/08/6PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD86_receptors-per- mAPC]/[Avagadro's_Num])*(1/T_cells_per_mAPC) 417 TregTMDSCEng*Tumor.Effector_TT_MDSCs*((Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole))*gamma_TC_Assoc) (s_Assoc + (Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole))*gamma_TC_Assoc) 418 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCST_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_ Tcell]/(Avagadro's_Num)*(1/T_per_Tr_cell) 419 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCST_EngTeff*([PD1_receptors-per- Tcell]/(Avagadro's_Num)*(1/T_per_Tr_cell) 420 [Treg:T_IntTime]*Tumor.MDSCST_Teff*[Sig_MDSCTeff=Total] 421 [Treg:T_IntTime]*Tumor.MDSCST_Teff*[Sig_MDSCTeff=Total] 422 Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PD1_mabt/Vt_Teff*Tumor_Void_Fraction)- Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.[C1=PD1]/Vt - [Koff_PD1-PD1mAb]*Tumor.[C1=PD1:aPD1] 423 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [Koff_PD1-PD1mAb]*Tumor.[C2=PD1:aPD1] 424 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C3=PD1]/Vt - [Koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] 425 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [Koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] 426 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [Koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] 427 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [Koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] 428 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD	
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 mAPC_Migrate*Tumor.mAPC_T*(1/[Num_TDLN_Considered])*(1-[mAPC_Debis_T_Inact]) mAPC_Migrate*Tumor.mAPC_T*['I-1/[Num_TDLN_Considered]) mAPC_Migrate*Tumor.mAPC_T*['ImAPC_Debis_T_Inact] [Exp_CD28:80/86/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD86_receptors-per- mAPC)/[Avagadro's_Num])*(1/T_cells_per_mAPC) [Exp_CD28:80/86/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD86_receptors-per- mAPC)/[Avagadro's_Num])*(1/T_cells_per_mAPC) TregTMDSCEng*Tumor.Effector_TT_MDSC*((Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole))*gamma_TC_Assoc)/(s_Assoc + (Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole))*gamma_TC_Assoc) [Exp_CD28:80/86/PD1/L1/L2]*Tumor.MDSCST_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_ Tcell/[Avagadro's_Num])*(1/T_per_T_cell) [Exp_CD28:80/86/PD1/L1/L2]*Tumor.MDSCST_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_ Tcell/[Avagadro's_Num])*(1/T_per_T_cell) [Treg:T_IntTime]*Tumor.MDSCST_Teff*[Sig_MDSCTeff=Total] [Treg:T_B*V_T_avg_const*(1.43/1.63)*Lymph_Node.PD1_mab/(VL_1Cff*Tumor.Void_Fraction)- Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Lymph_Node.PD1_mab/(VL_1Cff*Tumor.[C14a=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14a=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14a=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14a=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T14b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C1a=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T14b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T14b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1	
 mAPC_Migrate*Tumor.mAPC_T*(1-I/Num_TDLN_Considered]) mAPC_Migrate*Tumor.mAPC_T*[mAPC_Debis_T_Inact] mAPC_Migrate*Tumor.mAPC_T_EngTregT*([CD80_receptors-per- mAPC]/[Avagadro's_Num])*(1/T_cells_per_mAPC) [Exp_CD28/80/86/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD86_receptors-per- mAPC]/[Avagadro's_Num])*(1/T_cells_per_mAPC) TregTMDSCEng*Tumor.Effector_TT_MDSCs*((Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole))*gamma_TC_Assoc)/(s_Assoc) + (Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole))*gamma_TC_Assoc) [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*(1/T_per_Tr_cell) [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*(1/T_per_Tr_cell) [Treg:T_IntTime]*Tumor.MDSCsT_Teff*[Sig_MDSCTeff=Total] [Treg:T_IntTime]*Tumor.MDSCsT_Teff*[Sig_MDSCTeff=Total] [Treg:T_IntTime]*Tumor.MDSCsT_Teff*[Sig_MDSCTeff=Total] [Kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [Koff_PD1-PD1mAb]*Tumor.[C14a=PD1:aPD1] [Kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [Koff_PD1-PD1mAb]*Tumor.[C14a=PD1:aPD1] [Kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [Koff_PD1-PD1mAb]*Tumor.[C1a=PD1:aPD1] [Kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [Koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] [Kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [Koff_PD1-PD1mAb]*Tumor.[C1a=PD1:aPD1] [Kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [Koff_PD1-PD1mAb]*Tumor.[C1a=PD1:aPD1] [Kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [Koff_PD1-PD1mAb]*Tumor.[C1a=PD1:aPD1] [Kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [Koff_PD1-PD1mAb]*Tumor.[T1b=PD1:aPD1] [Kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [Koff_PD1-PD1mAb]*Tumor.[T1b=PD1:aPD1] [Kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [K	
 mAPC_Migrate*Tumor.mAPC_T*[mAPC_Debis_T_Inact] [Exp_CD28/80/86/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD80_receptors-per- mAPC]/(Avagadro's_Num])*(1/Tr_cells_per_mAPC) [Exp_CD28/80/86/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD86_receptors-per- mAPC]/(Avagadro's_Num])*(1/Tr_cells_per_mAPC) TregTMDSCEng*Tumor.Effector_TT_MDSCs*((Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole)/gamma_TC_Assoc)('s_Assoc + (Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole)/gamma_TC_Assoc)('s_Assoc + (Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E- 100*mole)/gamma_TC_Assoc)('s_Assoc + (Tumor.MDSCsT_EngTeff*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*(1/T_per_Tr_cell) [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCST_EngTeff*([PD1_receptors-per- Tcell]/[Avagadro's_Num])*(1/T_per_Tr_cell) Treg:T_IntTime]*Tumor.MDSCST_Teff*[Sig_MDSCTeff=Total] Treg:T_IntTime]*Tumor.MDSCST_Teff*[Sig_MDSCTeff=Total]) Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PD1_mabt/Vt_Teff*Tumor_Void_Fraction)- Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.[C12=PD1/Vt - [koff_PD1-PD1mAb]*Tumor.[C14=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_ma	
 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD80_receptors-per-mAPC]/[Avagadro's_Num])*(1/T_cells_per_mAPC) [Exp_CD28/80/86/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD86_receptors-per-mAPC]/[Avagadro's_Num])*(1/T_cells_per_mAPC) TregTMDSCEng*Tumor.Effector_TT_MDSCs*((Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E-100*mole))*gamma_TC_Assoc) [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_Tcell)00*mole))*gamma_TC_Assoc) [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_Tcell) [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_Tcell) [Treg:T_IntTime]*Tumor.MDSCsT_Teff*(1-[Sig_MDSCTeff=Total]) [Treg:T_IntTime]*Tumor.MDSCsT_Teff*(1-[Sig_MDSCTeff=Total]) [Kn_PD1+PD1mAb]*Tumor.PD1_mabt*Tumor.[C1a=PD1]/Vt - [Koff_PD1+PD1mAb]*Tumor.[C14a=PD1] [Kon_PD1+PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [Koff_PD1+PD1mAb]*Tumor.[C1a=PD1]aPD1] [Kon_PD1+PD1mAb]*Tumor.PD1_mabt*Tumor.[C3=PD1]/Vt - [Koff_PD1+PD1mAb]*Tumor.[C3=PD1]aPD1] [Kon_PD1+PD1mAb]*Tumor.PD1_mabt*Tumor.[C3=PD1]/Vt - [Koff_PD1+PD1mAb]*Tumor.[C3=PD1]aPD1] [Kon_PD1+PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [Koff_PD1+PD1mAb]*Tumor.[C3=PD1]aPD1] [Kon_PD1+PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [Koff_PD1+PD1mAb]*Tumor.[T1b=PD1]aPD1] [Kon_PD1+PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [Koff_PD1+PD1mAb]*Tumor.[T1b	
 mAPC]/[Avagadro's_Num])*(1/Tr_cells_per_mAPC) IExp_CD28/80/86/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD86_receptors-per-mAPC]/[Avagadro's_Num])*(1/Tr_cells_per_mAPC) TregTMDSCEng*Tumor.Effector_TT_MDSCs*((Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E-100*mole))^{gamma_TC_Assoc})(s_Assoc + (Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E-100*mole))^{gamma_TC_Assoc})(s_Assoc + (Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E-100*mole))^{gamma_TC_Assoc})(s_Assoc + (Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E-100*mole))^{gamma_TC_Assoc}) IExp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_Tr_cell) ITreg:T_IntTime]*Tumor.MDSCsT_Teff*(ISig_MDSCTeff=Total] ITreg:T_IntTime]*Tumor.MDSCsT_Teff*(ISig_MDSCTeff=Total] ITreg:T_IntTime]*Tumor.MDSCsT_Teff*(ISig_MDSCTeff=Total] ITreg:T_IntTime]*Tumor.MDSCsT_Teff*(I-ISig_MDSCTeff=Total] Itreg:T_IntTime]*Tumor.MDSCsT_Teff*(I-ISig_MDSCTeff=Total] Itreg:T_IntTime]*Tumor.PD1_mabt*Tumor.PO1_mabt/(VL_Teff*Tumor_Void_Fraction)-Kpa_T8*S_TB*Vt_avg_const*(1.43/1.63)*Iumor.PO1_mabt/(VL_Teff*Tumor_Void_Fraction)-Kpa_T8*S_TB*Vt_avg_const*(1.43/1.63)*Lymph_Node.PD1_PD1PD1PD1PD1PD1PD1P1:aPD1] Ikon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C14=PD1/Vt - [koff_PD1-PD1mAb]*Tumor.[C2=PD1:aPD1] Ikon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C3=PD1] Ikon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14=PD1:aPD1] Ikon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1b=PD1:aPD1] Ikon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1b=PD1:aPD1] Ikon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1b=PD1:aPD1] Ikon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1ab=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1b=PD1:aPD1] Ikon_PD1-PD1mAb	
 416 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.mAPCT_EngTregT*([CD86_receptors-per-mAPC]/[Avagadro's_Num])*(1/Tr_cells_per_mAPC) 417 TregTMDSCEng*Tumor.Effector_TT_MDSCs*((Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E-100*mole))*gamma_TC_Assoc) (s_Assoc + (Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E-100*mole))*gamma_TC_Assoc) 418 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_Tcell) 419 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_Tcell) 420 [Treg:T_IntTime]*Tumor.MDSCsT_Teff*(Sig_MDSCTeff=Total] 421 [Treg:T_IntTime]*Tumor.MDSCsT_Teff*(Sig_MDSCTeff=Total]) 422 Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Lymph_Node.PD1_mab/(VL) 423 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C14a=PD1/Vt - [koff_PD1-PD1mAb]*Tumor.[C14a=PD1:aPD1] 424 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1] 425 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C9a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1] 426 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1] 427 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1] 428 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1b=PD1:aPD1] 429 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1b=PD1:aPD1] 430 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1b=PD1:aPD1] 431 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1b=PD1:aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1b=PD1:aPD1] 434 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1b=PD1:aPD1] 435 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*T	
 TregTMDSCEng*Tumor.Effector_TT_MDSCs*((Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E-100*mole))*gamma_TC_Assoc) (s_Assoc + (Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E-100*mole))*gamma_TC_Assoc) Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_Tcell) [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_Tcell) [Treg:T_IntTime]*Tumor.MDSCsT_Teff*[Sig_MDSCTeff=Total] [Treg:T_IntTime]*Tumor.MDSCsT_Teff*[Sig_MDSCTeff=Total] [Treg:T_IntTime]*Tumor.MDSCsT_Teff*[Sig_MDSCTeff=Total] [Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PD1_mabt/Vt_Teff*Tumor_Void_Fraction)-Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PD1_mabt/Vt_NL [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14a=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [k	
 100*mole)/samma_TC_Assoc)/(s_Assoc + (Tumor.MDSC_T/(Tumor.Effector_TT_MDSCs + 1E-100*mole)/samma_TC_Assoc) (Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_Tcell) (Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_Tcell) (Treg:T_IntTime]*Tumor.MDSCsT_Teff*[Sig_MDSCTeff=Total] (Treg:T_IntTime]*Tumor.MDSCsT_Teff*[Sig_MDSCTeff=Total]) (Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PD1_mabt/(Vt_Teff*Tumor_Void_Fraction)- Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PD1_mabt/(VL) (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C14a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14a=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T11b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T11b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T11b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1]<td></td>	
 100*mole))^gamma_TC_Assoc) (Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_Tcell) (Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PDL1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_Tcell) (Treg:T_IntTime]*Tumor.MDSCsT_Teff*(Sig_MDSCTeff=Total] (Treg:T_IntTime]*Tumor.MDSCsT_Teff*(1-[Sig_MDSCTeff=Total]) (Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PD1_mabt/(Vt_Teff*Tumor_Void_Fraction)- Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Lymph_Node.PD1_mab/(VL) (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C14a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C2=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C2=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T14b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T4b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1a=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T4b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T4b=PD1]/Vt - [kof	
418 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_ 419 [Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PDL1_receptors-per- Tcell]/[Avagadro's_Num])*(1/T_per_Tr_cell) 420 [Treg:T_IntTime]*Tumor.MDSCsT_Teff*[Sig_MDSCTeff=Total] 421 [Treg:T_IntTime]*Tumor.MDSCsT_Teff*[Sig_MDSCTeff=Total]) 422 Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PD1_mabt/(Vt_Teff*Tumor_Void_Fraction)- Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Lymph_Node.PD1_mab/(VL) 423 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C1a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14a=PD1:aPD1] 424 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C2=PD1:aPD1] 425 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] 426 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C1a=PD1:aPD1] 426 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] 427 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C1a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1a=PD1:aPD1] 428 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1a=PD1:aPD1] 429 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1a=PD1:aPD1] 430 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T1b=PD1]/Vt	
 (Exp_CD28/80/86/PD1/L1/L2]*Tumor.MDSCsT_EngTeff*([PDL1_receptors-per- Tcell]/[Avagadro's_Num])*(1/T_per_Tr_cell) (Treg:T_IntTime]*Tumor.MDSCsT_Teff*[Sig_MDSCTeff=Total]) (Treg:T_IntTime]*Tumor.MDSCsT_Teff*[Sig_MDSCTeff=Total]) (Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PD1_mabt/(Vt_Teff*Tumor_Void_Fraction)- Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PD1_mabt/(VL) (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C14a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14a=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C9a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C3a=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C9a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C9a=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T11b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_MDSCST*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1] (kon_PD1-PD1mAb]*Tumor.PD1_MDSCST*Tu	
Tcell]/[Avagadro's_Num])*(1/T_per_Tr_cell) 420 [Treg:T_IntTime]*Tumor.MDSCsT_Teff*[Sig_MDSCTeff=Total]) 421 [Treg:T_IntTime]*Tumor.MDSCsT_Teff*(1-[Sig_MDSCTeff=Total]) 422 Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PD1_mabt/(Vt_Teff*Tumor_Void_Fraction)- Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Lymph_Node.PD1_mabt/(VL) 423 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C14a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14a=PD1]aPD1] 424 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C2=PD1:aPD1] 425 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C2=PD1:aPD1] 426 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C9a=PD1:aPD1] 426 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C19a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C10a=PD1]aPD1] 427 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] 428 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] 429 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T14b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] 430 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1a=PD1]aPD1] 431 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T18==PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T18==PD1]aPD1] 432 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[er_1r_cell)
 420 [Treg:T_IntTime]*Tumor.MDSCsT_Teff*[Sig_MDSCTeff=Total] 421 [Treg:T_IntTime]*Tumor.MDSCsT_Teff*(1-[Sig_MDSCTeff=Total]) 422 Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PD1_mabt/(Vt_Teff*Tumor_Void_Fraction)- Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Lymph_Node.PD1_mab/(VL) 423 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C14a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14a=PD1:aPD1] 424 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] 425 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C9a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C9a=PD1] 426 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C9a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C9a=PD1:aPD1] 427 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] 428 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T11b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1b=PD1:aPD1] 429 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] 430 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] 431 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] 432 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.PTb=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 434 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.PTb=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 435 [kon_PD1-PD1mAb]*Tumor.PD1_mAbt*Tumor.PD1_mabt*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_aPD1:aPD1] 436 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PD1_MDSCsT+[PD1:PDL1_MDSCT]+[PD1:aPD1_MDSCs]) 	
421 [Treg:T_IntTime]*Tumor.MDSCsT_Teff*(1-[Sig_MDSCTeff=Total]) 422 Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PD1_mabt/(Vt_Teff*Tumor_Void_Fraction)- Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Lymph_Node.PD1_mab/(VL) 423 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C14a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14a=PD1:aPD1] 424 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C2=PD1:aPD1] 425 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] 426 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] 427 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] 428 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T11b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T11b=PD1:aPD1] 429 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] 430 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T14b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] 431 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T8a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 432 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T8a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T8a=PD1:aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T8a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_aPD1_aPD1] 434 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T8a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.	
422 Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PD1_mabt/(Vt_Teff*Tumor_Void_Fraction)- Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Lymph_Node.PD1_mab/(VL) 423 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C14a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14a=PD1:aPD1] 424 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C2=PD1:aPD1] 425 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] 426 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] 427 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C9a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] 428 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] 429 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] 430 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] 431 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 432 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1a=PD1:aPD1] 434 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T1a=PD1:aPD1] 435 [kon_PD1	
Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Lymph_Node.PD1_mab/(VL) 423 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C14a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C14a=PD1:aPD1] 424 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C2=PD1:aPD1] 425 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] 426 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] 426 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C9a=PD1:aPD1] 427 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] 428 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T11b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T11b=PD1:aPD1] 429 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] 430 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T14b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] 431 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T6a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] 432 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T6a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T8a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T8a=PD1:aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.PD1_mabt*Tumor.[PD1-PD1mAb]*Tumor.[PD1:aPD1_aPD1]	
424 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C2=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C2=PD1:aPD1] 425 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] 426 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C9a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C9a=PD1:aPD1] 426 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C9a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C9a=PD1:aPD1] 427 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] 428 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T11b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] 429 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] 430 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T14b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] 431 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[Tb=PD1:aPD1] 432 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T8a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[Tb=PD1:aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T8a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[Tb=PD1:aPD1] 434 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.PD1_mabt*Tumor.PD1_mabt*Tumor.[PD1-PD1mAb]*Tumor.[PD1:aPD1_aPD1] 435 [kon_PD1_PDL1]*Tumor.PD1_MDSCST*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_MDSC] 436 [Exp_CD28/086/PD1/L1/L2]*(Tumor.PD1_MDSCsT+[PD1:PDL1_MDSCT]+[PD1:aPD1_MDSCs]) </th <td></td>	
425 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C7a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C7a=PD1:aPD1] 426 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C9a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C9a=PD1:aPD1] 427 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] 428 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T11b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T11b=PD1:aPD1] 429 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] 430 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T14b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] 431 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] 432 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T8a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T8a=PD1] 434 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.PD1_TeffT/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_mPD1] 435 [kon_PD1_PD1mAb]*Tumor.PD1_MDSCsT*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_MDSC] 436 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PD1_MDSCsT+[PD1:PDL1_MDSCT]+[PD1:aPD1_MDSCs])]
426 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[C9a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[C9a=PD1:aPD1] 427 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] 428 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T11b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T11b=PD1:aPD1] 429 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] 430 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T14b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] 431 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 432 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T8a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T8a=PD1] 434 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.PD1_TeffT/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_mPD1_mDSC 435 [kon_PD1_PDL]]*Tumor.PD1_MDSCST*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_MDSC] 436 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PD1_MDSCST+[PD1:PDL1_MDSCT]+[PD1:aPD1_MDSCs])	
427 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T10b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T10b=PD1:aPD1] 428 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T11b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T11b=PD1:aPD1] 429 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] 430 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T14b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] 431 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 432 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T8a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T8a=PD1:aPD1] 434 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_aPD1_Teff] 435 [kon_PD1-PD1mAb]*Tumor.PD1_MDSCsT*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1=MD1_MDSC] 436 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PD1_MDSCsT+[PD1:PDL1_MDSCT]+[PD1:aPD1_MDSCs])	
428 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T11b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T11b=PD1:aPD1] 429 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] 430 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T14b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] 431 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 432 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T8a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T8a=PD1:aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.PD1_TeffT/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_Teff] 434 [kon_PD1-PD1mAb]*Tumor.PD1_MDSCST*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_MDSC 435 [kon_PD1_PDL1]*Tumor.PD1_MDSCST*Tumor.PD1_TeffT1/[Vol_Cell-Rec_MDSC-TeffT] - [koff_PD1_PD11]*Tumor.[PD1:PD11_MDSCT] 436 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PD1_MDSCsT+[PD1:PDL1_MDSCT]+[PD1:aPD1_MDSCs])	1
429 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T12b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T12b=PD1:aPD1] 430 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T14b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] 431 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 432 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T8a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T8a=PD1:aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.PD1_TeffT/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_Teff] 434 [kon_PD1-PD1mAb]*Tumor.PD1_MDSCsT*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_MDSC 435 [kon_PD1_PDL1]*Tumor.PD1_MDSCsT*Tumor.PDL1_TeffT1/[Vol_Cell-Rec_MDSC-TeffT] - [koff_PD1_PDL1]*Tumor.[PD1:PDL1_MDSCT] 436 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PD1_MDSCsT+[PD1:PDL1_MDSCT]+[PD1:aPD1_MDSCs])	
430 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T14b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T14b=PD1:aPD1] 431 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 432 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T8a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T8a=PD1:aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.PD1_TeffT/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_Teff] 434 [kon_PD1-PD1mAb]*Tumor.PD1_MDSCsT*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_MDSC 435 [kon_PD1_PDL1]*Tumor.PD1_MDSCsT*Tumor.PDL1_TeffT1/[Vol_Cell-Rec_MDSC-TeffT] - [koff_PD1_PDL1]*Tumor.[PD1:PDL1_MDSCT] 436 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PD1_MDSCsT+[PD1:PDL1_MDSCT]+[PD1:aPD1_MDSCs])	
431 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T7b=PD1:aPD1] 432 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T7b=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T8a=PD1]aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T8a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T8a=PD1]aPD1] 433 [kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.PD1_TeffT/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_Teff] 434 [kon_PD1-PD1mAb]*Tumor.PD1_MDSCsT*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_MDSC 435 [kon_PD1_PDL1]*Tumor.PD1_MDSCsT*Tumor.PDL1_TeffT1/[Vol_Cell-Rec_MDSC-TeffT] - [koff_PD1_PDL1]*Tumor.[PD1:PDL1_MDSCT] 436 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PD1_MDSCsT+[PD1:PDL1_MDSCT]+[PD1:aPD1_MDSCs])	
432[kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.[T8a=PD1]/Vt - [koff_PD1-PD1mAb]*Tumor.[T8a=PD1:aPD1]433[kon_PD1-PD1mAb]*Tumor.PD1_mabt*Tumor.PD1_TeffT/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_Teff]434[kon_PD1-PD1mAb]*Tumor.PD1_MDSCsT*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_MDSC435[kon_PD1_PDL1]*Tumor.PD1_MDSCsT*Tumor.PDL1_TeffT1/[Vol_Cell-Rec_MDSC-TeffT] -436[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PD1_MDSCsT+[PD1:PDL1_MDSCT]+[PD1:aPD1_MDSCs])	
 434 [kon_PD1-PD1mAb]*Tumor.PD1_MDSCsT*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_MDS0 435 [kon_PD1_PDL1]*Tumor.PD1_MDSCsT*Tumor.PDL1_TeffT1/[Vol_Cell-Rec_MDSC-TeffT] - [koff_PD1_PDL1]*Tumor.[PD1:PDL1_MDSCT] 436 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PD1_MDSCsT+[PD1:PDL1_MDSCT]+[PD1:aPD1_MDSCs]) 	
435 [kon_PD1_PDL1]*Tumor.PD1_MDSCsT*Tumor.PDL1_TeffT1/[Vol_Cell-Rec_MDSC-TeffT] - [koff_PD1_PDL1]*Tumor.[PD1:PDL1_MDSCT] 436 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PD1_MDSCsT+[PD1:PDL1_MDSCT]+[PD1:aPD1_MDSCs])	
[koff_PD1_PDL1]*Tumor.[PD1:PDL1_MDSCT] 436 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PD1_MDSCsT+[PD1:PDL1_MDSCT]+[PD1:aPD1_MDSCs])	DSCs]
436 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PD1_MDSCsT+[PD1:PDL1_MDSCT]+[PD1:aPD1_MDSCs])	
437 [kon_PD1_PDL1]*Tumor.PD1_TeffT*Tumor.PDL1_TregT/[Vol_Cell-Rec_Tr-TeffT] - [koff PD1 PDL1]*Tumor.[PDL1:PD1 TrTeff]	
438 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PD1_TeffT+[PDL1:PD1_TrTeff]+[PD1:aPD1_Teff])	
439 [kon_PD1-PD1mAb]*Tumor.PD1_TeffT1*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_Teff1]	1
440 [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PD1_TeffT1+[PDL1:PD1_MDSCT]+[PD1:aPD1_Teff1])	

Reaction	Reaction Rate
Number	
441	[kon_PD1-PD1mAb]*Tumor.PD1_TregT*Tumor.PD1_mabt/Vt - [koff_PD1-PD1mAb]*Tumor.[PD1:aPD1_Treg]
442	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PD1_TregT+[PD1:PDL1_TrTeff]+[PD1:aPD1_Treg])
443	Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Tumor.PDL1_mabt/(Vt_Teff*Tumor_Void_Fraction)-
	Kpa_TB*S_TB*Vt_avg_const*(1.43/1.63)*Lymph_Node.PDL1_mab/(VL)
444	[kon_PDL1-PDL1mAb]*Tumor.PDL1_mabt*Tumor.[C3=PDL1]/Vt - [koff_PDL1-PDL1mAb]*Tumor.[C3=PDL1:aPDL1]
445	[kon_PDL1-PDL1mAb]*Tumor.PDL1_mabt*Tumor.[T13a=PDL1]/Vt - [koff_PDL1-
114	PDL1mAb]*Tumor.[T13a=PDL1:aPDL1]
446	[kon_PDL1-PDL1mAb]*Tumor.PDL1_mabt*Tumor.[T2=PDL1]/Vt - [koff_PDL1-PDL1mAb]*Tumor.[T2=PDL1:aPDL1]
447	[kon_PDL1-PDL1mAb]*Tumor.PDL1_mabt*Tumor.[T7a=PDL1]/Vt - [koff_PDL1-PDL1mAb]*Tumor.[T7a=PDL1:aPDL1]
448	[kon_PDL1-PDL1mAb]*Tumor.PDL1_mabt*Tumor.PDL1_TeffT/Vt - [koff_PDL1-PDL1mAb]*Tumor.[PDL1:aPDL1_Teff]
417	[kon_PDL1-PDL1mAb]*Tumor.PDL1_mabt*Tumor.PDL1_TeffT1/Vt -[koff_PDL1-PDL1mAb]*Tumor.[PDL1:aPDL1_Teff1]
418	[kon_PDL1_CD80]*Tumor.PDL1_MDSCsT*Tumor.CD80_TeffT1/[Vol_Cell-Rec_MDSC-TeffT] -
410	[koff_PDL1_CD80]*Tumor.[PDL1:CD80_MDSCT] [kon PD1 PDL1]*Tumor.PDL1 MDSCsT*Tumor.PD1 TeffT1/[Vol Cell-Rec MDSC-TeffT] -
419	
420	[koff_PD1_PDL1]*Tumor.[PDL1:PD1_MDSCT]
420	[kon_PDL1-PDL1mAb]*Tumor.PDL1_MDSCsT*Tumor.PDL1_mabt/Vt - [koff_PDL1- PDL1mAb]*Tumor.[PDL1:aPDL1_MDSCs]
421	[Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PDL1_MDSCsT+[PDL1:CD80_MDSCT]+[PDL1:PD1_MDSCT]+[PDL1:aPDL1_MD
421	$[Exp_CD28/80/80/PD1/E1/E2]^{(1ullio1.PDE1_MDSCs1+[PDE1.CD80_MDSC1]+[PDE1.PD1_MDSC1]+[PDE1.aPDE1_MDSCs1])$
422	[kon PD1 PDL1]*Tumor.PDL1 TeffT*Tumor.PD1 TregT/[Vol Cell-Rec Tr-TeffT] -
422	[koff_PD1_PDL1]*Tumor.[PD1:PDL1_Treff]
423	[Koh_PD1_PD21]*1ulliol.[PD1.PD21_IT1eff] [Exp_CD28/80/86/PD1/L1/L2]*(Tumor.PDL1_TeffT+[PD1:PDL1_TrTeff]+[PDL1:aPDL1_Teff])
423	[Exp CD28/80/86/PD1/L1/L2]*(Tumor.PDL1 TeffT1+[PD1:PDL1 MDSCT]+[PDL1:aPDL1 Teff1])
425	[kon PDL1-PDL1mAb]*Tumor.PDL1 TregT*Tumor.PDL1 mabt/Vt - [koff PDL1-PDL1mAb]*Tumor.[PDL1:aPDL1 Treg]
426	[Exp CD28/80/86/PD1/L1/L2]*(Tumor.PDL1 TregT+[PDL1:CD80 TrTeff]+[PDL1:PD1 TrTeff]+[PDL1:aPDL1 Treg])
427	kf TRecover*Tumor.T Recover Can Dead*(1-Total TC Sig)
428	CancerTInt*Tumor.TC1*(1-Total_TC_Sig*[%Sig_Inhibit_Cancer])
429	CancerTInt*Tumor.TC1*Total_TC_Sig*[%Sig_Inhibit_Cancer]
430	CancerTInt*Tumor.TC2* Total TC Sig*[%Sig Inhibit Cancer]
431	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.Teff_EngMDSC*([CD80_receptors-per-Tcell]/[Avagadro's_Num])*(1/Tr_per_T_cell)
432	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.Teff_EngMDSC*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/Tr_per_T_cell)
433	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.Teff_EngMDSC*([PDL1_receptors-per-Tcell]/[Avagadro's_Num])*(1/Tr_per_T_cell)
434	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.Teff_EngTregT*([CD80_receptors-per-Tcell]/[Avagadro's_Num])*(1/Tr_per_T_cell)
435	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.Teff_EngTregT*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/Tr_per_T_cell)
436	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.Teff_EngTregT*([PDL1_receptors-per-Tcell]/[Avagadro's_Num])*(1/Tr_per_T_cell)
437	TregTMDSCEng*Tumor.Effector_TT_TregT *((TregT/(Tumor.Effector_TT_TregT + 1E-20*mole))^gamma_TC_Assoc)/(
	s_Assoc + (TregT/(Tumor.Effector_TT_TregT + 1E-20*mole))^gamma_TC_Assoc)
438	[Exp_CTLA4]*Tumor.TregT_EngAPC*([CTLA4_receptors-Tr]/[Avagadro's_Num])*(1/mAPC_per_Tr_cell)
439	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.TregT_EngTeff*([PD1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_Tr_cell)
440	[Exp_CD28/80/86/PD1/L1/L2]*Tumor.TregT_EngTeff*([PDL1_receptors-per-Tcell]/[Avagadro's_Num])*(1/T_per_Tr_cell)
441	[Treg:T_IntTime]*Tumor.TregT_Teff*[Sig_TrTeff=Total]
442	[Treg:T_IntTime]*Tumor.TregT_Teff*(1-[Sig_TrTeff=Total])

Table S2 – Model Reaction Rates (End)

 Table S3 – Model Reaction and Rate Descriptions (Start)

Reaction Number	Reaction Description
1	Distribution of Anti-CTLA-4 mAb between the central and lymph node compartments
2	Distribution of Anti-CTLA-4 mAb between the central and leaky tissues
3	Distribution of Anti-CTLA-4 mAb between the central and tight tissues
4	Distribution of Anti-CTLA-4 mAb between the central and tumor compartments
5	Clearance of Anti-CTLA-4 mAb from the central compartment
	The generation of Effector T cells and their migration into the blood/plasma from the designated number of lymph nodes as a
6	multiple of that from a single lymph node
7	Trafficking of free Effector T cells from blood to GI vasculature
8	Trafficking of free Effector T cells from blood to Liver vasculature
9	Trafficking of free Effector T cells from blood to Spleen vasculature
10	Trafficking of free Effector T cells from blood to Lymph Node vasculature
11	The natural turnover of Effector T cells in the blood
12	Trafficking of free Effector T cells from blood to Peripheral (other tissues not directly accounted for) vasculature
13	Trafficking of free Effector T cells from blood to Tumor vasculature
14	Distribution of Anti-PD-1 mAb between the central and lymph node compartments
15	Distribution of Anti-PD-1 mAb between the central and leaky tissues
16	Distribution of Anti-PD-1 mAb between the central and tight tissues
17	Distribution of Anti-PD-1 mAb between the central and tumor compartments

Reaction Number	Reaction Description
18	Clearance of Anti-PD-1 mAb from the central compartment
19	Distribution of Anti-PD-L1 mAb between the central and lymph node compartments
20	Distribution of Anti-PD-L1 mAb between the central and leaky tissues
21	Distribution of Anti-PD-L1 mAb between the central and tight tissues
22	Distribution of Anti-PD-L1 mAb between the central and tumor compartments
23	Clearance of Anti-PD-L1 mAb from the central compartment
24	Saturation of Anti-PD-L1 mAb clearance from the central compartment
25	Trafficking of Effector T cells from GI to Liver vasculature
26	Turnover of free Effector T cells in the GI vasculature
27	Extravasation of arrested Effector T cells from the Liver vasculature
28	Turnover of arrested Effector T cells in the Liver vasculature
29	Arrest of bound Effector T cells in the Liver vasculature
30	Detachment of bound Effector T cells in the Liver vasculature
31	Turnover of bound Effector T cells in the liver vasculature
32	Trafficking of free Effector T cells from Liver to Lung vasculature
33 34	Turnover of free Effector T cells in the liver vasculature Trafficking of free Effector T cells from Liver to lymph node extravascular space
34 35	Turnover of Effector T cells in the Liver extravascular space
35 36	Extravasation of arrested Effector T cells from the Spleen vasculature
30 37	Turnover of arrested Effector T cells in the Spleen vasculature
38	Arrest of bound Effector T cells in the Spleen vasculature
39	Detachment of bound Effector T cells in the Spleen vasculature
40	Turnover of bound Effector T cells in the Spleen vasculature
41	Binding or free Effector T cells to the Spleen vasculature
42	Trafficking of free Effector T cells from Spleen to Liver vasculature
43	Turnover of free Effector T cells in the Spleen vasculature
44	Trafficking of free Effector T cells from Spleen to lymph node extravascular space
45	Turnover of Effector T cells in the Spleen extravascular space
46	Binding or free Effector T cells to the Liver vasculature
47	Extravasation of arrested Effector T cells from the Lungs vasculature
48	Turnover of arrested Effector T cells in the Lungs vasculature
49	Depletion of arrested Effector T cells in the Lungs vasculature
50	Binding or free Effector T cells to the Lungs vasculature
51	Trafficking of free Effector T cells from Lungs to (arterial) Blood
52 53	Turnover of free Effector T cells in the Lungs vasculature
55 54	Trafficking of free Effector T cells from Lungs to lymph node extravascular space Turnover of Effector T cells in the Lungs extravascular space
55	Arrest of bound Effector T cells in the Lungs vasculature
55 56	Detachment of bound Effector T cells in the Lungs vasculature
57	Turnover of bound Effector T cells in the Lungs vasculature
58	Depletion of bound Effector T cells in the Lungs vasculature
59	Interaction at the immunological synapse between CD80 on Primed Naive T cells and PD-L1 on T Regulatory cells in the lymph node
60	CD80 expression threshold on Primed Naive T cells for interaction with T Regulatory cells in the lymph node
61	Interaction at the immunological synapse between PD-1 on Primed Naive T cells and PD-L1 on T Regulatory cells in the lymph node
62 62	Interaction at the immunological synapse between PD-1 on Primed Naive T cells and Anti-PD-1 mAb in the lymph node
63 (4	PD-1 expression threshold on Primed Naive T cells for interaction with T Regulatory cells in the lymph node
64 65	Interaction at the immunological synapse between PD-L1 on Primed Naive T cells and Anti-PD-L1 mAb in the lymph node
65	PD-L1 expression threshold on Primed Naive T cells for interaction with T Regulatory cells in the lymph node
66 67	Inactivation of Naïve T cells by T Regulatory cells in the lymph node Dissociation of T Regulatory cells from Naïve T cells in the lymph node without inactivation of the latter
67 68	Inactivation of Primed Naïve T cells by T Regulatory cells in the lymph node
69	Dissociation of T Regulatory cells from Primed Naïve T cells in the lymph node without inactivation of the latter
70	CD80 expression by Primed Naive T cells for interaction with T Regulatory cells in the lymph node
71	PD-1 expression by Primed Naive T cells for interaction with T Regulatory cells in the lymph node
72	PD-L1 expression by Primed Naive T cells for interaction with T Regulatory cells in the lymph node
73	PD-1 expression by T Regulatory cells for interaction with Primed Naive T cells in the lymph node
74	PD-L1 expression by T Regulatory cells for interaction with Primed Naive T cells in the lymph node
75	CD80 expression threshold on mAPCs for interaction with T Regulatory cells in the lymph node
76	CD86 expression threshold on mAPCs for interaction with T Regulatory cells in the lymph node
77	Interaction at the immunological synapse between CD80 on mAPCs and CTLA-4 on T Regulatory cells in the lymph node
78	Interaction at the immunological synapse between CD86 on mAPCs and CTLA-4 on T Regulatory cells in the lymph node
79	Interaction at the immunological synapse between CTLA-4 on T Regulatory cells and Anti-CTLA-4 mAb in the lymph node
80	CTLA-4 expression threshold on T Regulatory cells for interaction with mAPCs in the lymph node
81	Interaction at the immunological synapse between PD-L1 on Primed Naive T cells and PD-1 on T Regulatory cells in the lymph node
82	Interaction at the immunological synapse between PD-1 on T Regulatory cells and Anti-PD-1 mAb in the lymph node

Reaction Number	Reaction Description
83	PD-1 expression threshold on Regulatory cells for interaction with Primed Naive T cells in the lymph node
84	Interaction at the immunological synapse between PD-L1 on T Regulatory cells and Anti-PD-L1 mAb in the lymph node
85	Interaction at the immunological synapse between PD-L1 on T Regulatory cells and Anti-PD-1 mAb in the lymph node
86	Phagocytosis of tumor debris by resident APCs in the lymph node
87	Decay of tumor debris in the lymph nodes
88	Lymph return of Anti-CTLA-4 to the blood
89	Interaction at the immunological synapse between CTLA-4 on Primed Naïve T cells during priming interactions with mAPCS
	and Anti-CTLA-4 mAb in the lymph node
90	Internalization of the CTLA-4 receptor on Primed Naïve T cells following its binding to Anti-CTLA-4 mAb
91	Migration of Effector T cells from the lymph node into the blood (removal linked to regeneration by algebraic equation below
92	Return of Effector T cells from lymph node extravascular space to the Lungs vascular space
93	Turnover of Effector T cells in the lymph node extravascular space
94	Trafficking of free Effector T cells from lymph node vascular space to the Lungs vascular space
95	Turnover of free Effector T cells in the lymph node vascular space
96	CD80 expression by total mAPCs in the lymph node
97	CD86 expression by total mAPCs in the lymph node
98	PD-1 expression by total mAPCs in the lymph node
99	PD-L1 expression by total mAPCs in the lymph node
100	PD-L2 expression by total mAPCs in the lymph node
100	Natural turnover of mAPCs in the lymph node
101	
102	Inactivation of mAPCs in the lymph node as a result of CTLA-4 secreted from T Regulatory cells in the lymph nodes binding
102	to CD80 and CD86
103	CD80 expression threshold on mAPCs in the lymph node
104	CD86 expression threshold on mAPCs in the lymph node
105	CD80 expression by mAPCs that interact with Naive T cells in the lymph node
106	CD86 expression by mAPCs that interact with Naive T cells in the lymph node
107	CD80 expression threshold on mAPCs for interaction with Naive T cells in the lymph node
108	CD86 expression threshold on mAPCs for interaction with Naive T cells in the lymph node
109	CD80 expression by mAPCs that interact with Primed Naive T cells in the lymph node
110	CD86 expression by mAPCs that interact with Primed Naive T cells in the lymph node
111	PD-1 expression by mAPCs that interact with Primed Naive T cells in the lymph node
112	PD-L1 expression by mAPCs that interact with Primed Naive T cells in the lymph node
113	PD-L2 expression by mAPCs that interact with Primed Naive T cells in the lymph node
114	Interaction at the immunological synapse between CD80 on mAPCs and CTLA-4 on Primed Naïve T cells in the lymph node
115	Interaction at the immunological synapse between CD80 on mAPCs and PD-L1 on Primed Naïve T cells in the lymph node
116	CD80 expression threshold on mAPCs for interaction with Primed Naive T cells in the lymph node
117	Interaction at the immunological synapse between CD86 on mAPCs and CTLA-4 on Primed Naïve T cells in the lymph node
118	Interaction at the immunological synapse between CD86 on mAPCs and CD28 on Primed Naïve T cells in the lymph node
119	CD86 expression threshold on mAPCs for interaction with Primed Naive T cells in the lymph node
120	
120	Interaction at the immunological synapse between PD-1 on mAPCs cells during priming interactions with Primed Naïve T
101	cells and Anti-PD-1 mAb in the lymph node
121	PD-1 expression threshold on mAPCs for interaction with Primed Naive T cells in the lymph node
122	PD-L1 expression threshold on mAPCs for interaction with Primed Naive T cells in the lymph node
123	Interaction at the immunological synapse between PD-L2 on mAPCs and PD-1 on Primed Naïve T cells in the lymph node
124	PD-L2 expression threshold on mAPCs for interaction with Primed Naive T cells in the lymph node
125	PD-1 expression threshold on total mAPCs in the lymph node
126	PD-L1 expression threshold on total mAPCs in the lymph node
127	PD-L2 expression threshold on total mAPCs in the lymph node
128	Engagement of Naïve T cells in the first priming phase in the lymph node
129	Naïve T cells cycling out of the lymph node
130	Naïve T cells being disengaged in the first priming phase without undergoing successful priming in the lymph node
131	Naïve T cells successfully undergoing the first priming phase in the lymph node
132	Transendocytosis of the CD80 receptors on mAPCs through CTLA-4 binding and internalization on Primed Naïve T cells in the lymph node
133	Transendocytosis of the CD86 receptors on mAPCs through CTLA-4 binding and internalization on Primed Naïve T cells in the lymph node
134	Interaction at the immunological synapse between CD80 on mAPCs cells and CD28 on Naïve T cells in the lymph node
135	Interaction at the immunological synapse between CD86 on mAPCs cells and CD28 on Naïve T cells in the lymph node
136	CD28 expression threshold on Naïve T cells in the lymph node
137	Naïve T cells expressing CD28 in the lymph node
138	Lymph return of Anti-PD-1 to the blood
139	Lymph return of Anti-PD-L1 to the blood
140	Interaction at the immunological synapse between PD-L1 on mAPCs involved in the second priming phase and Anti-PD-L1
- • •	mAb in the lymph node
1 4 1	Interaction at the immunological synapse between PD-L1 on Primed Naïve T cells involved in the second priming phase with
141	
141	mAPCs and Anti-PD-L1 mAb in the lymph node CTLA-4 expression threshold on Primed Naïve T cells for interaction with mAPCs in the lymph node

Number 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164	CD28 expression threshold on Primed Naïve T cells for interaction with mAPCs in the lymph node Interaction at the immunological synapse between PD-L1 on mAPCs and CD80 on Primed Naïve T cells in the lymph node CD80 expression threshold on Primed Naïve T cells for interaction with mAPCs in the lymph node Interaction at the immunological synapse between PD-L1 on mAPCs and PD-1 on Primed Naïve T cells in the lymph node Interaction at the immunological synapse between PD-1 on Primed Naïve T cells involved in the second priming phase with mAPCs and Anti-PD-1 mAb in the lymph node PD-1 expression threshold on Primed Naïve T cells for interaction with mAPCs in the lymph node Interaction at the immunological synapse between PD-1 on mAPCs and PD-L1 on Primed Naïve T cells in the lymph node PD-1 expression threshold on Primed Naïve T cells for interaction with mAPCs in the lymph node Interaction at the immunological synapse between PD-1 on mAPCs and PD-L1 on Primed Naïve T cells in the lymph node PD-L1 expression threshold on Primed Naïve T cells for interaction with mAPCs in the lymph node CTLA-4 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node CD28 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node Primed Naïve T cells engaged in the second priming phase in the lymph node Primed Naïve T cells engaged in the second priming phase successfully undergoing priming to become Proliferating T cells in the lymph node Primed Naïve T cells engaged in the second priming phase successfully undergoing priming to become Proliferating T cells in the lymph
145 146 147 148 150 151 152 153 154 155 156 157 158 159 160 161 162 163	Interaction at the immunological synapse between PD-L1 on mAPCs and CD80 on Primed Naïve T cells in the lymph node CD80 expression threshold on Primed Naïve T cells for interaction with mAPCs in the lymph node Interaction at the immunological synapse between PD-L1 on mAPCs and PD-1 on Primed Naïve T cells in the lymph node Interaction at the immunological synapse between PD-1 on Primed Naïve T cells involved in the second priming phase with mAPCs and Anti-PD-1 mAb in the lymph node PD-1 expression threshold on Primed Naïve T cells for interaction with mAPCs in the lymph node Interaction at the immunological synapse between PD-1 on mAPCs and PD-L1 on Primed Naïve T cells in the lymph node PD-L1 expression threshold on Primed Naïve T cells for interaction with mAPCs in the lymph node CTLA-4 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node CD28 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node CD80 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node Primed Naïve T cells engaged in the second priming phase in the lymph node Primed Naïve T cells engaged in the second priming phase disengaging form being primed in the lymph node Primed Naïve T cells engaged in the second priming phase successfully undergoing priming to become Proliferating T cells in the
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147 148 150 151 152 153 154 155 156 157 158 159 160 161 162 163	Interaction at the immunological synapse between PD-L1 on mAPCs and PD-1 on Primed Naïve T cells in the lymph node Interaction at the immunological synapse between PD-1 on Primed Naïve T cells involved in the second priming phase with mAPCs and Anti-PD-1 mAb in the lymph node PD-1 expression threshold on Primed Naïve T cells for interaction with mAPCs in the lymph node Interaction at the immunological synapse between PD-1 on mAPCs and PD-L1 on Primed Naïve T cells in the lymph node PD-L1 expression threshold on Primed Naïve T cells for interaction with mAPCs in the lymph node CTLA-4 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node CD28 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node CD80 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node CD80 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node Primed Naïve T cells engaging in the second priming phase in the lymph node Primed Naïve T cells engaged in the second priming phase disengaging form being primed in the lymph node Primed Naïve T cells engaged in the second priming phase successfully undergoing priming to become Proliferating T cells in the lymph node Proliferating T cells becoming fully activated Effector T cells in the lymph node Sets the proliferation threshold for Proliferating T cells in the lymph node
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152 153 154 155 156 157 158 159 160 161 162 163	CTLA-4 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node CD28 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node CD80 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node Primed Naïve T cells engaging in the second priming phase in the lymph node Primed Naïve T cells unsuccessfully undergoing the second priming phase to become anergic T cells in the lymph node Primed Naïve T cells engaged in the second priming phase disengaging form being primed in the lymph node Primed Naïve T cells engaged in the second priming phase successfully undergoing priming to become Proliferating T cells in the lymph node Proliferating T cells becoming fully activated Effector T cells in the lymph node Sets the proliferation threshold for Proliferating T cells in the lymph node
153 154 155 156 157 158 159 160 161 162 163	CD28 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node CD80 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node Primed Naïve T cells engaging in the second priming phase in the lymph node Primed Naïve T cells unsuccessfully undergoing the second priming phase to become anergic T cells in the lymph node Primed Naïve T cells engaged in the second priming phase disengaging form being primed in the lymph node Primed Naïve T cells engaged in the second priming phase successfully undergoing priming to become Proliferating T cells in the lymph node Proliferating T cells becoming fully activated Effector T cells in the lymph node Sets the proliferation threshold for Proliferating T cells in the lymph node
154 155 156 157 158 159 160 161 162 163	CD80 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node Primed Naïve T cells engaging in the second priming phase in the lymph node Primed Naïve T cells unsuccessfully undergoing the second priming phase to become anergic T cells in the lymph node Primed Naïve T cells engaged in the second priming phase disengaging form being primed in the lymph node Primed Naïve T cells engaged in the second priming phase successfully undergoing priming to become Proliferating T cells in the lymph node Proliferating T cells becoming fully activated Effector T cells in the lymph node Sets the proliferation threshold for Proliferating T cells in the lymph node
155 156 157 158 159 160 161 162 163	 PD-1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node PD-L1 expression by Primed Naïve T cells for interaction with mAPCs in the lymph node Primed Naïve T cells engaging in the second priming phase in the lymph node Primed Naïve T cells unsuccessfully undergoing the second priming phase to become anergic T cells in the lymph node Primed Naïve T cells engaged in the second priming phase disengaging form being primed in the lymph node Primed Naïve T cells engaged in the second priming phase successfully undergoing primed in the lymph node Primed Naïve T cells engaged in the second priming phase successfully undergoing priming to become Proliferating T cells in the lymph node Proliferating T cells becoming fully activated Effector T cells in the lymph node Sets the proliferation threshold for Proliferating T cells in the lymph node
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162 163	Proliferating T cells becoming fully activated Effector T cells in the lymph node Sets the proliferation threshold for Proliferating T cells in the lymph node
162 163	Sets the proliferation threshold for Proliferating T cells in the lymph node
163	
	Internalization of the Anti ("I'I A A antibodies bound to ("I'I A A recontors or "I'Deculatory calls in the lymph and
	Internalization of the Anti-CTLA-4 antibodies bound to CTLA-4 receptors on T Regulatory cells in the lymph node Transendocytosis of the CD80 receptors on mAPCs through CTLA-4 binding and internalization on T Regulatory cells in the
	lymph node
165	Transendocytosis of the CD86 receptors on mAPCs through CTLA-4 binding and internalization on T Regulatory cells in the lymph node
166	CTLA-4 expression on the surface of non-interacting T Regulatory cells in the lymph node
167	Interaction between T Regulatory cells and mAPCs in lymph node
168	Interaction between T Regulatory cells and Naïve T cells in lymph node
169	Interaction between T Regulatory cells and Primed Naïve T cells in lymph node
170	Dissociation of T Regulatory cells from mAPCs in the lymph node with inactivation of the latter
171	Dissociation of T Regulatory cells from mAPCs in the lymph node without inactivation of the latter
172	CD80 expression by mAPCs for interaction with T Regulatory cells in the lymph node
173	CD86 expression by mAPCs for interaction with T Regulatory cells in the lymph node
174	CTLA-4 expression by T Regulatory cells for interaction with mAPCs in the lymph node
175	Binding of Anti-CTLA-4 to CTLA-4 expressed on the surface of non-interacting T Regulatory in the lymph node
176	CTLA-4 expression threshold on non-interacting T Regulatory cells in the lymph node
177	Administration of Anti-CTLA-4 mAb into the central compartment
178	Administration of Anti-PD-1 mAb into the central compartment
179	Administration of Anti-PD-L1 mAb into the central compartment
180	Naïve T cells cycling into the lymph node
181	The proliferation rate of the Proliferating T cells in the lymph node
182	Appearance of monocytes in the tumor
183	Proliferation of cancer cells in the tumor
184	Distribution of Anti-CTLA-4 mAb between leaky tissues and lymph node
185	Distribution of Anti-CTLA-4 mAb between tight tissues and lymph node
186	Trafficking of free Effector T cells from Peripheral tissues vasculature to the lung vasculature
187	Turnover of free Effector T cells in the Peripheral tissues vasculature
188	Distribution of Anti-PD-1 mAb between leaky tissues and lymph node
189	Distribution of Anti-PD-1 mAb between tight tissues and lymph node
190 191	Distribution of Anti-PD-L1 mAb between leaky tissues and lymph node
191	Distribution of Anti-PD-L1 mAb between tight tissues and lymph node CD80 expression by the T5 subtype of cancer cells in the tumor
192 193	PD-1 expression by the T2 subtype of cancer cells in the tumor
195 194	PD-1 expression by the T2 subtype of cancer cells in the tumor PD-1 expression by the T9 subtype of cancer cells in the tumor
194 195	CD80 expression by the T9 subtype of cancer cells in the tumor
195	PD-1 expression by the T6 subtype of cancer cells in the tumor
190 197	PD-1 expression by the T6 subtype of cancer cells in the tumor
197 198	PD-L1 expression by the T0 subtype of cancer cells in the tumor PD-1 expression by the T14 subtype of cancer cells in the tumor
198	PD-1 expression by the T14 subtype of cancer cells in the tumor
200	CD80 expression by the T14 subtype of cancer cells in the tumor
200	PD-1 expression by the T10 subtype of cancer cells in the tumor
201	PD-1 expression by the T10 subtype of cancer cells in the tumor PD-L1 expression by the T10 subtype of cancer cells in the tumor
202	PD-L1 expression by the T10 subtype of cancer cells in the tumor PD-L2 expression by the T10 subtype of cancer cells in the tumor
204 205	PD-1 expression by the T16 subtype of cancer cells in the tumor PD-L1 expression by the T16 subtype of cancer cells in the tumor
205 206	PD-L1 expression by the T16 subtype of cancer cells in the tumor PD-L2 expression by the T16 subtype of cancer cells in the tumor
200	CD80 expression by the T16 subtype of cancer cells in the tumor

Reaction Number	Reaction Description				
Number 208	PD-1 expression by the T7 subtype of cancer cells in the tumor				
208	PD-L2 expression by the T7 subtype of cancer cells in the tumor				
210	PD-1 expression by the T15 subtype of cancer cells in the tumor				
211	PD-L2 expression by the T15 subtype of cancer cells in the tumor				
212	CD80 expression by the T15 subtype of cancer cells in the tumor				
213	PD-L1 expression by the T3 subtype of cancer cells in the tumor				
214	PD-L1 expression by the T11 subtype of cancer cells in the tumor				
215	CD80 expression by the T11 subtype of cancer cells in the tumor				
216	PD-L1 expression by the T8 subtype of cancer cells in the tumor				
217	PD-L2 expression by the T8 subtype of cancer cells in the tumor				
218	PD-L1 expression by the T13 subtype of cancer cells in the tumor				
219	PD-L2 expression by the T13 subtype of cancer cells in the tumor				
220	CD80 expression by the T13 subtype of cancer cells in the tumor				
221	PD-L2 expression by the T4 subtype of cancer cells in the tumor				
222 223	PD-L2 expression by the T12 subtype of cancer cells in the tumor CD80 expression by the T12 subtype of cancer cells in the tumor				
223	Interaction at the immunological synapse between PD-1 expressed by the T10 subtype of cancer cells and Anti-PD-1 in the				
	tumor				
225 226	PD-1 expression threshold by the T10 subtype of cancer cells in the tumor				
	Interaction at the immunological synapse between PD-L1 expressed by the T10 subtype of cancer cells and Anti-PD-L1 in the tumor				
227	PD-L1 expression threshold by the T10 subtype of cancer cells in the tumor				
228 229	PD-L2 expression threshold by the T10 subtype of cancer cells in the tumor				
	Interaction at the immunological synapse between PD-L1 expressed by the T11 subtype of cancer cells and Anti-PD-L1 in the tumor				
230	PD-L1 expression threshold by the T11 subtype of cancer cells in the tumor				
231	CD80 expression threshold by the T11 subtype of cancer cells in the tumor				
232	PD-L2 expression threshold by the T12 subtype of cancer cells in the tumor				
233 234	CD80 expression threshold by the T12 subtype of cancer cells in the tumor				
234	Interaction at the immunological synapse between PD-L1 expressed by the T13 subtype of cancer cells and Anti-PD-L1 in the tumor				
235	PD-L1 expression threshold by the T13 subtype of cancer cells in the tumor				
236	PD-L2 expression threshold by the T15 subtype of cancer cells in the tumor				
237	CD80 expression by the T13 subtype of cancer cells in the tumor				
238	Interaction at the immunological synapse between PD-1 expressed by the T14 subtype of cancer cells and PD-L1 on the complementary Effector T cells in the tumor				
239	PD-1 expression threshold by the T14 subtype of cancer cells in the tumor				
240	Interaction at the immunological synapse between PD-L1 expressed by the T14 subtype of cancer cells and CD80 on the complementary Effector T cells in the tumor				
241	Interaction at the immunological synapse between PD-L1 expressed by the T14 subtype of cancer cells and Anti-PD-L1 in the tumor				
242	PD-L1 expression threshold by the T14 subtype of cancer cells in the tumor				
243	Interaction at the immunological synapse between CD80 expressed by the T14 subtype of cancer cells and PD-L1 on the complementary Effector T cells in the tumor				
244	CD80 expression threshold by the T14 subtype of cancer cells in the tumor				
245	Interaction at the immunological synapse between PD-1 expressed by the T15 subtype of cancer cells and Anti-PD-1 in the tumor				
246	PD-1 expression threshold by the T15 subtype of cancer cells in the tumor				
247	Interaction at the immunological synapse between PD-L2 expressed by the T15 subtype of cancer cells and PD-1 on the complementary Effector T cells in the tumor				
248	PD-L2 expression threshold by the T15 subtype of cancer cells in the tumor				
249	Interaction at the immunological synapse between CD80 expressed by the T15 subtype of cancer cells and PD-L1 on the complementary Effector T cells in the tumor				
250	CD80 expression threshold by the T15 subtype of cancer cells in the tumor				
251	Interaction at the immunological synapse between PD-1 expressed by the T16 subtype of cancer cells and PD-L1 on the complementary Effector T cells in the tumor				
252	Interaction at the immunological synapse between PD-1 expressed by the T16 subtype of cancer cells and Anti-PD-1 in the tumor				
253	PD-1 expression threshold by the T16 subtype of cancer cells in the tumor				
254	Interaction at the immunological synapse between PD-L1 expressed by the T16 subtype of cancer cells and Anti-PD-L1 in the tumor				
255	PD-L1 expression threshold by the T16 subtype of cancer cells in the tumor				
255	Interaction at the immunological synapse between PD-L2 expressed by the T16 subtype of cancer cells and PD-1 on the				
	complementary Effector T cells in the tumor				
257	PD-L2 expression threshold by the T16 subtype of cancer cells in the tumor				
258	CD80 expression threshold by the T16 subtype of cancer cells in the tumor				
259	PD-1 expression threshold by the T2 subtype of cancer cells in the tumor				
260	PD-L1 expression threshold by the T3 subtype of cancer cells in the tumor				

Reaction Number	Reaction Description PD-L2 expression threshold by the T4 subtype of cancer cells in the tumor					
261						
262	CD80 expression threshold by the T5 subtype of cancer cells in the tumor					
263	Interaction at the immunological synapse between PD-L2 expressed by the T6 subtype of cancer cells and PD-1 on the complementary Effector T cells in the tumor					
264	PD-1 expression threshold by the T6 subtype of cancer cells in the tumor					
265	Interaction at the immunological synapse between PD-L1 expressed by the T6 subtype of cancer cells and PD-1 on the complementary Effector T cells in the tumor					
266	Interaction at the immunological synapse between PD-L1 expressed by the T6 subtype of cancer cells and CD80 on the complementary Effector T cells in the tumor					
267	Interaction at the immunological synapse between PD-L1 expressed by the T6 subtype of cancer cells and Anti-PD-L1 in the tumor					
268	PD-L1 expression threshold by the T6 subtype of cancer cells in the tumor					
269	PD-1 expression threshold by the T7 subtype of cancer cells in the tumor					
270	PD-L2 expression threshold by the T7 subtype of cancer cells in the tumor					
271	Interaction at the immunological synapse between PD-L1 expressed by the T8 subtype of cancer cells and CD80 on Effector T cells in the tumor					
272	Interaction at the immunological synapse between PD-L1 expressed by the T8 subtype of cancer cells and Anti-PD-L1 in the tumor					
273	PD-L1 expression threshold by the T8 subtype of cancer cells in the tumor					
274	PD-L2 expression threshold by the T8 subtype of cancer cells in the tumor					
275	Interaction at the immunological synapse between PD-1 expressed by the T9 subtype of cancer cells and PD-L1 on the complementary Effector T cells in the tumor					
276	PD-1 expression threshold by the T9 subtype of cancer cells in the tumor					
277	CD80 expression threshold by the T9 subtype of cancer cells in the tumor					
278	Transendocytosis of the CD80 receptors on mAPCs through CTLA-4 binding and internalization on T Regulatory cells in the tumor					
279	Transendocytosis of the CD86 receptors on mAPCs through CTLA-4 binding and internalization on T Regulatory cells in the tumor					
280	Internalization of the Anti-CTLA-4 antibodies bound to CTLA-4 receptors on T Regulatory cells in the tumor					
281	PD-1 expression by Effector T cells interacting with the T8 subtype of cancer cells in the tumor					
282 283	CD80 expression by Effector T cells interacting with the T8 subtype of cancer cells in the tumor					
285 284	PD-1 expression by Effector T cells interacting with the T3 subtype of cancer cells in the tumor CD80 expression by Effector T cells interacting with the T3 subtype of cancer cells in the tumor					
285	PD-L1 expression by Effector T cells interacting with the T16 subtype of cancer cells in the tumor					
286	PD-1 expression by Effector T cells interacting with the T16 subtype of cancer cells in the tumor					
287	CD80 expression by Effector T cells interacting with the T16 subtype of cancer cells in the tumor					
288	PD-L1 expression by Effector T cells interacting with the T14 subtype of cancer cells in the tumor					
289	PD-1 expression by Effector T cells interacting with the T14 subtype of cancer cells in the tumor					
290 201	CD80 expression by Effector T cells interacting with the T14 subtype of cancer cells in the tumor					
291 292	PD-L1 expression by Effector T cells interacting with the T10 subtype of cancer cells in the tumor PD-1 expression by Effector T cells interacting with the T10 subtype of cancer cells in the tumor					
292	CD80 expression by Effector T cells interacting with the T10 subtype of cancer cells in the tumor					
294	PD-L1 expression by Effector T cells interacting with the T6 subtype of cancer cells in the tumor					
295	PD-1 expression by Effector T cells interacting with the T6 subtype of cancer cells in the tumor					
296	CD80 expression by Effector T cells interacting with the T6 subtype of cancer cells in the tumor					
297	PD-L1 expression by Effector T cells interacting with the T15 subtype of cancer cells in the tumor					
298 299	PD-1 expression by Effector T cells interacting with the T15 subtype of cancer cells in the tumor					
299 300	PD-L1 expression by Effector T cells interacting with the T7 subtype of cancer cells in the tumor PD-1 expression by Effector T cells interacting with the T7 subtype of cancer cells in the tumor					
301	PD-L1 expression by Effector T cells interacting with the T13 subtype of cancer cells in the tumor					
302	PD-1 expression by Effector T cells interacting with the T13 subtype of cancer cells in the tumor					
303	PD-L1 expression by Effector T cells interacting with the T11 subtype of cancer cells in the tumor					
304	PD-1 expression by Effector T cells interacting with the T11 subtype of cancer cells in the tumor					
305	PD-L1 expression by Effector T cells interacting with the T12 subtype of cancer cells in the tumor					
306	PD-1 expression by Effector T cells interacting with the T12 subtype of cancer cells in the tumor					
307 308	PD-1 expression by Effector T cells interacting with the T4 subtype of cancer cells in the tumor PD-L1 expression by Effector T cells interacting with the T9 subtype of cancer cells in the tumor					
308 309	PD-L1 expression by Effector T cells interacting with the T5 subtype of cancer cells in the tumor					
310	PD-L1 expression by Effector T cells interacting with the T2 subtype of cancer cells in the tumor					
311	Interaction at the immunological synapse between PD-1 expressed by the T10 subtype of cancer cells and PD-L1 on the complementary Effector T cells in the tumor					
312	Interaction at the immunological synapse between PD-L1 expressed by the Effector T cells interacting with the T10 subtype of cancer cells and Anti-PD-L1 in the tumor					
313	PD-L1 expression threshold by the Effector T cells interacting with the T10 subtype of cancer cells in the tumor					
314	Interaction at the immunological synapse between PD-L1 expressed by the T10 subtype of cancer cells and PD-1 on the complementary Effector T cells in the tumor					
315	Interaction at the immunological synapse between PD-L2 expressed by the T10 subtype of cancer cells and PD-1 on the complementary Effector T cells in the tumor					

Reaction Number	Reaction Description					
316	PD-1 expression threshold by the Effector T cells interacting with the T10 subtype of cancer cells in the tumor					
317	Interaction at the immunological synapse between PD-L1 expressed by the T10 subtype of cancer cells and CD80 on the complementary Effector T cells in the tumor					
318	CD80 expression threshold by the Effector T cells interacting with the T10 subtype of cancer cells in the tumor					
319	Interaction at the immunological synapse between PD-L1 expressed by the T11 subtype of cancer cells and CD80 on the complementary Effector T cells in the tumor					
320	Interaction at the immunological synapse between PD-L1 expressed by the Effector T cells interacting with the T11 subtype of cancer cells and Anti-PD-L1 in the tumor					
321	PD-L1 expression threshold by the Effector T cells interacting with the T11 subtype of cancer cells in the tumor					
322	Interaction at the immunological synapse between PD-L1 expressed by the T11 subtype of cancer cells and PD-1 on the complementary Effector T cells in the tumor					
323	PD-1 expression threshold by the Effector T cells interacting with the T11 subtype of cancer cells in the tumor					
324	Interaction at the immunological synapse between CD80 expressed by the T12 subtype of cancer cells and PD-L1 on the complementary Effector T cells in the tumor					
325	Interaction at the immunological synapse between PD-L1 expressed by the Effector T cells interacting with the T12 subtype of cancer cells and Anti-PD-L1 in the tumor					
326	PD-L1 expression threshold by the Effector T cells interacting with the T12 subtype of cancer cells in the tumor					
327	Interaction at the immunological synapse between PD-L2 expressed by the T12 subtype of cancer cells and PD-1 on the complementary Effector T cells in the tumor					
328	PD-1 expression threshold by the Effector T cells interacting with the T12 subtype of cancer cells in the tumor					
329	Interaction at the immunological synapse between CD80 expressed by the T13 subtype of cancer cells and PD-L1 on the complementary Effector T cells in the tumor					
330	PD-L1 expression threshold by the Effector T cells interacting with the T13 subtype of cancer cells in the tumor					
331	Interaction at the immunological synapse between PD-L1 expressed by the T13 subtype of cancer cells and PD-1 on the complementary Effector T cells in the tumor					
332	Interaction at the immunological synapse between PD-L2 expressed by the T13 subtype of cancer cells and PD-1 on the complementary Effector T cells in the tumor					
333	Interaction at the immunological synapse between PD-1 expressed by the Effector T cells interacting with the T13 subtype of cancer cells and Anti-PD-1 in the tumor					
334	PD-1 expression threshold by the Effector T cells interacting with the T13 subtype of cancer cells in the tumor					
335	Interaction at the immunological synapse between PD-L1 expressed by the Effector T cells interacting with the T14 subtype of cancer cells and Anti-PD-L1 in the tumor					
336	PD-L1 expression threshold by the Effector T cells interacting with the T14 subtype of cancer cells in the tumor					
337	Interaction at the immunological synapse between PD-L1 expressed by the T14 subtype of cancer cells and PD-1 on the complementary Effector T cells in the tumor					
338	PD-1 expression threshold by the Effector T cells interacting with the T14 subtype of cancer cells in the tumor					
339 340	CD80 expression threshold by the Effector T cells interacting with the T14 subtype of cancer cells in the tumor Interaction at the immunological synapse between PD-1 expressed by the T15 subtype of cancer cells and PD-L1 on the					
341	complementary Effector T cells in the tumor Interaction at the immunological synapse between PD-L1 expressed by the Effector T cells interacting with the T15 subtype of					
	cancer cells and Anti-PD-L1 in the tumor					
342	PD-L1 expression threshold by the Effector T cells interacting with the T15 subtype of cancer cells in the tumor					
343	Interaction at the immunological synapse between PD-1 expressed by the Effector T cells interacting with the T15 subtype of cancer cells and Anti-PD-1 in the tumor					
344	PD-1 expression threshold by the Effector T cells interacting with the T15 subtype of cancer cells in the tumor					
345	Interaction at the immunological synapse between CD80 expressed by the T16 subtype of cancer cells and PD-L1 on the complementary Effector T cells in the tumor					
346	Interaction at the immunological synapse between PD-L1 expressed by the Effector T cells interacting with the T16 subtype of cancer cells and Anti-PD-L1 in the tumor					
347	PD-L1 expression threshold by the Effector T cells interacting with the T16 subtype of cancer cells in the tumor					
348	Interaction at the immunological synapse between PD-L1 expressed by the T16 subtype of cancer cells and PD-1 on the complementary Effector T cells in the tumor					
349	Interaction at the immunological synapse between PD-1 expressed by the Effector T cells interacting with the T16 subtype of cancer cells and Anti-PD-1 in the tumor					
350	PD-1 expression threshold by the Effector T cells interacting with the T16 subtype of cancer cells in the tumor					
351	Interaction at the immunological synapse between PD-L1 expressed by the T16 subtype of cancer cells and CD80 on the complementary Effector T cells in the tumor					
352	CD80 expression threshold by the Effector T cells interacting with the T16 subtype of cancer cells in the tumor					
353	Interaction at the immunological synapse between PD-1 expressed by the T2 subtype of cancer cells and PD-L1 on the complementary Effector T cells in the tumor					
354	PD-L1 expression threshold by the Effector T cells interacting with the T2 subtype of cancer cells in the tumor					
355	Interaction at the immunological synapse between PD-L1 expressed by the T3 subtype of cancer cells and PD-1 on the complementary Effector T cells in the tumor					
356	Interaction at the immunological synapse between PD-1 expressed by the Effector T cells interacting with the T3 subtype of cancer cells and Anti-PD-1 in the tumor					
357	PD-1 expression threshold by the Effector T cells interacting with the T3 subtype of cancer cells in the tumor					
358	Interaction at the immunological synapse between PD-L1 expressed by the T3 subtype of cancer cells and CD80 on the complementary Effector T cells in the tumor					

Reaction Number	Reaction Description				
359	CD80 expression threshold by the Effector T cells interacting with the T3 subtype of cancer cells in the tumor				
360	Interaction at the immunological synapse between PD-L2 expressed by the T4 subtype of cancer cells and PD-1 on the				
	complementary Effector T cells in the tumor				
361	Interaction at the immunological synapse between PD-1 expressed by the Effector T cells interacting with the T4 subtype of				
362	cancer cells and Anti-PD-1 in the tumor PD-1 expression threshold by the Effector T cells interacting with the T4 subtype of cancer cells in the tumor				
363	Interaction at the immunological synapse between CD80 expressed by the T5 subtype of cancer cells and PD-L1 on the				
505	complementary Effector T cells in the tumor				
364	Interaction at the immunological synapse between PD-L1 expressed by the Effector T cells interacting with the T5 subtype of				
	cancer cells and Anti-PD-L1 in the tumor				
365	PD-L1 expression threshold by the Effector T cells interacting with the T5 subtype of cancer cells in the tumor				
366	Interaction at the immunological synapse between PD-1 expressed by the T6 subtype of cancer cells and PD-L1 on the				
2/7	complementary Effector T cells in the tumor				
367	Interaction at the immunological synapse between PD-L1 expressed by the Effector T cells interacting with the T6 subtype of cancer cells and Anti-PD-L1 in the tumor				
368	PD-L1 expression threshold by the Effector T cells interacting with the T6 subtype of cancer cells in the tumor				
369	Interaction at the immunological synapse between PD-1 expressed by the Effector T cells interacting with the T6 subtype of				
	cancer cells and Anti-PD-1 in the tumor				
370	PD-1 expression threshold by the Effector T cells interacting with the T6 subtype of cancer cells in the tumor				
371	CD80 expression threshold by the Effector T cells interacting with the T6 subtype of cancer cells in the tumor				
372	Interaction at the immunological synapse between PD-1 expressed by the T7 subtype of cancer cells and PD-L1 on the				
252	complementary Effector T cells in the tumor				
373 374	PD-L1 expression threshold by the Effector T cells interacting with the T7 subtype of cancer cells in the tumor				
3/4	Interaction at the immunological synapse between PD-L2 expressed by the T7 subtype of cancer cells and PD-1 on the complementary Effector T cells in the tumor				
375	PD-1 expression threshold by the Effector T cells interacting with the T7 subtype of cancer cells in the tumor				
376	Interaction at the immunological synapse between PD-L1 expressed by the T8 subtype of cancer cells and PD-1 on the				
	complementary Effector T cells in the tumor				
377	Interaction at the immunological synapse between PD-L2 expressed by the T8 subtype of cancer cells and PD-1 on the				
	complementary Effector T cells in the tumor				
378	PD-1 expression threshold by the Effector T cells interacting with the T8 subtype of cancer cells in the tumor				
379	CD80 expression threshold by the Effector T cells interacting with the T8 subtype of cancer cells in the tumor				
380	Interaction at the immunological synapse between CD80 expressed by the T9 subtype of cancer cells and PD-L1 on the				
381	complementary Effector T cells in the tumor Interaction at the immunological synapse between PD-L1 expressed by the Effector T cells interacting with the T9 subtype of				
301	cancer cells and Anti-PD-L1 in the tumor				
382	PD-L1 expression threshold by the Effector T cells interacting with the T9 subtype of cancer cells in the tumor				
383	Turnover of resting macrophages				
384	Phagocytosis of tumor debris by resting APCs in the lymph node				
385	Transport of tumor debris from the tumor to the lymph node				
386	Decay of tumor debris in the tumor				
387	The distribution of tumor debris away from any of the considered lymph nodes				
388	Accounting for the distribution of tumor debris from the tumor to the lymph nodes other than the lymph node compartment in				
389	the model Natural turnover of cancer cells in the tumor				
389 390	CD80 expression threshold by the mAPCs interacting with the T Regulatory cells in the tumor				
391	Interaction at the immunological synapse between CD80 expressed by the Effector T cells and PD-L1 on the T Regulatory				
071	cells in the tumor				
392	CD80 expression threshold by the Effector T cells interacting with the T Regulatory cells in the tumor				
393	CD80 expression threshold by the Effector T cells interacting with the MDSCs in the tumor				
394	CD86 expression threshold by the mAPCs interacting with the T Regulatory cells in the tumor				
395 206	Flow of Anti-CTLA-4 mAb between the tumor and lymph node				
396	Interaction at the immunological synapse between CD80 expressed by the mAPCs and CTLA-4 on the T Regulatory cells in the tumor				
397	Interaction at the immunological synapse between CD86 expressed by the mAPCs and CTLA-4 on the T Regulatory cells in				
391	the tumor				
398	Interaction at the immunological synapse between CTLA-4 expressed by the T Regulatory cells and Anti-CTLA-4 in the				
	tumor				
399	CTLA-4 expression threshold by the T Regulatory cells interacting with the mAPCs in the tumor				
400	Turnover of Effector T cells in the tumor				
401	Apoptosis of Effector T cells following complete cancer cell death in the tumor				
402	Conversion of Effector T cells into Resident Effector Memory cells following complete cancer cell death in the tumor				
403	Association of Effector T cells with cancer cells in the tumor				
404	Turnover of arrested Effector T cells in Tumor vasculature				
405	Extravasation of arrested Effector T cells into Tumor interstitium Turnover of bound Effector T cells in Tumor vasculature				
	LUTROVER OF DOUBLE HITECTOR L CEUS IN LUMOR VASCILIATURE				
406 407	Arrest of bound Effector T cells in the Tumor vasculature				

Reaction Number	Reaction Description					
409	Binding or free Effector T cells to the Tumor vasculature					
410	Trafficking of free Effector T cells from the Tumor vasculature to the Lungs vasculature					
411	Turnover of free Effector T cells in Tumor vasculature					
412	Transport of mAPCs from the tumor to the lymph node					
413	Accounting for the distribution of mAPCs from the tumor to the lymph nodes other than the lymph node compartment in the model					
414	The distribution of mAPCs away from any of the considered lymph nodes					
415	CD80 expression by mAPCs interacting with the T Regulatory cells in the tumor					
416	CD86 expression by mAPCs interacting with the T Regulatory cells in the tumor					
417	Association of Effector T cells with MDSCs in the tumor					
418	PD-1 expression by MDSCs interacting with the Effector T cells in the tumor					
419	PD-L1 expression by MDSCs interacting with the Effector T cells in the tumor					
420	Dissociation of MDSCs from Effector T cells with inactivation of the latter in the tumor					
421	Dissociation of MDSCs from Effector T cells without inactivation of the latter in the tumor					
422 423	Distribution of Anti-PD-1 mAb between Tumor and Lymph Node Interaction at the immunological synapse between PD-1 expressed by the T14 subtype of cancer cells and Anti-PD-1 in the					
424	tumor Interaction at the immunological synapse between PD-1 expressed by the T2 subtype of cancer cells and Anti-PD-1 in the tumor					
425	Interaction at the immunological synapse between PD-1 expressed by the T7 subtype of cancer cells and Anti-PD-1 in the tumor					
426	Interaction at the immunological synapse between PD-1 expressed by the T9 subtype of cancer cells and Anti-PD-1 in the tumor					
427	Interaction at the immunological synapse between PD-1 expressed by the Effector T cells interacting with the T10 subtype of cancer cells and Anti-PD-1 in the tumor					
428	Interaction at the immunological synapse between PD-1 expressed by the Effector T cells interacting with the T11 subtype of cancer cells and Anti-PD-1 in the tumor					
429	Interaction at the immunological synapse between PD-1 expressed by the Effector T cells interacting with the T12 subtype of cancer cells and Anti-PD-1 in the tumor					
430	Interaction at the immunological synapse between PD-1 expressed by the Effector T cells interacting with the T14 subtype of cancer cells and Anti-PD-1 in the tumor					
431	Interaction at the immunological synapse between PD-1 expressed by the Effector T cells interacting with the T7 subtype of cancer cells and Anti-PD-1 in the tumor					
432	Interaction at the immunological synapse between PD-1 expressed by the Effector T cells interacting with the T8 subtype of cancer cells and Anti-PD-1 in the tumor					
433	Interaction at the immunological synapse between PD-1 expressed by the Effector T cells interacting with the T Regulatory cells and Anti-PD-1 in the tumor					
434	Interaction at the immunological synapse between PD-1 expressed by the MDSCs interacting with Effector T cells and Anti- PD-1 in the tumor					
435	Interaction at the immunological synapse between PD-L1 expressed by the Effector T cells and PD-1 on the MDSCs in the tumor					
436 437	PD-1 expression threshold by the MDSCs interacting with the Effector T cells in the tumor Interaction at the immunological synapse between PD-1 expressed by the Effector T cells and PD-L1 on the T Regulatory cell					
130	in the tumor DD-1 superscient threshold by the Effector T calls interacting with the T Deculatory calls in the tumor					
438 439	PD-1 expression threshold by the Effector T cells interacting with the T Regulatory cells in the tumor Interaction at the immunological synapse between PD-1 expressed by the Effector T cells interacting with the MDSCs and Anti-PD-1 in the tumor					
440	PD-1 expression threshold by the Effector T cells interacting with the MDSCs in the tumor					
441	Interaction at the immunological synapse between PD-1 expressed by the T Regulatory cells interacting with the Effector T cells and Anti-PD-1 in the tumor					
442	PD-1 expression threshold by the T Regulatory cells interacting with the Effector T cells in the tumor					
443	Distribution of Anti-PD-L1 mAb between Tumor and Lymph Node					
444	Interaction at the immunological synapse between PD-L1 expressed by the T3 subtype of cancer cells and Anti-PD-L1 in the tumor					
445	Interaction at the immunological synapse between PD-L1 expressed by the Effector T cells interacting with the T13 subtype of cancer cells and Anti-PD-L1 in the tumor					
446	Interaction at the immunological synapse between PD-L1 expressed by the Effector T cells interacting with the T2 subtype of cancer cells and Anti-PD-L1 in the tumor					
447	Interaction at the immunological synapse between PD-L1 expressed by the Effector T cells interacting with the T7 subtype of cancer cells and Anti-PD-L1 in the tumor					
448	Interaction at the immunological synapse between PD-L1 expressed by the Effector T cells interacting with the T Regulatory cells and Anti-PD-L1 in the tumor					
417	Interaction at the immunological synapse between PD-L1 expressed by the Effector T cells interacting with the MDSCs and Anti-PD-L1 in the tumor					
418	Interaction at the immunological synapse between CD80 expressed by the Effector T cells and PD-L1 on the MDSCs in the tumor					
419	Interaction at the immunological synapse between PD-1 expressed by the Effector T cells and PD-L1 on the MDSCs in the tumor					

 420 Interaction at the immunological synapse between PD-L1 expressed by the MDSCs interacting with the Effect Anti-PD-L1 in the tumor 421 PD-L1 expression threshold by the MDSCs interacting with the Effector T cells in the tumor 422 Interaction at the immunological synapse between PD-L1 expressed by the Effector T cells and PD-1 on the 'in the tumor 423 PD-L1 expression threshold by the Effector T cells interacting with the T Regulatory cells in the tumor 424 PD-1 expression threshold by the Effector T cells interacting with the MDSCs in the tumor 425 Interaction at the immunological synapse between PD-L1 expressed by the T Regulatory cells interacting wit cells and Anti-PD-L1 in the tumor 426 PD-1 expression threshold by the T Regulatory cells interacting with the Effector T cells in the tumor 427 Recovery of Effector T cells from the delay state following interaction with cancer cells in the tumor 428 Generation of cancer debris by killing of the cancer cells by the Effector T cells in the tumor 429 Dissociation of Effector T cells from the cancer cells into a delay state in the tumor 430 Inactivation of Effector T cells interacting with the MDSCs in the tumor 431 CD80 expression by Effector T cells interacting with the MDSCs in the tumor 434 CD80 expression by Effector T cells interacting with the MDSCs in the tumor 	Γ Regulatory cells
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433 PD-L1 expression by Effector T cells interacting with the MDSCs in the tumor	
434 CD80 expression by Effector T cells interacting with the T Regulatory cells in the tumor	
435 PD-1 expression by Effector T cells interacting with the T Regulatory cells in the tumor	
436 PD-L1 expression by Effector T cells interacting with the T Regulatory cells in the tumor	
437 Association of Effector T cells with T Regulatory cells in the tumor	
438 CTLA-4 expression by T Regulatory cells interacting with the mAPCs in the tumor	
439 PD-1 expression by T Regulatory cells interacting with the Effector T cells in the tumor	
440 PD-L1 expression by T Regulatory cells interacting with the Effector T cells in the tumor	
441 Dissociation of T Regulatory cells from Effector T cells with inactivation of the latter in the tumor	
442 Dissociation of T Regulatory cells from Effector T cells without inactivation of the latter in the tumor	

Table S3 – Model Reaction and Rate Descriptions (End)

Table S4 – Definition of species in the model (Start)

Compartment Location	Variable Name	Units	Variable Definition
Blood-Lymph	CTLA4_mabB	mole	Anti-CTLA-4 antibody in the blood
Blood-Lymph	CTLA4_mabB_ugml	µg/ml	Serum concentration of Anti-CTLA-4
Blood-Lymph	PD1_mabb	mole	Anti-PD-1 antibody in the blood
Blood-Lymph	PDL1_mabb	mole	Anti-PD-L1 antibody in the blood
Blood-Lymph	PDL1_mabB_ugml	µg/ml	Serum concentration of Anti-PD-L1
Blood-Lymph	PD1_mabB_ugml	µg/ml	Serum concentration of Anti-PD-1
Blood-Lymph	Effector_TB	cell	Effector T cells that have been generated from all the lymph nodes considered that have migrated into the blood
Blood-Lymph	Effector_T_TOTAL	cell	The total number of Effector T cells present that have exited the lymph nodes
Blood-Lymph	Effector_T_TB	cell	Effector T cells that have been generated from all the lymph nodes considered that are in the process of migrating into the blood
Lungs	EffT_f_LungsVasc	cell	Free effector T cells in the Lung vasculature
Lungs	EffT_r_LungsVasc	cell	Bound effector T cells in the Lung vasculature
Lungs	EffT_AR_LungsVasc	cell	Arrested effector T cells in the Lung vasculature
Lungs	EffT_LungsEx	cell	Effector T cells in the Lung interstitium
Lungs	Lung_Free_Sites	cell	Available binding sites for cells in the Lung vasculature
Liv_Spln_GI	EffT_Liver_f_Vasc	cell	Free effector T cells in the Liver vasculature
Liv_Spln_GI	EffT_LiverEx	cell	Effector T cells in the Liver interstitium
Liv_Spln_GI	EffT_Liver_b_Vasc	cell	Bound effector T cells in the Liver vasculature
Liv_Spln_GI	EffT_Liver_AR_Vasc	cell	Arrested effector T cells in the Liver vasculature
Liv_Spln_GI	Liver_Free_Sites	cell	Available binding sites for cells in the Liver vasculature
Liv_Spln_GI	EffT_Spleen_f_Vasc	cell	Free effector T cells in the Spleen vasculature
Liv_Spln_GI	EffT_GI_f_Vasc	cell	Free effector T cells in the GI vasculature
Liv_Spln_GI	EffT_SpleenEx	cell	Effector T cells in the Spleen interstitium
Liv_Spln_GI	EffT_Spleen_b_Vasc	cell	Bound effector T cells in the Spleen vasculature
Liv_Spln_GI	EffT_Spleen_AR_Vasc	cell	Arrested effector T cells in the Spleen vasculature
Liv_Spln_GI	Spleen_Free_Sites	cell	Available binding sites for cells in the Spleen vasculature
Lymph_Node	Naive_T	cell	Naïve T cells that undergo the first phase of priming in the Lymph Nodes
Lymph_Node	Primed_Naive_T	cell	Primed Naive T cells that undergo the second phase of priming in the Lymph Nodes

Compartment Location	Variable Name	Units	Variable Definition
T 1			CD28 expressed by interacting Primed Naive T cells
Lymph_Node	PNT_Int_CD28	mole	engaged in the second priming phase Total number of mature antigen presenting cells (mAPCs)
Lymph_Node	mAPC	cell	in the lymph node compartment
Lymph_Node	Effector T	cell	Effector T cells that are generate in the lymph node compartment (considering one lymph node)
Lymph_Node	CTLA4 mab	mole	Anti-CTLA-4 antibody in the lymph node
Lymph Node	Naive T0	cell	Naive T cells that can undergo priming in the lymph node
· · -			Proliferating Naive T cells that have undergone the second
Lymph_Node	Prolif_Naive_T	cell	phase of priming in the lymph node
			Primed Naive T cells that do not undergo proliferation
Lymph_Node	Anergic Naive T	cell	following the second phase of priming and are deemed to be anergic T cells in the lymph node
Lymph_Node	PD1_mabLN_ugml	µg/ml	Concentration of anti-PD-1 antibody in the lymph node
Lymph_Node	CTLA4_mab_ugml	µg/ml	Concentration of anti-CTLA-4 antibody in the lymph node
Lymph_Node	PDL1_mabLN_ugml	µg/ml	Concentration of anti-PD-L1 antibody in the lymph node
Lymph_Node	EffT_LN_ExRec	cell	Effector T cells in the lymph node interstitium
Lymph_Node	EffT_LN_f_Vasc	cell	Free effector T cells in the lymph node vasculature
Lymph_Node	mAPC1	cell	mAPCs in lymph node interacting with T regulatory cells
Lemme Ned	Naive_T2	11	Naïve T cells in the lymph node interacting with T
Lymph_Node	Deimod Naiva T2	cell	regulatory cells Primed naïve T cells in the lymph node interacting with T
Lymph_Node	Primed_Naive_T2	cell	regulatory cells
Lymph_Node	mAPC_cells_per_ml	cell/ml	Calculation of mAPC in the lymph node
Lymph_Node	PD1_mab	mole	Anti-PD-1 antibody in the lymph node
Lymph_Node	PDL1_mab	mole	Anti-PD-L1 antibody in the lymph node
			Naive T cells engaged in the first priming phase in the
Lymph_Node	Naive_T1	cell	lymph node
Laurah Mada	Drived Maine T1	11	Primed Naive T cells engaged in the second priming phase
Lymph_Node Lymph Node	Primed_Naive_T1 mAPC_Total_Calc_Pr	cell cell	in the lymph node mAPCs in the lymph node that are not engaged in priming
Lymph Node	Total T CD8-CD4	cell	Total number of all T cells in the lymph node
Ljmpi_10ue		con	Primed Naive T cells engaged in the second priming phase
			in the lymph node that are accounting for the expression of
Lymph_Node	PNT1_Int	cell	immune checkpoints
Laurah Mada			CTLA-4 expressed by interacting Primed Naive T cells
Lymph_Node	PNT_CTLA4	mole	engaged in the second priming phase mAPCs interacting with Naive T cells in the first phase of
Lymph_Node	mAPC_Int_P1	cell	priming
· · -			mAPCs interacting with Primed Naive T cells in the second
Lymph_Node	mAPC_Int_P2	cell	phase of priming
T 1 N. 1		1	CD80 receptors expressed by mAPCs that are involved in
Lymph_Node	mAPC_Int_P2_CD80	mole	the second priming phase interactions CD86 receptors expressed by mAPCs that are involved in
Lymph_Node	mAPC_Int_P2_CD86	mole	the second priming phase interactions
			Receptor-receptor interactions at the immunological
			synapse between CD28 expressed on Primed Naive T cells and CD80 expressed on mAPCs during the second phase of
Lymph_Node	POS_Sig_PNT_CD80	mole	priming
J			Receptor-receptor interactions at the immunological
			synapse between CD28 expressed on Primed Naive T cells
T I NI I	DOG G' DIT CDOC	1	and CD86 expressed on mAPCs during the second phase of
Lymph_Node	POS_Sig_PNT_CD86	mole	priming Receptor-receptor interactions at the immunological
			synapse between CTLA-4 expressed on Primed Naive T
			cells and CD80 expressed on mAPCs during the second
Lymph_Node	NEG_Sig_PNT_CD80	mole	phase of priming
			Receptor-receptor interactions at the immunological
			synapse between CTLA-4 expressed on Primed Naive T
Lymph_Node	NEG_Sig_PNT_CD86	mole	cells and CD80 expressed on mAPCs during the second phase of priming
		more	Heterogeneous receptor-antibody interactions at the
		1	anter and the protein and the state of the state o
	CTLA4_mAb_CTLA4		immunological synapse between CTLA-4 expressed on Primed Naive T cells during the second priming phase and

Compartment Location	Variable Name	Units	Variable Definition
_			Anti-CTLA-4 mAb delivered to the lymph node by way of
		_	IV injection into the blood
Lymph_Node	mAPC_Int_P2_PDL1	mole	PD-L1 receptors expressed by mAPCs that are involved in the second priming phase interactions
Lymph_Node	mAPC_Int_P2_PDL2	mole	PD-L2 receptors expressed by mAPCs that are involved in the second priming phase interactions
Lymph_Node	mAPC_Int_P2_PD1	mole	PD-1 receptors expressed by mAPCs that are involved in the second priming phase interactions
Lymph_Node	PNT_Int_CD80	mole	CD80 expressed by interacting Primed Naive T cells engaged in the second priming phase
Lymph_Node	PNT_Int_PD1	mole	PD-1 expressed by interacting Primed Naive T cells engaged in the second priming phase
Lymph_Node	PNT_Int_PDL1	mole	PD-L1 expressed by interacting Primed Naive T cells engaged in the second priming phase
Lympn_roue		mole	Receptor-receptor interactions at the immunological
Lymph Nodo		molo	synapse between CD80 expressed on Primed Naive T cells and PD-L1 expressed on mAPCs during the second phase
Lymph_Node	PNT_CD80-PDL1	mole	of priming Receptor-receptor interactions at the immunological
			synapse between PD-1 expressed on Primed Naive T cells and PD-L2 expressed on mAPCs during the second phase
Lymph_Node	PNT_PD1-PDL2	mole	of priming
			Receptor-receptor interactions at the immunological synapse between PD-1 expressed on Primed Naive T cells and PD-L1 expressed on mAPCs during the second phase
Lymph_Node	PNT_PD1-PDL1	mole	of priming
			Receptor-receptor interactions at the immunological
			synapse between PD-L1 expressed on Primed Naive T cells and CD80 expressed on mAPCs during the second phase of
Lymph_Node	PNT_PDL1-CD80	mole	priming
Lympn_roue		more	Receptor-receptor interactions at the immunological
			synapse between PD-L1 expressed on Primed Naive T cells
T		1	and PD-1 expressed on mAPCs during the second phase of
Lymph_Node	PNT_PDL1-PD1	mole	priming Heterogenous receptor-antibody interactions at the
			immunological synapse between PD-L1 expressed on
			Primed Naive T cells during the second priming phase and
Lymph_Node	DDI 1 m Ab DNT DDI 1	mala	Anti-PD-L1 mAb delivered to the lymph node by way of IV injection into the blood
Lympn_Node	PDL1mAb-PNT_PDL1	mole	Heterogeneous receptor-antibody interactions at the
			immunological synapse between PD-L1 expressed on
			mAPCs during the second priming phase and Anti-PD-L1
Lymph_Node	DDI 1m Ab m ADC DDI 1	mala	mAb delivered to the lymph node by way of IV injection into the blood
Lympn_Node	PDL1mAb-mAPC_PDL1	mole	Heterogeneous receptor-antibody interactions at the
			immunological synapse between PD-1 expressed on
			mAPCs during the second priming phase and Anti-PD-1
Lymph Nodo	DD1mAb mADC DD1	mala	mAb delivered to the lymph node by way of IV injection into the blood
Lymph_Node	PD1mAb_mAPC_PD1	mole	Heterogeneous receptor-antibody interactions at the
			immunological synapse between PD-1 expressed on
			Primed Naive T cells during the second priming phase and
Lymph_Node	DD1mAb DNT DD1	mala	Anti-PD-1 mAb delivered to the lymph node by way of IV injection into the blood
Lymph_Node	PD1mAb_PNT_PD1 mAPC PD1	mole mole	Total PD-1 expression by all mAPCs in the lymph node
Lymph_Node	mAPC_PDL2	mole	Total PD-L2 expression by all mAPCs in the lymph node
Lymph_Node	mAPC_PDL1	mole	Total PD-L1 expression by all mAPCs in the lymph node
Lymph_Node	mAPC_CD86	mole	Total CD86 expression by all mAPCs in the lymph node
Lymph_Node	mAPC_CD80	mole	Total CD80 expression by all mAPCs in the lymph node
Lymph_Node	TregLN-NT	cell	T Regulatory cells in the lymph node that have engaged in interacting with Naïve T cells
Lymph_Node	TregLN-PNT	cell	T Regulatory cells in the lymph node that have engaged in interacting with Primed Naïve T cells
Lymph_Node	TregLN_mAPC	cell	T Regulatory cells in the lymph node that have engaged in interacting with mAPCs

Compartment Location	Variable Name	Units	Variable Definition
Lymph_Node	TregLN	cell	Total number of T Regulatory cells that able to engage with other cell types in the lymph node
			CTLA-4 receptors expressed by T Regulatory cells in the
Lymph_Node	Tr-mAPC_CTLA4	mole	lymph node PD-1 receptors expressed by T Regulatory cells in the
Lymph_Node	Tr-PNT_PD1	mole	lymph node
Lymph_Node	Tr-PNT_PDL1	mole	PD-L1 receptors expressed by T Regulatory cells in the lymph node
			PD-L1 receptors expressed by Primed Naïve T cells in the lymph node during engagement with T Regulatory cells
Lymph_Node	PNT-Tr_PDL1	mole	PD-1 receptors expressed by Primed Naïve T cells in the
Lymph_Node	PNT-Tr_PD1	mole	lymph node during engagement with T Regulatory cells CD80 receptors expressed by Primed Naïve T cells in the
Lymph_Node	PNT-Tr_CD80	mole	lymph node during engagement with T Regulatory cells
Lymph_Node	TrALN_CT_CD80	mole	Receptor-receptor interactions at the immunological synapse between CTLA-4 expressed on T Regulatory cells and CD80 expressed on mAPCs in the lymph node
Lymph_Node	TrALN_CT_CD86	mole	Receptor-receptor interactions at the immunological synapse between CTLA-4 expressed on T Regulatory cells and CD86 expressed on mAPCs in the lymph node
Lymph_Node	TrPNT_PD1-L1	mole	Receptor-receptor interactions at the immunological synapse between PD-1 expressed on T Regulatory cells and PD-L1 expressed on Primed Naïve T cells in the lymph node
Lymph_Node	TrPNT PDL1-PD1	mole	Receptor-receptor interactions at the immunological synapse between PD-L1 expressed on T Regulatory cells and PD-1 expressed on Primed Naïve T cells in the lymph node
Lymph_Node	TrPNT_PDL1-CD80	mole	Receptor-receptor interactions at the immunological synapse between PD-L1 expressed on T Regulatory cells and CD80 expressed on Primed Naïve T cells in the lymph node
Lymph_Node	TrALN_CT_aCT	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between CTLA-4 expressed on T Regulatory cells and Anti-CTLA-4 mAb delivered to the lymph node by way of IV injection into the blood
Lymph_Node	TrPNT_PD1_aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed on T Regulatory cells and Anti-PD-1 mAb delivered to the lymph node by way of IV injection into the blood
Lymph_Node	PNTTr_PDL1_aPDL1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed on Primed Naïve T cells and Anti-PD-L1 mAb delivered to the lymph node by way of IV injection into the blood
Lymph_Node	TrPNT_PDL1_aPDL1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed on T Regulatory cells and Anti-PD-L1 mAb delivered to the lymph node by way of IV injection into the blood
Lymph Node	PNTTr PD1 aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed on Primed Naïve T cells and Anti-PD-1 mAb delivered to the lymph node by way of IV injection into the blood
			CD80 receptors expressed by mACPs that are interacting
Lymph_Node	Tr-mAPC_CD80	mole	with T Regulatory cells in the lymph node CD86 receptors expressed by mACPs that are interacting
Lymph_Node	Tr-mAPC_CD86	mole	with T Regulatory cells in the lymph node
Lymph_Node	TregLN_mAPC1	cell	T Regulatory cells in the lymph node that have engaged in interacting with mAPCs in the lymph node that are accounting for the expression of immune checkpoints
_Lymph_Node	TregLN-PNT1	cell	T Regulatory cells in the lymph node that have engaged in interacting with Primed Naïve T cells in the lymph node that are accounting for the expression of immune checkpoints
Lymph_Node	C_DebrisLN	cell	Cancer debris that has been transported to the lymph node
Lymph_Node	APCLN	cell	Resident antigen presenting cells in the lymph node that have not yet phagocytosed tumor debris

Compartment Location	Variable Name	Units	Variable Definition
Lymph Nodo	TrLN CTLA4	mala	CTLA-4 expressed on the surface of non-interacting T Regulatory cells
Lymph_Node	IILN_CILA4	mole	Receptor-antibody interactions between CTLA-4 expressed
			on T Regulatory cells and Anti-CTLA-4 mAb delivered to
Lymph_Node	TrLN_CT_aCT	mole	the lymph node by way of IV injection into the blood
			Naive T cells undergoing the first priming phase in the
			lymph node that are accounting for the expression of
Lymph_Node	PNT1_Int1	cell	immune checkpoints
Lymph Nodo	NTT1 Int1	aa11	Naive T cells undergoing the first priming phase in the
Lymph_Node	NT1_Int1	cell	lymph node that are accounting for the expression of CD28 CD28 expressed to the immunological synapse of Naive T
Lymph_Node	NT Int CD28	mole	cells that are undergoing the first phase of priming
Lympn_10ue	MI_III_CD20	mole	CD86 receptors expressed by mAPCs that are involved in
Lymph_Node	mAPC_Int_P1_CD86	mole	the first priming phase interactions with Naïve T cells
			CD80 receptors expressed by mAPCs that are involved in
Lymph_Node	mAPC_Int_P1_CD80	mole	the first priming phase interactions with Naïve T cells
			Receptor-receptor interactions at the immunological
			synapse between CD28 expressed on Naive T cells and
Laurah Nada	DOG GI- NT CD96		CD86 expressed on mAPCs during the first phase of
Lymph_Node	POS_Sig_NT_CD86	mole	priming Receptor-receptor interactions at the immunological
			synapse between CD28 expressed on Naive T cells and
			CD86 expressed on mAPCs during the first phase of
Lymph_Node	POS_Sig_NT_CD80	mole	priming
Peripheral	CTLA4_leaky_ugml	µg/ml	Concentration of anti-CTLA-4 in leaky tissue
Peripheral	CTLA4_mabP_leaky	mole	Amount of anti-CTLA-4 in leaky tissue
Peripheral	CTLA4_mabP_tight	mole	Amount of anti-CTLA-4 in tight tissue
Peripheral	CTLA4_tight_ugml	µg/ml	Concentration of anti-CTLA-4 in tight tissue
Peripheral	EffT_P_f_Vasc	cell	Free effector T cells in the peripheral vasculature
Peripheral	PD1_leaky_ugml	µg/ml	Concentration of anti-PD-1 in leaky tissue
Peripheral	PD1_mabP_leaky	mole	Amount of anti-PD-1 in leaky tissue
Peripheral	PD1_mabP_tight	mole	Amount of anti-PD-1 in tight tissue
Peripheral	PD1_tight_ugml	µg/ml	Concentration of anti-PD-1 in tight tissue
Peripheral	PDL1_leaky_ugml	µg/ml	Concentration of anti-PD-L1 in leaky tissue
Peripheral	PDL1_mabP_leaky	mole	Amount of anti-PD-L1 in leaky tissue
Peripheral	PDL1_mabP_tight	mole	Amount of anti-PD-L1 in tight tissue
Peripheral	PDL1_tight_ugml	µg/ml	Concentration of anti-PD-L1 in tight tissue
Tumor	PD1_mabt	mole	Anti-PD-1 antibody in the tumor compartment
Tumor	PDL1_mabt	mole	Anti-PD-L1 antibody in the tumor compartment
Tumor	CTLA4_mabt	mole	Anti-CTLA-4 antibody in the tumor compartment
Tumor	Effector_TT	cell	Effector T cells in the tumor microenvironment
Tumor	Cancer	cell	Cancer cells in the tumor
Tumor	Effector TT C Eng	cell	Effector T cells that can engage with cancer cells in the
	Effector_TT_C_Eng	cell	tumor microenvironment Cancer cells that are engaged with Effector T cells in the
Tumor	TC1	cell	tumor microenvironment
1 unior	101	con	Effector T cells that have disengaged from the cancer cells
			in the tumor and are in delay state prior to being able to
Tumor	T_Recover_Can_Dead	cell	bind other cancer cells
			Cancer debris in the tumor that has resulted from cancer
Tumor	C_DebrisT	cell	death
			Effector T cells that are engaged with cancer cells in the
Tumor	TC2	cell	tumor microenvironment
Tumor	Monogrado	aa11	Monocytes that migrate into the tumor and differentiate
Tumor	Monocytes	cell	into APCs Antigen Presenting Cells (APCs) in the tumor that can
			Antigen Presenting Cells (APCs) in the tumor that can phagocytose tumor debris (tumor antigens) and become
Tumor	APC_T	cell	mature APCs
	······		Mature Antigen Presenting Cells (mAPCs) in the tumor
			that resulted from APCs that have phagocytosed tumor
Tumor	mAPC_T	cell	debris
Tumor	PD1_mabt	mole	Moles of anti-PD-1 antibody in the tumor interstitium
	PD1_mabT_ugml		Concentration of anti-PD-1 antibody in the tumor
			interstitium

Compartment Location	Variable Name	Units	Variable Definition
•	CTLA4_mabt_ugml		Concentration of anti-CTLA-4 antibody in the tumor
Tumor		µg/ml	interstitium
Tumor	PDL1_mabT_ugml	µg/ml	Concentration of anti-PD-L1 antibody in the tumor interstitium
Tumor	EffT_f_Vasc	cell	Free effector T cells in the tumor vasculature
Tumor	Tmr_Free_Sites	cell	Available binding sites for cells in the tumor vasculature
Tumor	EffT_b_Vasc	cell	Bound effector T cells in the tumor vasculature
Tumor	EffT_AR_Vasc	cell	Arrested effector T cells in the tumor vasculature Cancer cells that can engage with Effector T cells in the
Tumor	Cancer1	cell	tumor
			Effector T cells in the tumor that interact with the T3
-			subgroup of cancer cells expressing PD-L1 only, and other
Tumor	T{PD1}{CD80}-{PDL1}C	cell	unknown factors Effector T cells in the tumor that interact with the T4
			subgroup of cancer cells expressing PD-L2 only, and other
Tumor	T{PD1}-{PDL2}C	cell	unknown factors
			Effector T cells in the tumor that interact with the T2
T		11	subgroup of cancer cells expressing PD-1 only, and other
Tumor	T{PDL1}-{PD1}C	cell	unknown factors Effector T cells in the tumor that interact with the T5
			subgroup of cancer cells expressing CD80 only, and other
Tumor	T{PDL1}-{CD80}C	cell	unknown factors
			Effector T cells in the tumor that interact with the T6
Tumor	T{PD1}{L1}{80}-{PD1}{L1}C	cell	subgroup of cancer cells expressing PD-1 and PD-L1 only, and other unknown factors
1 011101		Cell	Effector T cells in the tumor that interact with the T8
			subgroup of cancer cells expressing PD-L1 and PD-L2
Tumor	T{PD1}{80}-{PDL1}{PDL2}C	cell	only, and other unknown factors
			Effector T cells in the tumor that interact with the T7
Tumor	T{PD1}{L1}-{PD1}{L2}C	cell	subgroup of cancer cells expressing PD-1 and PD-L2 only, and other unknown factors
1 unior		con	Effector T cells in the tumor that interact with the T10
			subgroup of cancer cells expressing PD-1, PD-L1 and PD-
Tumor	$T{PD1}{L1}{80}-{PD1}{L1}{L2}C$	cell	L2 only, and other unknown factors
			Effector T cells in the tumor that interact with the T9 subgroup of cancer cells expressing CD80 and PD-1 only,
Tumor	T{PDL1}-{CD80}{PD1}C	cell	and other unknown factors
			Effector T cells in the tumor that interact with the T11
Τ		11	subgroup of cancer cells expressing PD-L1 and CD80 only,
Tumor	T{PD1}{L1}-{PDL1}{80}C	cell	and other unknown factors Effector T cells in the tumor that interact with the T12
			subgroup of cancer cells expressing PD-L2 and CD80 only,
Tumor	T{PD1}{L1}-{PDL2}{80}C	cell	and other unknown factors
			Effector T cells in the tumor that interact with the T13
Tumor	T{PD1}{L1}-{PDL1}{80}{L2}C	cell	subgroup of cancer cells expressing PD-L1, CD80 and PD-L2 only, and other unknown factors
			Effector T cells in the tumor that interact with the T14
			subgroup of cancer cells expressing PD-1, CD80 and PD-
Tumor	$T{PD1}{L1}{80}-{PD1}{80}{L1}C$	cell	L1 only, and other unknown factors
			Effector T cells in the tumor that interact with the T15 subgroup of cancer cells expressing PD-1, CD80 and PD-
Tumor	T{PD1}{L1}-{PD1}{80}{PDL2}C	cell	L2 only, and other unknown factors
			Effector T cells in the tumor that interact with the T16
Tumor	$T{PD1}{L1}{80}-$	0011	subgroup of cancer cells expressing PD-1, CD80, PD-L1
Tumor	{PD1}{80}{L1}{L2}C	cell	and PD-L2 only, and other unknown factors PD-L1 expressed by Effector T cells that interact with T2
Tumor	T2=PDL1	mole	subgroup of cancer cells
			PD-1 expressed by Effector T cells that interact with T3
Tumor	T3a=PD1	mole	subgroup of cancer cells
Tumor	T4=PD1	mole	PD-1 expressed by Effector T cells that interact with T4 subgroup of cancer cells
		more	PD-L1 expressed by Effector T cells that interact with T5
Tumor	T5=PDL1	mole	subgroup of cancer cells
			CD80 expressed by Effector T cells that interact with T3
Tumor	T3b=CD80	mole	subgroup of cancer cells

Compartment Location	Variable Name	Units	Variable Definition
			PD-L1 expressed by Effector T cells that interact with T7
Tumor	T7a=PDL1	mole	subgroup of cancer cells PD-1 expressed by Effector T cells that interact with T10
Tumor	T10b=PD1	mole	subgroup of cancer cells
			PD-1 expressed by Effector T cells that interact with T7
Tumor	T7b=PD1	mole	subgroup of cancer cells
Tumor	T6a=PDL1	mole	PD-L1 expressed by Effector T cells that interact with T6 subgroup of cancer cells
			CD80 expressed by Effector T cells that interact with T6
Tumor	T6c=CD80	mole	subgroup of cancer cells
Tumor	T6b=PD1	mole	PD-1 expressed by Effector T cells that interact with T6 subgroup of cancer cells
			PD-L1 expressed by Effector T cells that interact with T11
Tumor	T11a=PDL1	mole	subgroup of cancer cells
Tumor	T11b=PD1	mole	PD-1 expressed by Effector T cells that interact with T11 subgroup of cancer cells
Tumor		more	CD80 expressed by Effector T cells that interact with T10
Tumor	T10c=CD80	mole	subgroup of cancer cells
Τ			PD-1 expressed by Effector T cells that interact with T12
Tumor	T12b=PD1	mole	subgroup of cancer cells PD-L1 expressed by Effector T cells that interact with T13
Tumor	T13a=PDL1	mole	subgroup of cancer cells
_			PD-L1 expressed by Effector T cells that interact with T12
Tumor	T12a=PDL1	mole	subgroup of cancer cells CD80 expressed by Effector T cells that interact with T14
Tumor	T14c=CD80	mole	subgroup of cancer cells
			PD-1 expressed by Effector T cells that interact with T15
Tumor	T15b=PD1	mole	subgroup of cancer cells
Tumor	T15a=PDL1	mole	PD-L1 expressed by Effector T cells that interact with T15 subgroup of cancer cells
		more	PD-1 expressed by Effector T cells that interact with T13
Tumor	T13b=PD1	mole	subgroup of cancer cells
Tumor	T14b=PD1	mole	PD-1 expressed by Effector T cells that interact with T14 subgroup of cancer cells
			PD-L1 expressed by Effector T cells that interact with T14
Tumor	T14a=PDL1	mole	subgroup of cancer cells
Tumor	T16b=PD1	mole	PD-1 expressed by Effector T cells that interact with T16 subgroup of cancer cells
		more	CD80 expressed by Effector T cells that interact with T16
Tumor	T16c=CD80	mole	subgroup of cancer cells
Tumor	T16a=PDL1	mole	PD-L1 expressed by Effector T cells that interact with T16 subgroup of cancer cells
1 unioi		more	PD-1 expressed by Effector T cells that interact with T8
Tumor	T8a=PD1	mole	subgroup of cancer cells
T	T01 CD00	1	CD80 expressed by Effector T cells that interact with T8
Tumor	T8b=CD80	mole	subgroup of cancer cells PD-L1 expressed by Effector T cells that interact with T9
Tumor	T9=PDL1	mole	subgroup of cancer cells
_			PD-L1 expressed by Effector T cells that interact with T10
Tumor	T10a=PDL1	mole	subgroup of cancer cells PD-1 expressed by the T10 subtype of cancer cells that
Tumor	C10a=PD1	mole	interact with Effector T cells in the tumor
			CD80 expressed by the T9 subtype of cancer cells that
Tumor	C9b=CD80	mole	Interact with Effector T cells in the tumor
Tumor	C9a=PD1	mole	PD-1 expressed by the T9 subtype of cancer cells that interact with Effector T cells in the tumor
			PD-L2 expressed by the T8 subtype of cancer cells that
Tumor	C8b=PDL2	mole	interact with Effector T cells in the tumor
Tumor	C16a=PD1	mole	PD-1 expressed by the T16 subtype of cancer cells that interact with Effector T cells in the tumor
		more	PD-L2 expressed by the T16 subtype of cancer cells that
Tumor	C16c=PDL2	mole	interact with Effector T cells in the tumor
Tumor	Cick-DDI 1	-1-	PD-L1 expressed by the T16 subtype of cancer cells that
Tumor	C16b=PDL1	mole	interact with Effector T cells in the tumor

Compartment Location	Variable Name	Units	Variable Definition
Tumor	C14a=PD1	mole	PD-1 expressed by the T14 subtype of cancer cells that interact with Effector T cells in the tumor
			PD-L1 expressed by the T14 subtype of cancer cells that
Tumor	C14b=PDL1	mole	interact with Effector T cells in the tumor PD-L2 expressed by the T13 subtype of cancer cells that
Tumor	C13b=PDL2	mole	interact with Effector T cells in the tumor PD-1 expressed by the T15 subtype of cancer cells that
Tumor	C15a=PD1	mole	interact with Effector T cells in the tumor
Tumor	C15b=PDL2	mole	PD-L2 expressed by the T15 subtype of cancer cells that interact with Effector T cells in the tumor
			CD80 expressed by the T14 subtype of cancer cells that
Tumor	C14c=CD80	mole	interact with Effector T cells in the tumor PD-L2 expressed by the T12 subtype of cancer cells that
Tumor	C12a=PDL2	mole	interact with Effector T cells in the tumor PD-L1 expressed by the T13 subtype of cancer cells that
Tumor	C13a=PDL1	mole	interact with Effector T cells in the tumor
Tumor	C12b=CD80	mole	CD80 expressed by the T12 subtype of cancer cells that interact with Effector T cells in the tumor
			PD-L2 expressed by the T10 subtype of cancer cells that
Tumor	C10c=PDL2	mole	interact with Effector T cells in the tumor CD80 expressed by the T11 subtype of cancer cells that
Tumor	C11b=CD80	mole	interact with Effector T cells in the tumor
Tumor	C11a=PDL1	mole	PD-L1 expressed by the T11 subtype of cancer cells that interact with Effector T cells in the tumor
Tumor	C6b=PDL1	mole	PD-L1 expressed by the T6 subtype of cancer cells that interact with Effector T cells in the tumor
			PD-1 expressed by the T7 subtype of cancer cells that
Tumor	C7a=PD1	mole	interact with Effector T cells in the tumor PD-1 expressed by the T6 subtype of cancer cells that
Tumor	C6a=PD1	mole	interact with Effector T cells in the tumor PD-L1 expressed by the T8 subtype of cancer cells that
Tumor	C8a=PDL1	mole	interact with Effector T cells in the tumor
Tumor	C10b=PDL1	mole	PD-L1 expressed by the T10 subtype of cancer cells that interact with Effector T cells in the tumor
Tumor	C7b=PDL2	mole	PD-L2 expressed by the T7 subtype of cancer cells that interact with Effector T cells in the tumor
Tumor	C5=CD80	mole	CD80 expressed by the T5 subtype of cancer cells that interact with Effector T cells in the tumor
			PD-L2 expressed by the T4 subtype of cancer cells that
Tumor	C4=PDL2	mole	interact with Effector T cells in the tumor PD-L1 expressed by the T3 subtype of cancer cells that
Tumor	C3=PDL1	mole	interact with Effector T cells in the tumor PD-1 expressed by the T2 subtype of cancer cells that
Tumor	C2=PD1	mole	interact with Effector T cells in the tumor
Tumor	C{PD1}	cell	T2 subgroup of cancer cells expressing PD-1 only, and other unknown factors
Tumor	C{PDL1}	cell	T3 subgroup of cancer cells expressing PD-L1 only, and other unknown factors
			T4 subgroup of cancer cells expressing PD-L2 only, and
Tumor	C{PDL2}	cell	other unknown factors T5 subgroup of cancer cells expressing CD80 only, and
Tumor	C{CD80}	cell	other unknown factors T6 subgroup of cancer cells expressing PD-1 and PD-L1
Tumor	C{PD1}{PDL1}	cell	only, and other unknown factors
Tumor	C{PD1}{PDL2}	cell	T7 subgroup of cancer cells expressing PD-1 and PD-L2 only, and other unknown factors
Tumor	C{PDL1}{PDL2}	cell	T8 subgroup of cancer cells expressing PD-L1 and PD-L2 only, and other unknown factors
			T9 subgroup of cancer cells expressing PD-1 and CD80
Tumor	C{PD1}{CD80}	cell	only, and other unknown factors T10 subgroup of cancer cells expressing PD-1, PD-L1 and
Tumor	C{PD1}{PDL1}{PDL2}	cell	PD-L2 only, and other unknown factors
Tumor	C{PDL1}{CD80}	cell	T11 subgroup of cancer cells expressing PD-L1 and CD80 only, and other unknown factors

Compartment Location	Variable Name	Units	Variable Definition
Tumor	C(PDI 2)(CD80)	cell	T12 subgroup of cancer cells expressing PD-L2 and CD80 only, and other unknown factors
Tumor	C(PDL2){CD80}	cell	T13 subgroup of cancer cells expressing PD-L1, PDL-L2 and CD80 only, and other unknown factors
	C{PDL1}{PDL2}{CD80}		T14 subgroup of cancer cells expressing PD-1, PD-L1 and
Tumor	C{PD1}{PDL1}{CD80}	cell	CD80 only, and other unknown factors T15 subgroup of cancer cells expressing PD-1, PD-L2 and
Tumor	C{PD1}{PDL2}{CD80}	cell	CD80 only, and other unknown factors
Tumor	C{PD1}{PDL1}{PDL2}{CD80}	cell	T16 subgroup of cancer cells expressing PD-1, PD-L1, PD- L2 and CD80 only, and other unknown factors
Tumor	C13c=CD80	mole	CD80 expressed by the T13 subtype of cancer cells that interact with Effector T cells in the tumor
Tumor	C15c=CD80	mole	CD80 expressed by the T15 subtype of cancer cells that interact with Effector T cells in the tumor
Tumor	C16d=CD80	mole	CD80 expressed by the T16 subtype of cancer cells that interact with Effector T cells in the tumor
Tumor	T2=PDL1:PD1=C2	mole	Receptor-receptor interactions at the immunological synapse between PD-1 expressed by the T2 subtype of cancer cells and PD-L1 expressed on Effector T cells
Tumor	T3a=PD1:PDL1=C3	mole	Receptor-receptor interactions at the immunological synapse between PD-L1 expressed by the T3 subtype of cancer cells and PD-1 expressed on Effector T cells
Tumor	T3b=CD80:PDL1=C3	mole	Receptor-receptor interactions at the immunological synapse between PD-L1 expressed by the T3 subtype of cancer cells and CD80 expressed on Effector T cells
Tumor	T4=PD1:PDL2=C4	mole	Receptor-receptor interactions at the immunological synapse between PD-L2 expressed by the T4 subtype of cancer cells and PD-1 expressed on Effector T cells
Tumor	T5=PDL1:CD80=C5	mole	Receptor-receptor interactions at the immunological synapse between CD80 expressed by the T5 subtype of cancer cells and PD-L1 expressed on Effector T cells
Tumor	T6a=PDL1:PD1=C6a	mole	Receptor-receptor interactions at the immunological synapse between PD-1 expressed by the T6 subtype of cancer cells and PD-L1 expressed on Effector T cells
Tumor	T6c=CD80:PDL1=C6b	mole	Receptor-receptor interactions at the immunological synapse between PD-L1 expressed by the T6 subtype of cancer cells and CD80 expressed on Effector T cells
Tumor	T6b=PD1:PDL1=C6b	mole	Receptor-receptor interactions at the immunological synapse between PD-L1 expressed by the T6 subtype of cancer cells and PD-1 expressed on Effector T cells
Tumor	T7a=PDL1:PD1=C7a	mole	Receptor-receptor interactions at the immunological synapse between PD-1 expressed by the T7 subtype of cancer cells and PD-L1 expressed on Effector T cells
Tumor	T7b=PD1:PDL2=C7b	mole	Receptor-receptor interactions at the immunological synapse between PD-L2 expressed by the T7 subtype of cancer cells and PD-1 expressed on Effector T cells
Tumor	T8a=PD1:PDL2=C8b	mole	Receptor-receptor interactions at the immunological synapse between PD-L2 expressed by the T8 subtype of cancer cells and PD-1 expressed on Effector T cells
Tumor	T8a=PD1:PDL1=C8a	mole	Receptor-receptor interactions at the immunological synapse between PD-L1 expressed by the T8 subtype of cancer cells and PD-1 expressed on Effector T cells
Tumor	T8b=CD80:PDL1=C8a	mole	Receptor-receptor interactions at the immunological synapse between PD-L1 expressed by the T8 subtype of cancer cells and CD80 expressed on Effector T cells
Tumor	T9=PDL1-PD1=C9a	mole	Receptor-receptor interactions at the immunological synapse between PD-1 expressed by the T9 subtype of cancer cells and PD-L1 expressed on Effector T cells
Tumor	T9=PDL1-CD80=C9b	mole	Receptor-receptor interactions at the immunological synapse between CD80 expressed by the T9 subtype of cancer cells and PD-L1 expressed on Effector T cells
Tumor	T10a=PDL1:PD1=C10a	mole	Receptor-receptor interactions at the immunological synapse between PD-1 expressed by the T10 subtype of cancer cells and PD-L1 expressed on Effector T cells

Compartment Location	Variable Name	Units	Variable Definition
			Receptor-receptor interactions at the immunological
Tumor	T10b=PD1:PDL1=C10b	mole	synapse between PD-L1 expressed by the T10 subtype of cancer cells and PD-1 expressed on Effector T cells
1 01101	1100-1 D1.1 DL1-C100	more	Receptor-receptor interactions at the immunological
			synapse between PD-L2 expressed by the T10 subtype of
Tumor	T10b=PD1:PDL2=C10c	mole	cancer cells and PD-1 expressed on Effector T cells
			Receptor-receptor interactions at the immunological synapse between PD-L1 expressed by the T10 subtype of
Tumor	T10c=CD80:PDL1=C10b	mole	cancer cells and CD80 expressed on Effector T cells
			Receptor-receptor interactions at the immunological
			synapse between PD-L1 expressed by the T11 subtype of
Tumor	T11b=PD1:PDL1=C11a	mole	cancer cells and PD-1 expressed on Effector T cells Receptor-receptor interactions at the immunological
			synapse between CD80 expressed by the T11 subtype of
Tumor	T11a=PDL1:CD80=C11b	mole	cancer cells and PD-L1 expressed on Effector T cells
			Receptor-receptor interactions at the immunological
Tumor	T12h_DD1.DD12_C12a	mala	synapse between PD-L2 expressed by the T12 subtype of
	T12b=PD1:PDL2=C12a	mole	cancer cells and PD-1 expressed on Effector T cells Receptor-receptor interactions at the immunological
			synapse between CD80 expressed by the T12 subtype of
Tumor	T12a=PDL1:CD80=C12b	mole	cancer cells and PD-L1 expressed on Effector T cells
			Receptor-receptor interactions at the immunological
Tumor	T13b=PD1:PDL1=C13a	mole	synapse between PD-L1 expressed by the T13 subtype of cancer cells and PD-1 expressed on Effector T cells
			Receptor-receptor interactions at the immunological
			synapse between CD80 expressed by the T13 subtype of
Tumor	T13a=PDL1:CD80=C13c	mole	cancer cells and PD-L1 expressed on Effector T cells
			Receptor-receptor interactions at the immunological synapse between PD-L2 expressed by the T13 subtype of
Tumor	T13b=PD1:PDL2=C13b	mole	cancer cells and PD-1 expressed on Effector T cells
			Receptor-receptor interactions at the immunological
Tumor	T14a=PDL1:PD1=C14a	mala	synapse between PD-1 expressed by the T14 subtype of cancer cells and PD-L1 expressed on Effector T cells
1 011101	114a–FDL1.FD1–C14a	mole	Receptor-receptor interactions at the immunological
			synapse between CD80 expressed by the T14 subtype of
Tumor	T14a=PDL1:CD80=C14c	mole	cancer cells and PD-L1 expressed on Effector T cells
			Receptor-receptor interactions at the immunological synapse between PD-L1 expressed by the T14 subtype of
Tumor	T14b=PD1:PDL1=C14b	mole	cancer cells and PD-1 expressed on Effector T cells
			Receptor-receptor interactions at the immunological
T		,	synapse between CD80 expressed by the T14 subtype of
Tumor	T14c=CD80:PDL1=C14b	mole	cancer cells and PD-L1 expressed on Effector T cells Receptor-receptor interactions at the immunological
			synapse between CD80 expressed by the T15 subtype of
Tumor	T15a=PDL1:CD80=C15c	mole	cancer cells and PD-L1 expressed on Effector T cells
			Receptor-receptor interactions at the immunological synapse between PD-1 expressed by the T15 subtype of
Tumor	T15a=PDL1:PD1=C15a	mole	cancer cells and PD-L1 expressed on Effector T cells
			Receptor-receptor interactions at the immunological
			synapse between PD-L2 expressed by the T15 subtype of
Tumor	T15b=PD1:PDL2=C15b	mole	cancer cells and PD-1 expressed on Effector T cells Receptor-receptor interactions at the immunological
			synapse between PD-L2 expressed by the T15 subtype of
Tumor	T16b=PD1:PDL2=C16c	mole	cancer cells and PD-1 expressed on Effector T cells
			Receptor-receptor interactions at the immunological
Tumor	T16b=PD1:PDL1=C16b	mole	synapse between PD-L1 expressed by the T15 subtype of cancer cells and PD-1 expressed on Effector T cells
- univi	1100-10111001-0100	more	Receptor-receptor interactions at the immunological
			synapse between PD-L1 expressed by the T15 subtype of
Tumor	T16c=CD80:PDL1=C16b	mole	cancer cells and CD80 expressed on Effector T cells
			Receptor-receptor interactions at the immunological synapse between PD-1 expressed by the T15 subtype of
Tumor	T16a=PDL1:PD1=C16a	mole	cancer cells and PD-L1 expressed on Effector T cells
			Receptor-receptor interactions at the immunological
T			synapse between CD80 expressed by the T15 subtype of
Tumor	T16a=PDL1:CD80=C16d	mole	cancer cells and PD-L1 expressed on Effector T cells

Compartment Location	Variable Name	Units	Variable Definition
			Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by Effector T cells that interact with the T2 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way
Tumor	T2=PDL1:aPDL1	mole	of IV injection into the blood
Tumor	T3a=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by Effector T cells that interact with the T3 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	C3=PDL1:aPDL1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by the T3 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T5=PDL1:aPDL1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by Effector T cells that interact with the T5 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T6a=PDL1:aPDL1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by Effector T cells that interact with the T6 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	C6b=PDL1:aPDL1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by the T6 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T10a=PDL1:aPDL1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by Effector T cells that interact with the T10 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	C10b=PDL1:aPDL1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by the T10 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	C11a=PDL1:aPDL1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by the T11 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T11a=PDL1:aPDL1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by Effector T cells that interact with the T11 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T12a=PDL1:aPDL1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by Effector T cells that interact with the T12 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T7a=PDL1:aPDL1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by Effector T cells that interact with the T7 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	C8a=PDL1:aPDL1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by the T8 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T9=PDL1:aPDL1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by Effector T cells that interact with the T9 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood

Compartment Location	Variable Name	Units	Variable Definition
Tumor		molo	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by the T13 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
1 umor	C13a=PDL1:aPDL1	mole	Heterogeneous receptor-antibody interactions at the
Tumor	T13a=PDL1:aPDL1	mole	immunological synapse between PD-L1 expressed by Effector T cells that interact with the T13 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T14a=PDL1:aPDL1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by Effector T cells that interact with the T14 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
1 011101	114a–FDL1.aFDL1	more	Heterogeneous receptor-antibody interactions at the
Tumor	C14b=PDL1:aPDL1	mole	immunological synapse between PD-L1 expressed by the T14 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
	C140-I DE1.ai DE1	more	Heterogeneous receptor-antibody interactions at the
Tumor	T15a=PDL1:aPDL1	mole	immunological synapse between PD-L1 expressed by Effector T cells that interact with the T15 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor		mala	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by Effector T cells that interact with the T16 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of Winteraction and the logd
Tumor	T16a=PDL1:aPDL1	mole	of IV injection into the blood Heterogeneous receptor-antibody interactions at the
Tumor	C16b=PDL1:aPDL1	mole	immunological synapse between PD-L1 expressed by the T16 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	C2=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by the T2 subtype of cancer cells and Anti-PD-1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T4=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by Effector T cells that interact with the T4 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	C6a=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by the T6 subtype of cancer cells and Anti-PD-1 mAb delivered to the tumor by way of IV injection into the blood
			Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by Effector T cells that interact with the T6 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way
Tumor	T6b=PD1:aPD1	mole	of IV injection into the blood Heterogeneous receptor-antibody interactions at the
Tumor	C7a=PD1:aPD1	mole	immunological synapse between PD-1 expressed by the T7 subtype of cancer cells and Anti-PD-1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T7b=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by Effector T cells that interact with the T7 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
			Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by Effector T cells that interact with the T8 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way
Tumor	T8a=PD1:aPD1	mole	of IV injection into the blood

Compartment Location	Variable Name	Units	Variable Definition
Tumor	C9a=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by the T9 subtype of cancer cells and Anti-PD-1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	C10a=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by the T10 subtype of cancer cells and Anti-PD-1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T10b=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by Effector T cells that interact with the T10 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T11b=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by Effector T cells that interact with the T11 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T13b=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by Effector T cells that interact with the T13 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	C14a=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by the T14 subtype of cancer cells and Anti-PD-1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T14b=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by Effector T cells that interact with the T14 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	C15a=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by the T15 subtype of cancer cells and Anti-PD-1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T15b=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by Effector T cells that interact with the T15 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	C16a=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by the T16 subtype of cancer cells and Anti-PD-1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T16b=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by Effector T cells that interact with the T16 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	T12b=PD1:aPD1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by Effector T cells that interact with the T12 subtype of cancer cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
			Total number of T Regulatory cells that able to engage
Tumor	TregT	cell	with Effector T cells and mAPCs in the tumor T Regulatory cells in the tumor that have engaged in interacting with Effector T cells
Tumor	TregT_Teff	cell	interacting with Effector T cells Total number of MDSCs that able to engage with Effector T cells in the tumor
Tumor Tumor	MDSC_T MDSCsT_Teff	cell	T cells in the tumor MDSCs in the tumor that have engaged in interacting with Effector T cells
Tumor	MDSCsT_EngTeff	cell	MDSCs in the tumor that have engaged in interacting with Effector T cells that are accounting for the expression of PD-1 and PD-L1

Compartment Location	Variable Name	Units	Variable Definition
			T Regulatory cells in the tumor that have engaged in
Tumor	TregT_EngAPC	cell	interacting with mAPCs that are accounting for the expression of CTLA-4
1 unior		Cell	mAPCs in the tumor that have engaged in interacting with
			T Regulatory cells that are accounting for the expression of
Tumor	mAPCT_EngTregT	cell	CD80 and CD86
			Effector T cells in the tumor that have engaged in interacting with T Regulatory cells that are accounting for
Tumor	Teff_EngTregT	cell	the expression of CD80, PD-1 and PD-L1
			PD-1 expressed by Effector T cells that interact with T
Tumor	PD1_TeffT	mole	Regulatory cells in the tumor
Tumor	PDL1 TeffT	mole	PD-L1 expressed by Effector T cells that interact with T Regulatory cells in the tumor
		inoite	CD80 expressed by Effector T cells that interact with T
Tumor	CD80_TeffT	mole	Regulatory cells in the tumor
T			CD80 expressed by mAPCs that interact with T Regulatory
Tumor	CD80_mAPCT	mole	cells in the tumor PD-L1 expressed by MDSCs that interact with Effector T
Tumor	PDL1_MDSCsT	mole	cells in the tumor
			PD-1 expressed by MDSCs that interact with Effector T
Tumor	PD1_MDSCsT	mole	cells in the tumor
Tumor	CD86_mAPCT	molo	CD86 expressed by mAPCs that interact with T Regulatory cells in the tumor
		mole	PD-1 expressed by T Regulatory cells that interact with
Tumor	PD1_TregT	mole	Effector T cells in the tumor
			PD-L1 expressed by T Regulatory cells that interact with
Tumor	PDL1_TregT	mole	Effector T cells in the tumor
Tumor	CTLA4_TregT	mole	CTLA-4 expressed by T Regulatory cells that interact with mAPCs in the tumor
		linoite	Receptor-receptor interactions at the immunological
			synapse between CD80 expressed by mAPCs and CTLA-4
Tumor	CTLA4:CD80_TrAT	mole	expressed on T Regulatory cells in the tumor
			Receptor-receptor interactions at the immunological synapse between CD86 expressed by mAPCs and CTLA-4
Tumor	CTLA4:CD86_TrAT	mole	expressed on T Regulatory cells in the tumor
			Heterogeneous receptor-antibody interactions at the
			immunological synapse between CTLA-4 expressed by T Regulatory cells that interact with the mAPCs and Anti-
			PD-L1 mAb delivered to the tumor by way of IV injection
Tumor	CTLA4_CTLA4-Trt	mole	into the blood
			Receptor-receptor interactions at the immunological synapse between PD-1 expressed by the Effector T cells
Tumor	PDL1:PD1_TrTeff	mole	and PD-L1 expressed on T Regulatory cells in the tumor
	—		Receptor-receptor interactions at the immunological
T			synapse between CD80 expressed by the Effector T cells
Tumor	PDL1:CD80_TrTeff	mole	and PD-L1 expressed on T Regulatory cells in the tumor Receptor-receptor interactions at the immunological
			synapse between PD-L1 expressed by the Effector T cells
Tumor	PD1:PDL1_TrTeff	mole	and PD-1 expressed on T Regulatory cells in the tumor
			Receptor-receptor interactions at the immunological synapse between CD80 expressed by the Effector T cells
Tumor	PDL1:CD80_MDSCT	mole	and PD-L1 expressed on MDSCs in the tumor
			Receptor-receptor interactions at the immunological
T			synapse between PD-1 expressed by the Effector T cells
Tumor	PDL1:PD1_MDSCT	mole	and PD-L1 expressed on MDSCs cells in the tumor Receptor-receptor interactions at the immunological
			synapse between PD-L1 expressed by the Effector T cells
Tumor	PD1:PDL1_MDSCT	mole	and PD-1 expressed on MDSCs in the tumor
			Heterogeneous receptor-antibody interactions at the
			immunological synapse between PD-1 expressed by Effector T cells that interact with the T Regulatory cells
			and Anti-PD-1 mAb delivered to the tumor by way of IV
Tumor	PD1:aPD1_Teff	mole	injection into the blood
			Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by
Tumor	PDL1:aPDL1_Teff	mole	Effector T cells that interact with the T Regulatory cells
	· · · · · · · · · · · · · · · · · · ·		

Compartment Location	Variable Name	Units	Variable Definition
			and Anti-PD-L1 mAb delivered to the tumor by way of IV
			injection into the blood
Tumor	PDL1:aPDL1_Treg	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by T Regulatory cells that interact with Effector T cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	PD1:aPD1_Treg	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by T Regulatory cells that interact with Effector T cells and Anti-PD-1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	PD1:aPD1_MDSCs	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by MDSCs that interact with Effector T cells and Anti-PD-1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	PDL1:aPDL1_MDSCs	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by MDSCs that interact with Effector T cells and Anti-PD-L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	TregT_EngTeff	cell	T Regulatory cells in the tumor that have engaged in interacting with Effector T cells that are accounting for the expression of PD-1 and PD-L1
Tumor	Teff_EngMDSC	cell	Effector T cells in the tumor that have engaged in interacting with MDSCs that are accounting for the expression of CD80, PD-1 and PD-L1
Tumor	CD80_TeffT1	mole	CD80 expressed by Effector T cells that interact with MDSCs in the tumor
Tumor	PDL1_TeffT1	mole	PD-L1 expressed by Effector T cells that interact with MDSCs in the tumor
Tumor	PD1_TeffT1	mole	PD-1 expressed by Effector T cells that interact with MDSCs in the tumor
Tumor	PD1:aPD1_Teff1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-1 expressed by Effector T cells that interact with the MDSCs and Anti-PD 1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	PDL1:aPDL1_Teff1	mole	Heterogeneous receptor-antibody interactions at the immunological synapse between PD-L1 expressed by Effector T cells that interact with the MDSCs and Anti-PD L1 mAb delivered to the tumor by way of IV injection into the blood
Tumor	Effector_TT_TregT	cell	Total number of Effector T cells that able to engage with T Regulatory cells in the tumor
Tumor	Effector_TT_MDSCs	cell	Total number of Effector T cells that able to engage with MDSCs in the tumor
Tumor	Effector_TT_Res	cell	Effector T cells that have become Resident Effector Memory cells after the tumor has died
Tumor	Effector_TT_Count	cell	The total number of Effector and Resident Effector Memory cells
Tumor	Effector_TT_per_Treg	cell/ cell	The number of Effector T cells per T Regulatory cells in the tumor
Tumor	Effector_TT_per_mL	cell/ mm ³	The volumetric density of Effector T cells per milliliter in the tumor

Table S4 – Definition of species in the model (End)

Table S5 – Model Parameters (Start)

Variable	Value	Units	Source	Description
				Percent Naïve T cells of total T cells in each lymph
%_NT_LN	55	dimensionless	[1, 2]	node (taken as all CD3+ cells)

Variable	Value	Units	Source	Description
%_Tr_LN	5-35	dimensionless	[1, 3-5]	Percent Regulatory T cells of total T cells in each lymph node
/0_11_LIN	5-55	dimensionless	Calculated; see	Tymph node
			algebraic	Fraction of cancer cells expressing CD80 and PD-1
%{CD80}{PD1}C	Calculated	dimensionless	equations below Calculated; see	checkpoint receptors only
			algebraic	Fraction of cancer cells expressing the CD80
%{CD80}C	Calculated	dimensionless	equations below	checkpoint receptor only
			Calculated; see	
%{Other}C	Calculated	dimensionless	algebraic equations below	Fraction of cancer cells expressing only unknown factors, other than CD80, PD-1, PD-L1 and PD-L2
	Culculated	unitensioniess	Calculated; see	
	~		algebraic	Fraction of cancer cells expressing CD80, PD-1,
%{PD1}{80}{L1}{L2}C	Calculated	dimensionless	equations below Calculated; see	PD-L1 and PD-L2 checkpoint receptors only
			algebraic	Fraction of cancer cells expressing CD80, PD-1,
%{PD1}{80}{L1}C	Calculated	dimensionless	equations below	and PD-L1 checkpoint receptors only
			Calculated; see algebraic	Fraction of concer calls expressing CD80 BD 1
%{PD1}{80}{PDL2}C	Calculated	dimensionless	equations below	Fraction of cancer cells expressing CD80, PD-1, and PD-L2 checkpoint receptors only
			Calculated; see	
	Calculated	dimensionless	algebraic equations below	Fraction of cancer cells expressing PD-1, PD-L1 and PD-L2 checkpoint receptors only
%{PD1}{L1}{L2}C	Calculated	unnensionness	Calculated; see	and 1 D-L2 encorpoint receptors only
			algebraic	Fraction of cancer cells expressing PD-1, and PD-
%{PD1}{L1}C	Calculated	dimensionless	equations below Calculated; see	L1 checkpoint receptors only
			algebraic	Fraction of cancer cells expressing PD-1, and PD-
%{PD1}{L2}C	Calculated	dimensionless	equations below	L2 checkpoint receptors only
			Calculated; see	
%{PD1}C	Calculated	dimensionless	algebraic equations below	Fraction of cancer cells expressing the PD-1 checkpoint receptor only
			Calculated; see	
	G 1 1 / 1		algebraic	Fraction of cancer cells expressing CD80, PD-L1,
%{PDL1}{80}{L2}C	Calculated	dimensionless	equations below Calculated; see	and PD-L1 checkpoint receptors only
			algebraic	Fraction of cancer cells expressing CD80 and PD-
%{PDL1}{80}C	Calculated	dimensionless	equations below	L1 checkpoint receptors only
			Calculated; see algebraic	Fraction of cancer cells expressing PD-L1, and PD-
%{PDL1}{PDL2}C	Calculated	dimensionless	equations below	L2 checkpoint receptors only
			Calculated; see algebraic	Errotion of concer calls expressing the DD I 1
%{PDL1}C	Calculated	dimensionless	equations below	Fraction of cancer cells expressing the PD-L1 checkpoint receptor only
,			Calculated; see	
9/ (DDI 2) (90) C	Calculated	dimensionless	algebraic	Fraction of cancer cells expressing CD80 and PD-
%{PDL2}{80}C	Calculated	dimensionless	equations below Calculated; see	L2 checkpoint receptors only
			algebraic	Fraction of cancer cells expressing the PD-L2
%{PDL2}C	Calculated	dimensionless	equations below	checkpoint receptor only Percent of cancer cells of total cancer cells that are
				CD80 positive that interact with the Effector T
%CD80_Exp_Cancer	5 (mean)	dimensionless	[6-8]	cells in the tumor compartment
%CD80_receptor_level_PNT	10	dimensionless	Assumed low	Percent of maximum CD80 receptor expression on Primed Naive T cells in the lymph nodes
	-			Percent of cancer cells of total cancer cells that are
%PD1_Exp_Cancer	10 (maan)	dimensionless	[9]	PD-1 positive that interact with the Effector T cells
/orD1_Exp_Cancer	10 (mean)	unnensionless	[9]	in the tumor compartment Percent of maximum PD-1 receptor expression on
%PD1_receptor_level_PNT	25	dimensionless	[10]	Primed Naive T cells in the lymph nodes
				Percent of cancer cells of total cancer cells that are PD-L1 positive that interact with the Effector T
%PDL1_Exp_Cancer	60	dimensionless	[11]	cells in the tumor compartment
				Percent of maximum PD-L1 receptor expression on
%PDL1_receptor_level_PNT	25	dimensionless	Assumed low	Primed Naive T cells in the lymph nodes Percent of cancer cells of total cancer cells that are
				PD-L2 positive that interact with the Effector T
%PDL2_Exp_Cancer	20 (mean)	dimensionless	[12]	cells in the tumor compartment

Variable	Value	Units	Source	Description
				The percent effect that total immune checkpoints
				on the cancer cells have on inactivating the
%Sig_Inhibit_Cancer	0.65	dimensionless	Set to fit response	Effector T cells in the tumor
				Defines the percentage of Regulatory T cells in the
				tumor compartment as a percent of total tumor
%T_Tregs_per_Cancer	0-0.25	dimensionless	Assumed	cells
Adhesion_D_Lung_Liv_spln				Effector T cell adhesion density in Lung, Liver, or
	1E9	cell/ml	[13]	Spleen vasculature
Adhesion_Density_Tmr				Effector T cell adhesion density in Tumor
	5E8	cell/ml	[13]	vasculature
				Sets the number of TAA/TSA released per cancer
			Estimated during	cell upon natural death and decay or following
	x = 1 to 5		fitting to anti-PD-	cytotoxic killing. The value is used to set a
	(Where it is		1 data and varied	multiple of cancer cells in the formation of debris
AntSpread	used as 10 ^x)	dimensionless	across range	for APC maturation.
	Assigned			
	from 0.8-		I I and a second second	The strength of the tumor antigens that are
Antigon Intensity	1.0 for melanoma	dimensionless	Upper range of cancer types [14]	involved in priming of the T cells in the lymph nodes
Antigen_Intensity AR Liver	1.5	1/minute	· · · ·	Effector T cell arrest rate in Liver vasculature
AR_Liver AR_Lungs	0.0027	1/minute 1/minute	[13] [13]	Effector T cell arrest rate in Lungs vasculature
AR_Lungs AR Spleen	0.0027	1/minute 1/minute	[13]	Effector T cell arrest rate in Spleen vasculature
AR_Spieen AR Tmr	1	1/minute	[13]	Effector T cell arrest rate in Tumor vasculature
AK_IIII	1	molecules	[15]	Avogadro's number – converts receptor numbers to
Avogadro's_Num	6.022E+23	/mole	Exact value	moles
BodyWeight (kg)	80	kg	[15]	Body weight of an average human being
body weight (kg)	00	K5	[15]	Diameter of each cancer cell when considering
Cancer_Cell_Diam_um	12	μm	[16, 17]	each cell's volume to be represented by a sphere
Cuncer_con_Dium_um	12	μπ	Calculated; see	each cen s volume to be represented by a sphere
			algebraic	Volume of each cancer cell when the diameter is
Cancer_Cell_Vol_mm3	9.0478E-7	mm ³	equations below	that of a sphere
	, , , , , , , , , , , , , , , , , , , ,		Calculated; see	
			algebraic	Diameter of the entire tumor – considering all cells
Cancer_Diam_mm	Calculated	mm	equations below	and a void fraction
			1	Diameter of the tumor when to start the therapeutic
Cancer_mm_Start_Therapy	Assigned	mm	Assigned	regimen
				Number of cancer cells that interact with each
Cancer_per_T_Cell_Int	Set to 1	cell/cell	Variable	Effector T cell in the model
				Maximum number of cancer cells that can interact
				with each Effector T cell in the model; assuming
				that each Effector T cell uses 25% of its surface
a			540, 403	area to interact with each cancer cell (can be up to
Cancer_per_T_Cell_max	4	cell/cell	[18, 19]	50%) [19].
			Calculated; see	
G	01141	3	algebraic	Volume of the entire tumor – considering all cells
Cancer_Vol_cm3	Calculated	cm ³	equations below	and a void fraction
				Rate constant defining the half-life of engagement between cancer cells and Effector T cells in the
				tumor (at a migration rate of 5-10 μ m/min, T cells
				encounter and engage with a cancer cell
CancerTEng	2.079	1/hour	[20]	approximately every 15 minutes to 1 hour).
8	,		(=~)	Rate constant defining the half-life of dissociation
				between Effector T cells and cancer cells (thus,
CancerTInt	0.03465	1/minute	[20]	determining total time of interaction)
				Fraction of total CD28 receptors on Naïve T cells
			Calculated with	that are involved in interacting with the CD80 and
			RO; see algebraic	CD86 receptors on mAPCs during priming in the
CD28_POS-Sig_NT	Calculated	dimensionless	equations below	lymph nodes
				Fraction of total CD28 receptors on Primed Naïve
			Calculated with	T cells that are involved in interacting with the
			RO; see algebraic	CD80 and CD86 receptors on mAPCs during
CD28_POS-to-Total	Calculated	dimensionless	equations below	priming in the lymph nodes
				Number of CD28 receptors expressed on each T
CD28_receptors-per-Tcell	15000	molecules/cell	[21]	cell during priming
			<u>a.</u>	Fraction of total CD80 receptors on Primed Naïve
			Calculated with	T cells that are involved in interacting with the PD-
CD80 DNT NEC to Mor-	Calculated	dimonsionlas-	RO; see algebraic	L1 receptors on mAPCs during priming in the
CD80_PNT_NEG-to-Max	Calculated	dimensionless	equations below	lymph nodes

Variable	Value	Units	Source	Description
CD80_receptors_per_C_Cl	30000	molecules/cell	Assumed same as T cells	Number of CD80 receptors expressed on each cancer cell (assumed same as for T cells).
CD80_receptors_per_C_CI	30000	molecules/cell	1 cens	Maximum number of CD80 receptors expressed on
CD80_receptors-per-mAPC	130000	molecules/cell	[22]	each mAPC
				Number of CD80 receptors expressed on each T
CD80_receptors-per-Tcell	30000	molecules/cell	[23, 24]	cell (by acquisition of CD80 from mAPCs over two rounds of priming) [24].
CD00_receptors-per-reen	30000	molecules/cell	[23, 24]	Fraction of total CD80 receptors on Primed Naïve
			Calculated with	T cells that are involved in interacting with the PD-
CD80Sig_Tr-PNT	Calculated	dimensionless	RO; see algebraic equations below	L1 receptors on Regulatory T cells during priming in the lymph nodes
	Calculated	unnensionness	equations below	Maximum number of CD86 receptors expressed on
CD86_receptors-per-mAPC	208000	molecules/cell	[22]	each mAPC
			Estimated during anti-PD-1 therapy	
			fitting; varied in	The chemokine factor to promote extravasation of
Chemokine	100	dimensionless	sensitivity analysis	effector T cells into the tumor
	0.00373614			Clearance rate of Anti-CTLA-4 mAb from the
Cl_CTLA4	1 0.01457072	1/hour	[15]	central compartment Clearance rate of Anti-PD-1 mAb from the central
Cl_PD1	2	liter/hour	[25]	compartment
	0.01653012			Clearance rate of Anti-PD-L1 mAb from the
Cl_PDL1	9	liter/hour	[26, 27]	central compartment Number of copies of each Naïve T cell clone in the
Copies-per-T_Cell_Clone	10-130	dimensionless	[28-30]	lymph nodes.
	Based on	unitensionitess	[15]	Time in simulation to switch schedule in regimen
CTLA4_change_schedule	regimen	day	Based on regimen	for Anti-CTLA-4 therapy
CTLA4_counter_off	Based on regimen	day	[15] Based on regimen	Time in simulation to stop Anti-CTLA-4 dose
	Based on	uuy	[15]	This in simulation to stop This CTEAT 4 dose
CTLA4_counter_on	regimen	day	Based on regimen	Time in simulation to start Anti-CTLA-4 dose
CTLA4_DoseSet	Based on regimen	mg/kg	Set dose	Dose of anti-CTLA-4 therapy
	Calculated;	mg/kg	Set dose	Dose of anti-CTEA-4 incrapy
	see			Fraction of total CTLA-4 receptors on Primed
	algebraic equations		Calculated with RO; see algebraic	Naïve T cells that are involved in interacting with the CD80 and CD86 receptors on mAPCs during
CTLA4_NEG-to-Total	below	dimensionless	equations below	priming in the lymph nodes
	Calculated;		1	
	see			Maximum number of CTLA-4 receptors that can
	algebraic equations			be recruited to the immunological synapse by Primed Naive T cells when interacting with
CTLA4_receptors-Int-PNT	below	molecules/cell	[31]	mAPCs
	Calculated;			
	see algebraic			
	equations			Number of CTLA-4 receptors that are expressed on
CTLA4_receptors-nInt-PNT	below	molecules/cell	[32]	the surface of non-interacting Primed Naive T cells
	Calculated; see		Assumed	
	algebraic		dependent on	
	equations	1 1 / 22	CD28/CTLA4	Maximum number of CTLA-4 receptors on T-
CTLA4_receptors-Tr	below Based on	molecules/cell	ratio [15]	regulatory cells
CTLA4mAb	regimen	mg/kg	Based on regimen	Dose of Anti-CTLA-4 being delivered
	Based on		[15]	Dose of Anti-CTLA-4 to deliver based on the
CTLA4mAb_Dose	regimen Based on	mg/kg	Based on regimen [15]	current schedule Dose of Anti-CTLA-4 to be delivered when
CTLA4mAb_New_Dose	regimen	mg/kg	Based on regimen	schedule is changed
			Calculated with	Fraction of CTLA-4 receptors expressed on T
CTLA4Sig_TrLN	Calculated	dimensionless	RO; see algebraic equations below	Regulatory cells that are occupied by Anti-CTLA-4 mAb in the lymph nodes
CILATOIS_IILIN	Calculated	annensiomess	Calculated with	Fraction of CTLA-4 receptors expressed on T
			RO; see algebraic	Regulatory cells that are interacting with CD80 and
CTLA4Sig_TrLN-mAPC	Calculated	dimensionless	equations below	CD86 on the mAPCs in the lymph nodes
CTLA4-to-CD28_Ratio_Int	Calculated	dimensionless	[31]	Ratio of CTLA-4 to CD28 expression on interacting Primed Naive T cells
- ILAI . to ODBO_Mutto_Int	Curculated		(01)	Ratio of CTLA-4 to CD28 expression on non-
CTLA4-to-CD28_Ratio_nInt	0.035	dimensionless	[32]	interacting Primed Naive T cells

Variable	Value	Units	Source	Description
				CTLA-4 expression levels on T Regulatory cells
	0.7		1001	relative to CD28 expression on Primed Naive T
CTLA4-to-CD28_Ratio_Tr	0.5	dimensionless	[33]	cells
day	1	day	Unit assignment	Assigns value of 1 day to the term day in the model
Debris_Decay	2	1/dev	[34, 35]	Half-life of tumor debris and non-phagocytosed tumor antigens
Debits_Decay	2	1/day	[34, 33]	Transport rate of tumor debris by the lymphatics to
				the lymph nodes (based on "permeation of tumor
Debris_Transport	3	1/day	[34]	debris and the blood")
Delta_Liver	1	1/day	[34]	Fraction of Effector T cells in extravascular space
Denu_Liver	1	dimensionless	[13]	of Liver that can recirculate
Delta_LN	0.018	unitensionitess	[10]	Fraction of Effector T cells in extravascular space
-		dimensionless	[13]	of Lymph Nodes that can recirculate
Delta_Lungs	1			Fraction of Effector T cells in extravascular space
-		dimensionless	[13]	of Lungs that can recirculate
Delta_Spleen	1			Fraction of Effector T cells in extravascular space
-		dimensionless	[13]	of Spleen that can recirculate
	Based on		[15]	Time between sequential doses of Anti-CTLA-4 in
Dose_sched_CTLA4	regimen	day	Based on regimen	a regimen
	Based on		[25]	Time between sequential doses of Anti-PD-1 in a
Dose_sched_PD1	regimen	day	Based on regimen	regimen
	Based on		[26, 27]	Time between sequential doses of Anti-PD-L1 in a
Dose_sched_PDL1	regimen	day	Based on regimen	regimen
				Molecular weight of Anti-PD-L1 antibody,
Durvalumab_MW	146300000	mg/mole	[36-39]	Durvalumab
E_Lungs	0.0019	1/minute	[13]	Effector T cell depletion rate
				Rate constant defining the half-life of Naïve T cell
EffT_InOutLN	0.0693	1/hour	[40]	migration into and out of the lymph nodes
	0.0		504.447	Rate constant defining the half-life of Effector T
EffT_Migrate	0.9	1/day	[34, 41]	cell migration from the lymph nodes to the blood
				Rate constant defining the half-life by which
				Effector T cells in the tumor compartment undergo
FOT D. C.	0.1155	1/ • /	540 401	apoptosis (90%) and become resident Effector T
EffT_Res_Conversion	0.1155	1/minute	[42, 43]	cells (10%) following the death of the tumor [42].
E	0.02	1/4	[24 25 44 45]	Rate constant defining the half-life of Effector T
EffT_Turnover	0.02	1/day	[34, 35, 44, 45]	cells Data constant defining the helf life of
Endo_CTLA4	0.3465	1/minute	[46, 47]	Rate constant defining the half-life of (trans)endocytosis of CTLA-4 on T cells
Endo_CTLA4	0.3403	1/IIIIIute	Assigned when to	Parameter used to define when to stop therapy after
EndTherapy	1	dimensionless	stop therapy	tumor becomes smaller than a certain size
EndTherapy	1	unicisioness	stop therapy	Rate constant defining the half-life of expression of
			Assumed to be	receptors on mAPCs that are part of the mAPC
Exp All mAPCLN	69.3	1/second	very fast	count
	07.5	1/becond	very fast	Rate constant defining the half-life of expression of
				CD28, CD80, CD86, PD-1, PD-L1 and PD-L2 to
				the immunological synapse by all interacting T
Exp_CD28/80/86/PD1/L1/L2	2.772	1/minute	[31, 48]	cells, mAPCs and cancer cells
				Rate constant defining the half-life of expression of
				CTLA-4 to the immunological synapse by all
Exp_CTLA4	0.0462	1/minute	[49]	interacting T cells
•				Assume that due to high cell numbers and packing,
	1			that the LN only allows for 3% interstitial space for
f_LN_CTLA4	0.2	dimensionless	[50]	antibody transport.
				Assume that due to high cell numbers and packing,
				that the LN only allows for 3% interstitial space for
f_LN_PD1	0.1	dimensionless	[50]	antibody transport.
Frac_CD80_Exp_Cancer	Set value	dimensionless	Varied parameter	Fraction form of %CD80_Exp_Cancer
Frac_PD1_Exp_Cancer	Set value	dimensionless	Varied parameter	Fraction form of %PD1_Exp_Cancer
Frac_PDL1_Exp_Cancer	Set value	dimensionless	Varied parameter	Fraction form of %PDL1_Exp_Cancer
Frac_PDL2_Exp_Cancer	Set value	dimensionless	Varied parameter	Fraction form of %PDL2_Exp_Cancer
Frac_Vv_Tmr	0.07	dimensionless	[13]	Fraction of vascular of total Tumor
gamma_Sig			Set for RO-based	
			dose response	
	3	dimensionless	potency	Gamma for total CTLA4 signaling in Tumor
gamma_Sig1			Set for RO-based	
8				
B	7	dimensionless	dose response potency	Gamma for total CD80/PD1/PDL1 total signaling in Tumor

Variable	Value	Units	Source	Description
gamma_SigTr			Set for RO-based	
			dose response	Gamma for total CD80/PD1/PDL1 total signaling
TC Assa	3	dimensionless	potency	in Lymph Node
gamma_TC_Assoc	0.9	dimensionless	[51]	Potency of Effector engagement/killing between
	0.9	dimensionless	[51]	Effector and target cells Molecular weight of Anti-CTLA-4 antibody,
Ipilimumab_MW	148634914	ma/mala	[52, 53]	Ipilimumab
	148034914	mg/mole	[32, 35]	Sets the immunological synapse diameter to 30nm,
IS_Scaling	2	dimensionless	[54, 55]	from 15nm.
ISF	15.9	liter	[54, 55]	Volume of interstitial fluid (ISF) is tissues
J Liver	0.0029	1/minute	[13]	Effector T cell transmigration rate in Liver
J_Lungs	0.0029	1/minute	[13]	Effector T cell transmigration rate in Lungs
J Spleen	0.0029	1/minute	[13]	Effector T cell transmigration rate in Spleen
J Tmr	0.0029	1/minute	[13]	Effector T cell transmigration rate in Tumor
			[]	Zero-order rate constant for the delivery of Anti-
				CTLA-4 into the central compartment for a
k_DoseAdmin_AntiCTLA4	0.6666666	1/hour	[15]	designated dose
				Zero-order rate constant for the delivery of Anti-
				PD-L1 into the central compartment for a
kDoseAdmin_AntiPDL1	1	1/hour	[26, 27]	designated dose
				Zero-order rate constant for the delivery of Anti-
				PD-1 into the central compartment for a designated
k_DoseAdmin_AntiPD1	1	1/hour	[25]	dose
kf_APC_turnover	0.462	1/day	[57]	Half-life of mAPC turnover in the lymph nodes
				Rate constant defining the half-life decay of cancer
kf_CanDecay	0.001	1/day	[34, 35]	cells by natural death
kf_Liver	7.6E-9			Attachment rate for free Effector T cells in Liver
		ml/cell/minute	[13]	vasculature
kf_Lungs	0.0000031			Attachment rate for free Effector T cells in Lung
		ml/cell/minute	[13]	vasculature
				Rate constant defining the half-life of the
				appearance of monocytes in the tumor following
kf_Monocytes_intoT	0.0231	1/minute	[58]	the appearance of tumor antigens
			Estimated in	
			proportion to cells	Rate constant defining the half-life for the fraction
			dividing 3 times a	of Primed Naive T cells that will not successfully
			day for about 1	undergo the second phase of priming, and will
kf_no_prolif	99.72	1/day	week as baseline	therefore be considered anergic
				Rate constant defining the approximate half-life of
				the entire second phase of priming in the lymph nodes, considering that the Primed Naïve T cells
				are\in the deep T-cell areas in the lymph node.
				This, along with the second priming phase,
				accounts for T cells starting to proliferate 1.5-2
				days following the encounter of antigens on
kf Phase2P	0.1155	1/hour	[59-61]	mAPCs [61].
M_1 H05021	0.1155	1/11001	[37-01]	Rate constant defining the half-life for conversion
				of proliferating Naive T cells into Effector T cells
				of proliferating Naive T cells into Effector T cells in the lymph nodes. The T cells were optimized to
kf Prolif end	15000	1/day	[19, 60, 62]	in the lymph nodes. The T cells were optimized to
kf_Prolif_end	15000	1/day	[19, 60, 62]	in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days.
	15000			in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days. Rate constant defining the half-life for turnover of
kf_RestingMacrophage		1/day 1/day	[19, 60, 62] [34, 41]	in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days. Rate constant defining the half-life for turnover of resting macrophages
			[34, 41]	in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days. Rate constant defining the half-life for turnover of
kf_RestingMacrophage kf_Spleen	0.01	1/day		in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days. Rate constant defining the half-life for turnover of resting macrophages Attachment rate for free Effector T cells in Spleen
kf_RestingMacrophage kf_Spleen	0.01	1/day	[34, 41]	in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days. Rate constant defining the half-life for turnover of resting macrophages Attachment rate for free Effector T cells in Spleen vasculature
kf_RestingMacrophage	0.01 0.0000081	1/day ml/cell/minute	[34, 41] [13]	in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days. Rate constant defining the half-life for turnover of resting macrophages Attachment rate for free Effector T cells in Spleen vasculature Attachment rate for free Effector T cells in Tumor
kf_RestingMacrophage kf_Spleen	0.01 0.0000081	1/day ml/cell/minute	[34, 41] [13]	in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days. Rate constant defining the half-life for turnover of resting macrophages Attachment rate for free Effector T cells in Spleen vasculature Attachment rate for free Effector T cells in Tumor vasculature
kf_RestingMacrophage kf_Spleen kf_Tmr	0.01 0.0000081	1/day ml/cell/minute	[34, 41] [13]	in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days. Rate constant defining the half-life for turnover of resting macrophages Attachment rate for free Effector T cells in Spleen vasculature Attachment rate for free Effector T cells in Tumor vasculature Rate constant defining the half-life of Effector T
kf_RestingMacrophage kf_Spleen kf_Tmr	0.01 0.0000081 6.9E-9	1/day ml/cell/minute ml/cell/minute	[34, 41] [13] [13]	in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days. Rate constant defining the half-life for turnover of resting macrophages Attachment rate for free Effector T cells in Spleen vasculature Attachment rate for free Effector T cells in Tumor vasculature Rate constant defining the half-life of Effector T cell recovery following their interaction with
kf_RestingMacrophage kf_Spleen kf_Tmr kf_TRecover	0.01 0.0000081 6.9E-9	1/day ml/cell/minute ml/cell/minute	[34, 41] [13] [13]	in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days. Rate constant defining the half-life for turnover of resting macrophages Attachment rate for free Effector T cells in Spleen vasculature Attachment rate for free Effector T cells in Tumor vasculature Rate constant defining the half-life of Effector T cell recovery following their interaction with cancer cells in the tumor
kf_RestingMacrophage kf_Spleen kf_Tmr kf_TRecover kg	0.01 0.0000081 6.9E-9	1/day ml/cell/minute ml/cell/minute 1/minute	[34, 41] [13] [13] Estimated	in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days. Rate constant defining the half-life for turnover of resting macrophages Attachment rate for free Effector T cells in Spleen vasculature Attachment rate for free Effector T cells in Tumor vasculature Rate constant defining the half-life of Effector T cell recovery following their interaction with cancer cells in the tumor Assigns value of 1 kilogram to the term kg in the model EC50 Durvalumab saturation for ADA
kf_RestingMacrophage kf_Spleen kf_Tmr kf_TRecover kg	0.01 0.0000081 6.9E-9 0.1386 1	1/day ml/cell/minute ml/cell/minute 1/minute kilogram µg/ml	[34, 41] [13] [13] Estimated Unit assignment [63]	in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days. Rate constant defining the half-life for turnover of resting macrophages Attachment rate for free Effector T cells in Spleen vasculature Attachment rate for free Effector T cells in Tumor vasculature Rate constant defining the half-life of Effector T cell recovery following their interaction with cancer cells in the tumor Assigns value of 1 kilogram to the term kg in the model
kf_RestingMacrophage kf_Spleen	0.01 0.0000081 6.9E-9 0.1386 1	1/day ml/cell/minute ml/cell/minute 1/minute kilogram	[34, 41] [13] [13] Estimated Unit assignment	in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days. Rate constant defining the half-life for turnover of resting macrophages Attachment rate for free Effector T cells in Spleen vasculature Attachment rate for free Effector T cells in Tumor vasculature Rate constant defining the half-life of Effector T cell recovery following their interaction with cancer cells in the tumor Assigns value of 1 kilogram to the term kg in the model EC50 Durvalumab saturation for ADA Dissociation rate constant for the interaction of CD28 with CD80
kf_RestingMacrophage kf_Spleen kf_Tmr kf_TRecover kg Km koff_CD28_CD80	0.01 0.0000081 6.9E-9 0.1386 1 0.344 1.6	1/day ml/cell/minute ml/cell/minute 1/minute kilogram μg/ml 1/second	[34, 41] [13] [13] Estimated Unit assignment [63] [64]	in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days. Rate constant defining the half-life for turnover of resting macrophages Attachment rate for free Effector T cells in Spleen vasculature Attachment rate for free Effector T cells in Tumor vasculature Rate constant defining the half-life of Effector T cell recovery following their interaction with cancer cells in the tumor Assigns value of 1 kilogram to the term kg in the model EC50 Durvalumab saturation for ADA Dissociation rate constant for the interaction of CD28 with CD80 Dissociation rate constant for the interaction of
kf_Spleen kf_Tmr kf_TRecover kg Km	0.01 0.0000081 6.9E-9 0.1386 1 0.344	1/day ml/cell/minute ml/cell/minute 1/minute kilogram µg/ml	[34, 41] [13] [13] Estimated Unit assignment [63]	in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days. Rate constant defining the half-life for turnover of resting macrophages Attachment rate for free Effector T cells in Spleen vasculature Attachment rate for free Effector T cells in Tumor vasculature Rate constant defining the half-life of Effector T cell recovery following their interaction with cancer cells in the tumor Assigns value of 1 kilogram to the term kg in the model EC50 Durvalumab saturation for ADA Dissociation rate constant for the interaction of CD28 with CD80 Dissociation rate constant for the interaction of CD28 with CD86
kf_RestingMacrophage kf_Spleen kf_Tmr kf_TRecover kg Km koff_CD28_CD80	0.01 0.0000081 6.9E-9 0.1386 1 0.344 1.6	1/day ml/cell/minute ml/cell/minute 1/minute kilogram μg/ml 1/second	[34, 41] [13] [13] Estimated Unit assignment [63] [64]	in the lymph nodes. The T cells were optimized to account for 3 divisions per day over 5 days. Rate constant defining the half-life for turnover of resting macrophages Attachment rate for free Effector T cells in Spleen vasculature Attachment rate for free Effector T cells in Tumor vasculature Rate constant defining the half-life of Effector T cell recovery following their interaction with cancer cells in the tumor Assigns value of 1 kilogram to the term kg in the model EC50 Durvalumab saturation for ADA Dissociation rate constant for the interaction of CD28 with CD80 Dissociation rate constant for the interaction of

Variable	Value	Units	Source	Description
hoff CTLAA CD86	5.1	1/second	[64]	Dissociation rate constant for the interaction of CTLA-4 with CD86
koff_CTLA4_CD86	5.1	1/second	[64]	Dissociation rate constant for the interaction of
				CTLA-4 with Anti-CTLA-4 (considering a Kd of
koff_CTLA4mAb_CTLA4	0.3	1/second	[65]	5.25+/-3.62 nM)
boff DD1 DD1 1	1.44	1/second	[66]	Dissociation rate constant for the interaction of PD- 1 with PD-L1
koff_PD1_PDL1	1.44	1/second	[00]	Dissociation rate constant for the interaction of PD-
koff_PD1_PDL2	0.55	1/second	[66]	1 with PD-L2
	0.000768	1/ 1	[(7])	Dissociation rate constant for the interaction of PD-
koff_PD1-PD1mAb	0.000768	1/second	[67]	1 with Anti-PD-1 Dissociation rate constant for the interaction of PD-
koff_PDL1_CD80	5.94	1/second	[66]	L1 with CD80
	0.000005	1/ 1	100	Dissociation rate constant for the interaction of PD-
koff_PDL1-PDL1mAb	0.000025	1/second 1/(molarity*se	[26]	L1 with Anti-PD-L1 (considering a Kd of 100 pM) Association rate constant for the interaction of
kon_CD28_CD80	660000	cond)	[64]	CD28 with CD80
		1/(molarity*se		Association rate constant for the interaction of
kon_CD28_CD86	1400000	cond) 1/(molarity*se	[64]	CD28 with CD86 Association rate constant for the interaction of
kon CTLA4 CD80	2150000	cond)	[64]	CTLA-4 with CD80
		1/(molarity*se	[**]	Association rate constant for the interaction of
kon_CTLA4_CD86	1960000	cond)	[64]	CTLA-4 with CD86
		1/(molarity*se		Association rate constant for the interaction of CTLA-4 with Anti-CTLA-4 (considering a Kd of
kon_CTLA4mAb_CTLA4	40900000	cond)	[65]	5.25+/-3.62 nM)
		1/(molarity*se		Association rate constant for the interaction of PD-
kon_PD1_PDL1	184000	cond) 1/(molarity*se	[66]	1 with PD-L1
kon PD1 PDL2	250000	cond)	[66]	Association rate constant for the interaction of PD- 1 with PD-L2
	200000	1/(molarity*se	[00]	Association rate constant for the interaction of PD-
kon_PD1-PD1mAb	250000	cond)	[67]	1 with Anti-PD-1
kon_PDL1_CD80	316000	1/(molarity*se cond)	[66]	Association rate constant for the interaction of PD- L1 with CD80
KOII_I DL1_CD00	510000	1/(molarity*se	[00]	Association rate constant for the interaction of PD-
kon_PDL1-PDL1mAb	250000	cond)	[26]	L1 with Anti-PD-L1 (considering a Kd of 100 pM)
KP_CTLA4 KP PD1	0.8	dimensionless dimensionless	[56]	Available fraction of ISF for antibody distribution Available fraction of ISF for antibody distribution
KP_PDL1	0.4	dimensionless	[56] [56]	Available fraction of ISF for antibody distribution
 Kpa_LNB				Transport of antibody between Serum and Lymph
17 100	9.87E-8	cm/second	[68]	Node
Kpa_TB kr_Lungs	9.86E-8	cm/second	[68]	Transport of antibody between Serum and Tumor Detachment rate of Effector T cells in the Lung
m_Dungo	2.3	1/second	[13]	vasculature
kr_Periph				Detachment rate of Effector T cells in the
kr_Tmr	3.3	1/second	[13]	Peripheral vasculature Detachment rate of Effector T cells in the Tumor
Ki_Thi	3.3	1/second	[13]	vasculature
L	1	liter	Unit assignment	Assigns value of 1 liter to the term L in the model
LC_GI LC_Liver	0.3 0.087	ml/minute ml/minute	[13]	Lymph flow rate of GI Lymph flow rate of Liver
LC_LIVEI LC LN	0.087	ml/minute	[13]	Lymph flow rate of Lymph Node
LC_Lungs	0.043	ml/minute	[13]	Lymph flow rate of Lungs
LC_Periph	0.369	ml/minute	[13]	Lymph flow rate of Peripheral tissues
LC_Spleen LC_Tmr	0.00087 0.03	ml/minute ml/minute	[13] [13]	Lymph flow rate of Spleen Lymph flow rate of Tumor
Le_IIII	1 (unless	initinute	[15]	The fraction of CD80 and CD86 expression on the
mAPC_activation_level	varied)	dimensionless	[13]	mAPCs from 0-1.
			Varied across range (5-95%) and	
			estimated during	The fraction of tumor debris that is considered to
			fitting to anti-PD-	not be transported to the lymph nodes, and is
mAPC_Debis_T_Inact	0.05-0.95	dimensionless	1 data	removed from the system
mAPC_Migrate	0.2	1/day	[34, 41, 69]	Maximum migration rate of mAPCs Maximum number of mAPCs that can interact with
				each Naive and Primed Naive T cell. Note: all T
				cells were estimated to be the same size, and a
mAPC_per_T_cell	10	cell/cell	[19, 70-72]	surface area analysis was used for this estimation.

Variable	Value	Units	Source	Description
mAPC_per_Tr_cell	10	cell/cell	[19, 70-72]	Maximum number of mAPCs that can interact with each Effector T cell. Note: all T cells were estimated to be the same size, and a surface area analysis was used for this estimation.
mAPC50_per_T_cell	3	cell/cell	[40]	Number of mAPCs that should interact with each Naive and Primed Naive T cell to achieve a 50% priming rate
	3	cell/cell		The ratio of MDSCs per T Regulatory cells in the
MDSCs_per_Treg			[73]	tumor Assigns value of 1 miligram to the term mg in the
mg	1	milligram	Unit assignment	model Assigns value of 1 mole to the term mole in the
mole	1 Based on	mole	Unit assignment [15]	model New time between sequential doses of Anti-CTLA-
New_sched_CTLA4	regimen Based on	day	Based on regimen [25]	4 in a regimen New time between sequential doses of Anti-PD-1
New_sched_PD1	regimen Based on	day	Based on regimen	in a regimen New time between sequential doses of Anti-PD-L1
New_sched_PDL1	regimen	day	Based on regimen	in a regimen Molecular weight of Anti-PD-1 antibody,
Nivolumab_MW	143600000	mg/mole	[36-38, 74]	Nivolumab The number of total different lymph nodes (or
Num_TDLN_Considered	35 Based on	dimensionless	[75-78] Estimated [25]	lobules receiving a variety of antigens) in a region near the tumor (can be >9cm) that can produce an immune response against the tumor. Time in simulation to switch schedule in regimen
PD1_change_schedule	regimen Based on	day	Based on regimen [25]	for Anti-PD-1 therapy
PD1_counter_off	regimen	day	Based on regimen	Time in simulation to stop Anti-PD-1 dose
PD1_counter_on	Based on regimen	day	[25] Based on regimen	Time in simulation to start Anti-PD-1 dose
PD1_DoseSet PD1_PNT_NEG-to-Max	0-10 Calculated	mg/kg dimensionless	Based on regimen Calculated with RO; see algebraic equations below	Dose administered of anti-PD-1 therapy Fraction of total PD-1 receptors on Primed Naïve T cells that are involved in interacting with the PD- L1 and PD-L2 receptors on mAPCs during priming in the lymph nodes
PD1_receptors_per_C_Cl	9288	molecules/cell	Assumed same as on T cells	Number of PD-1 receptors expressed on each cancer cell
PD1_receptors-per-mAPC	9288	molecules/cell	Assumed same as on T cells	Maximum number of PD-1 receptors expressed on each mAPC (maximum taken as max from mAPC levels)
PD1_receptors-per-Tcell	3096 Based on	molecules/cell milligram/kilo	[66] [25]	Maximum number of PD-1 receptors expressed on each T cell
PD1mAb	regimen	gram	Based on regimen	Dose of Anti-PD-1 being delivered
PD1mAb_Dose	Based on regimen	milligram/kilo gram	[25] Based on regimen	Dose of Anti-PD-1 to deliver based on the current schedule
PD1mAb_New_Dose	Based on regimen	milligram/kilo gram	[25] Based on regimen	Dose of Anti-PD-1 to be delivered when schedule is changed
			Calculated with RO; see algebraic	Fraction of total PD-1 receptors on Primed Naïve T cells that are involved in interacting with the PD- L1 receptors on Regulatory T cells during priming
PD1Sig_Tr-PNT	Calculated Based on	dimensionless	equations below [26, 27]	in the lymph nodes Time in simulation to switch schedule in regimen
PDL1_change_schedule	regimen Based on	day	Based on regimen [26, 27]	for Anti-PD-L1 therapy
PDL1_counter_off	regimen Based on	day	Based on regimen [26, 27]	Time in simulation to stop Anti-PD-L1 dose
PDL1_counter_on PDL1_DoseSet	regimen 0-20	day mg/kg	Based on regimen Based on regimen	Time in simulation to start Anti-PD-L1 dose Dose administered of anti-PD-L1 therapy
PDL1_PNT_NEG-to-Max	Calculated	dimensionless	Calculated with RO; see algebraic equations below	Fraction of total PD-L1 receptors on Primed Naïve T cells that are involved in interacting with the PD- 1 and CD80 receptors on mAPCs during priming in the lymph nodes
PDL1_receptors_per_C_Cl	80372	molecules/cell	[66]	Number of PD-L1 receptors expressed on each cancer cell (maximum taken as max from mAPC levels)
PDL1_receptors-per-mAPC	80372	molecules/cell	[66]	Maximum number of PD-L1 receptors expressed on each mAPC

Variable	Value	Units	Source	Description
				Maximum number of PD-L1 receptors expressed
PDL1_receptors-per-Tcell	9282 Dagad an	molecules/cell	[66]	on each T cell
PDL1mAb	Based on regimen	milligram/kilo gram	[26, 27] Based on regimen	Dose of Anti-PD-L1 being delivered
	Based on	milligram/kilo	[26, 27]	Dose of Anti-PD-L1 to deliver based on the current
PDL1mAb_Dose	regimen	gram	Based on regimen	schedule
	Based on	milligram/kilo	[26, 27]	Dose of Anti-PD-L1 to be delivered when schedule
PDL1mAb_New_Dose	regimen	gram	Based on regimen	is changed
			Calculated; see	Fraction of total PD-L1 receptors on Primed Naïve T cells that are involved in interacting with the PD-
			algebraic	1 receptors on Regulatory T cells during priming in
PDL1Sig_Tr-PNT	Calculated	dimensionless	equations below	the lymph nodes
				Number of PD-L2 receptors expressed on each
	50.40	1 1 / 11	100	cancer cell (maximum taken as max from mAPC
PDL2_receptors_per_C_Cl	5243	molecules/cell	[66]	levels)
PDL2_receptors-per-mAPC	5243	molecules/cell	[66]	Maximum number of PD-L2 receptors expressed on each mAPC
Phago_Debris	1E-7	1/(mole*day)	[34, 41]	Tumor antigen uptake rate by APCs
		-,(,))	[= .,]	Calculates the ratio of available Naive T cells for
Precursor_Frequen_NT	Calculated	dimensionless	[72, 79]	priming phase 1 to total T cells in the lymph nodes
				Calculates the ratio of available Primed Naive T
Precursor Frequen PNT	Calculated	dimensionless	[72, 70]	cells for priming phase 2 to total T cells in the lymph nodes
rrecursor_rrequen_rN1	Calculated	unnensiomess	[72, 79]	Rate constant defining the approximate half-life of
				the entire first phase of priming in the lymph
				nodes, including the priming of all of the
				superficial Naïve T cells and those in the deep T-
				cell areas in the lymph node. This, along with the
				second priming phase, accounts for T cells starting
DrimoNT roto	0.05775	1/hour	[59-61]	to proliferate 1.5-2 days following the encounter of antigens on mAPCs [61].
PrimeNT_rate	0.03773	1/IIOUI	[39-01]	Rate constant defining the approximate half-life of
				each interaction between Naive T cells and mAPCs
				during the first phase of priming in the lymph
				nodes, including the formation time of mature
				synapses between the Naïve T cells and the
PrimeNT1_rate	2.772	1/hour	[59, 60, 80]	mAPCs.
				Rate constant defining the approximate half-life of each interaction between Primed Naive T cells and
				mAPCs during the second phase of priming in the
				lymph nodes, which was dominated by stable T-
PrimeTLN2_rate	1.386	1/hour	[59, 60]	cell-mAPC interactions.
				Calculates the probability in a deterministic
				manner that at least one successful priming
Prob_NT-mAPC_Interact	Calculated	dimensionless	[72]	interaction will occur between Naive T cells and mAPCs during the first phase of priming
1100_111-mAr C_interact	Calculated	annensionness	[72]	Calculates the probability in a deterministic
				manner that at least one successful priming
				interaction will occur between Primed Naive T
				cells and mAPCs during the second phase of
Prob_PNT-mAPC_Interact	Calculated	dimensionless	[72]	priming Proliferation threshold for fully primod and
				Proliferation threshold for fully primed and activated T cells in the lymph nodes that are
				undergoing proliferation. The T cells were
	718.303810			optimized to account for 3 divisions per day over 5
Prolif_Fract	81261	1/hour	[19, 60, 62]	days.
				Proliferation level for fully primed and activated T
	00.000001			cells in the lymph nodes that are undergoing
Prolif Thresh	93.3228814 9744991	1/hour	[10, 60, 62]	proliferation. The T cells were optimized to
Prolif_Thresh	8.00049841	1/hour	[19, 60, 62]	account for 3 divisions per day over 5 days.
Q_L	9	L/day	[56]	Lymph flow rate for antibody transport
QC_GI	468	ml/minute	[13]	Blood flow rate in GI
QC_Liver	800	ml/minute	[13]	Blood flow rate in Liver
QC_LN	138	ml/minute	[13]	Blood flow rate in Lymph Node
QC_Lungs	3000	ml/minute	[13]	Blood flow rate in Lungs
QC_Periph QC_Spleen	1521 138	ml/minute ml/minute	[13] [13]	Blood flow rate in Periphery Blood flow rate in Spleen
QC_Spreen QC_Tmr	0.564	ml/minute	[13]	Blood flow rate in Tumor
v			L . ~ J	

Variable	Value	Units	Source	Description
	64/144 day			Proliferation rate of cancer cells that defines the volumetric doubling time of the tumor.
	doubling:			64 day metastatic doubling: 0.010955675075414
	see			144 day non-metastatic doubling:
Rate_Tumor_Growth	description	1/day	[81]	0.004913635262592
s_Assoc	5.27	Dimensionless	[51]	Effector:Target cell association/killing EC50
S_LNB	166	cm^2/cm^3	[68]	Surface are of vasculature per volume Lymph Node for antibody transport
S_TB	100	eni 2/eni 3	[00]	Surface are of vasculature per volume Tumor for
	108	cm^2/cm^3	[68]	antibody transport
				Fraction of inhibitory effect that other factors
Sig MDSCTeff = Other	0.15	dimensionless	Assumed	expressed by MDSCs have on the Effector T cells in the tumor
Sig_wibseren = outer	0.15	uniensioniess	Calculated with	Fraction of CD80 receptors expressed on Effector
			RO; see algebraic	T cells that are interacting with PD-L1 on the
Sig_MDSCTeff=CD80	Calculated	dimensionless	equations below	MDSCs in the lymph nodes
			Calculated with	Fraction of PD-1 receptors expressed on Effector T
Sig_MDSCTeff=PD1	Calculated	dimensionless	RO; see algebraic equations below	cells that are interacting with PD-L1 on the MDSCs in the lymph nodes
~ <u></u>	Carolintou		Calculated with	Fraction of PD-L1 receptors expressed on Effector
			RO; see algebraic	T cells that are interacting with PD-1 on the
Sig_MDSCTeff=PDL1	Calculated	dimensionless	equations below	MDSCs in the lymph nodes
			Calculated with RO; see algebraic	Total inhibitory fraction that MDSCs have on the Effector T cells in the tumor following their
Sig_MDSCTeff=Total	Calculated	dimensionless	equations below	interaction
0-			Calculated with	Positive CD28 co-receptor fraction signaling on
	~		RO; see algebraic	Naive T cells by CD80 and CD86 on mAPC in the
Sig_NT=CD28	Calculated	dimensionless	equations below Calculated with	lymph nodes following their interaction Total inhibitory fraction that mAPCs have on the
Sig_PNT=CTLA4/PD1/L1/C			RO; see algebraic	Effector T cells during priming following their
D80	Calculated	dimensionless	equations below	interaction
			Calculated with	Fraction of inhibitory effect that other factors
Sig T-Other	0.15	dimensionless	RO; see algebraic equations below	expressed by all cancer cells have on the Effector T cells in the tumor
Sig_T=Other	0.15	dimensionless	Calculated with	Total fraction of inhibitory effect that cancer cells
			RO; see algebraic	expressing only other factors have on the Effector
Sig_T1=Total	Calculated	dimensionless	equations below	T cells in the tumor
			Calculated with	Total fraction of inhibitory effect that cancer cells expressing PD-1, PD-L1, PD-L2 and other factors
Sig_T10=Total	Calculated	dimensionless	RO; see algebraic equations below	have on the Effector T cells in the tumor
	Culturated	unitensionitess	Calculated with	Fraction of PD-L1 receptors on Effector T cells
			RO; see algebraic	that are occupied by PD-1 expressed on the T10
Sig_T10a=PDL1	Calculated	dimensionless	equations below	subset of cancer cells in the tumor
			Calculated with RO; see algebraic	Fraction of PD-1 receptors on Effector T cells that are occupied by PD-L1 and PD-L2 expressed on
Sig_T10b=PD1	Calculated	dimensionless	equations below	the T10 subset of cancer cells in the tumor
			Calculated with	Fraction of CD80 receptors on Effector T cells that
S_{a}^{*} T10a-CD20	Calapiteted	dimonologia	RO; see algebraic	are occupied by PD-L1 expressed on the T10
Sig_T10c=CD80	Calculated	dimensionless	equations below Calculated with	subset of cancer cells in the tumor Total fraction of inhibitory effect that cancer cells
			RO; see algebraic	expressing PD-L1, CD80 and other factors have on
Sig_T11=Total	Calculated	dimensionless	equations below	the Effector T cells in the tumor
			Calculated with RO; see algebraic	Fraction of PD-L1 receptors on Effector T cells that are occupied by CD80 expressed on the T11
Sig_T11a=PDL1	Calculated	dimensionless	equations below	subset of cancer cells in the tumor
<u> </u>			Calculated with	Fraction of PD-1 receptors on Effector T cells that
	~		RO; see algebraic	are occupied by PD-L1 expressed on the T11
Sig_T11b=PD1	Calculated	dimensionless	equations below	subset of cancer cells in the tumor Total fraction of inhibitory effect that cancer cells
			Calculated with RO; see algebraic	Total fraction of inhibitory effect that cancer cells expressing PD-L2, CD80 and other factors have on
Sig_T12=Total	Calculated	dimensionless	equations below	the Effector T cells in the tumor
			Calculated with	Fraction of PD-L1 receptors on Effector T cells
C:- T11- DDI 1	C-1 1 · 1	diana i d	RO; see algebraic	that are occupied by CD80 expressed on the T12
Sig_T12a=PDL1	Calculated	dimensionless	equations below Calculated with	subset of cancer cells in the tumor Fraction of PD-1 receptors on Effector T cells that
			RO; see algebraic	are occupied by PD-L2 expressed on the T12
Sig_T12b=PD1	Calculated	dimensionless	equations below	subset of cancer cells in the tumor

Variable	Value	Units	Source	Description
			Calculated with	Total fraction of inhibitory effect that cancer cells
Sig T12-Total	Calculated	dimensionless	RO; see algebraic equations below	expressing PD-L1, PD-L2, CD80 and other factors have on the Effector T cells in the tumor
Sig_T13=Total	Calculated	dimensionless	Calculated with	Fraction of PD-L1 receptors on Effector T cells
			RO; see algebraic	that are occupied by CD80 expressed on the T13
Sig_T13a=PDL1	Calculated	dimensionless	equations below	subset of cancer cells in the tumor
			Calculated with	Fraction of PD-1 receptors on Effector T cells that
			RO; see algebraic	are occupied by PD-L1 and PD-L2 expressed on
Sig_T13b=PD1	Calculated	dimensionless	equations below	the T13 subset of cancer cells in the tumor
			Calculated with	Total fraction of inhibitory effect that cancer cells
			RO; see algebraic	expressing PD-1, PD-L1, CD80 and other factors
Sig_T14=Total	Calculated	dimensionless	equations below	have on the Effector T cells in the tumor
			Calculated with	Fraction of PD-L1 receptors on Effector T cells that are occupied by CD80 and PD-1 expressed on
Sig_T14a=PDL1	Calculated	dimensionless	RO; see algebraic equations below	the T14 subset of cancer cells in the tumor
Sig_114a=rDL1	Calculated	unnensionness	Calculated with	Fraction of PD-1 receptors on Effector T cells that
			RO; see algebraic	are occupied by PD-L1 expressed on the T14
Sig_T14b=PD1	Calculated	dimensionless	equations below	subset of cancer cells in the tumor
~-8			Calculated with	Fraction of CD80 receptors on Effector T cells that
			RO; see algebraic	are occupied by PD-L1 expressed on the T14
Sig_T14c=CD80	Calculated	dimensionless	equations below	subset of cancer cells in the tumor
			Calculated with	Total fraction of inhibitory effect that cancer cells
			RO; see algebraic	expressing PD-1, PD-L2, CD80 and other factors
Sig_T15=Total	Calculated	dimensionless	equations below	have on the Effector T cells in the tumor
			Calculated with	Fraction of PD-L1 receptors on Effector T cells
Sig T15a-DDI 1	Calculated	dimonsionlas-	RO; see algebraic equations below	that are occupied by CD80 and PD-1 expressed on the T15 subset of cancer cells in the tumor
Sig_T15a=PDL1	Calculated	dimensionless	Calculated with	Fraction of PD-1 receptors on Effector T cells that
			RO; see algebraic	are occupied by PD-L2 expressed on the T15
Sig_T15b=PD1	Calculated	dimensionless	equations below	subset of cancer cells in the tumor
~- <u>-</u>			Calculated with	Total fraction of inhibitory effect that cancer cells
			RO; see algebraic	expressing PD-1, PD-L1, PD-L2, CD80 and other
_Sig_T16=Total	Calculated	dimensionless	equations below	factors have on the Effector T cells in the tumor
			Calculated with	Fraction of PD-L1 receptors on Effector T cells
			RO; see algebraic	that are occupied by CD80 and PD-1 expressed on
Sig_T16a=PDL1	Calculated	dimensionless	equations below	the T16 subset of cancer cells in the tumor
			Calculated with RO; see algebraic	Fraction of PD-1 receptors on Effector T cells that are occupied by PD-L1 and PD-L2 expressed on
Sig_T16b=PD1	Calculated	dimensionless	equations below	the T16 subset of cancer cells in the tumor
51g_1100-1D1	Calculated	unicisioness	Calculated with	Fraction of CD80 receptors on Effector T cells that
			RO; see algebraic	are occupied by PD-L1 expressed on the T16
Sig_T16c=CD80	Calculated	dimensionless	equations below	subset of cancer cells in the tumor
			Calculated with	Fraction of PD-L1 receptors on Effector T cells
			RO; see algebraic	that are occupied by PD-1 expressed on the T2
Sig_T2=PDL1	Calculated	dimensionless	equations below	subset of cancer cells in the tumor
			Calculated with	Total fraction of inhibitory effect that cancer cells
Sig T2-Tetal	Calculated	dimensionless	RO; see algebraic	expressing PD-1 and other factors have on the
Sig_T2=Total	Calculated	unnensionness	equations below Calculated with	Effector T cells in the tumor Total fraction of inhibitory effect that cancer cells
			RO; see algebraic	expressing PD-L1 and other factors have on the
Sig_T3=Total	Calculated	dimensionless	equations below	Effector T cells in the tumor
			Calculated with	Fraction of PD-1 receptors on Effector T cells that
			RO; see algebraic	are occupied by PD-L1 expressed on the T3 subset
Sig_T3a=PD1	Calculated	dimensionless	equations below	of cancer cells in the tumor
			Calculated with	Fraction of CD80 receptors on Effector T cells that
			RO; see algebraic	are occupied by PD-L1 expressed on the T3 subset
Sig_T3b=CD80	Calculated	dimensionless	equations below	of cancer cells in the tumor
			Calculated with RO; see algebraic	Fraction of PD-1 receptors on Effector T cells that are occupied by PD-L2 expressed on the T4 subset
Sig T4=PD1	Calculated	dimensionless	equations below	of cancer cells in the tumor
~~ <u>5_17-101</u>	Calculated	annensionness	Calculated with	Total fraction of inhibitory effect that cancer cells
			RO; see algebraic	expressing PD-L2 and other factors have on the
Sig_T4=Total	Calculated	dimensionless	equations below	Effector T cells in the tumor
			Calculated with	Fraction of PD-L1 receptors on Effector T cells
			RO; see algebraic	that are occupied by CD80 expressed on the T5
Sig_T5=PDL1	Calculated	dimensionless	equations below	subset of cancer cells in the tumor
			Calculated with	Total fraction of inhibitory effect that cancer cells
	01.1.1	1 1	RO; see algebraic	expressing CD80 and other factors have on the
Sig_T5=Total	Calculated	dimensionless	equations below	Effector T cells in the tumor

Variable	Value	Units	Source	Description
			Calculated with	Total fraction of inhibitory effect that cancer cells
Sig_T6=Total	Calculated	dimensionless	RO; see algebraic equations below	expressing PD-1, PD-L1 and other factors have on the Effector T cells in the tumor
015_10-10tal	Carculated	Gimensiomess	Calculated with	Fraction of PD-L1 receptors on Effector T cells
	.		RO; see algebraic	that are occupied by PD-1 expressed on the T6
Sig_T6a=PDL1	Calculated	dimensionless	equations below	subset of cancer cells in the tumor
			Calculated with	Fraction of PD-1 receptors on Effector T cells that
Sig_T6b=PD1	Calculated	dimensionless	RO; see algebraic equations below	are occupied by PD-L1 expressed on the T6 subset of cancer cells in the tumor
~~ <u>~</u> _+00-11/1	Curculated	annensiomess	Calculated with	Fraction of CD80 receptors on Effector T cells that
	.		RO; see algebraic	are occupied by PD-L1 expressed on the T6 subset
Sig_T6c=CD80	Calculated	dimensionless	equations below	of cancer cells in the tumor
			Calculated with	Total fraction of inhibitory effect that cancer cells
Sig_T7=Total	Calculated	dimensionless	RO; see algebraic equations below	expressing PD-1, PD-L2 and other factors have on the Effector T cells in the tumor
~~ <u>6_</u> x / - 10tal	Survuiated	annensionness	calculated with	Fraction of PD-L1 receptors on Effector T cells
			RO; see algebraic	that are occupied by PD-1 expressed on the T7
Sig_T7a=PDL1	Calculated	dimensionless	equations below	subset of cancer cells in the tumor
			Calculated with	Fraction of PD-1 receptors on Effector T cells that
Sig_T7b=PD1	Calculated	dimensionless	RO; see algebraic equations below	are occupied by PD-L2 expressed on the T7 subset of cancer cells in the tumor
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Juounated		Calculated with	Total fraction of inhibitory effect that cancer cells
			RO; see algebraic	expressing PD-L1, PD-L2 and other factors have
Sig_T8=Total	Calculated	dimensionless	equations below	on the Effector T cells in the tumor
			Calculated with	Fraction of PD-1 receptors on Effector T cells that
Sig_T8a=PD1	Calculated	dimensionless	RO; see algebraic equations below	are occupied by PD-L1 and PD-L2 expressed on the T8 subset of cancer cells in the tumor
~- <u>8</u> _104-101	Juounated		Calculated with	Fraction of CD80 receptors on Effector T cells that
	.	.	RO; see algebraic	are occupied by PD- $L1$ expressed on the T8 subset
Sig_T8b=CD80	Calculated	dimensionless	equations below	of cancer cells in the tumor
			Calculated with RO: see algebraic	Fraction of PD-L1 receptors on Effector T cells that are occupied by PD-1 and CD80 expressed on
Sig_T9=PDL1	Calculated	dimensionless	RO; see algebraic equations below	that are occupied by PD-1 and CD80 expressed on the T9 subset of cancer cells in the tumor
	Luculateu		Calculated with	Total fraction of inhibitory effect that cancer cells
() ma		<u>.</u> .	RO; see algebraic	expressing PD-1, CD80 and other factors have on
Sig_T9=Total	Calculated	dimensionless	equations below	the Effector T cells in the tumor Eraction of inhibitory effect that other factors
			Calculated with RO; see algebraic	Fraction of inhibitory effect that other factors expressed by T Regulatory cells have on the
Sig_TrAPC = Other	0	dimensionless	equations below	mAPCs in the tumor
			Calculated with	Fraction of CD80 and CD86 receptors on mAPCs
Sig T-ADOT OT 11	Col1	dima- · ·	RO; see algebraic	that are occupied by CTLA-4 expressed on T Regulatory cells in the tumor
Sig_TrAPCT=CTLA4	Calculated	dimensionless	equations below Calculated with	Regulatory cells in the tumor Total inhibitory fraction that T Regulatory cells
			RO; see algebraic	have on the mAPCs in the tumor following their
Sig_TrAPCT=Total	Calculated	dimensionless	equations below	interaction
			Calculated with	Total inhibitory fraction that T Regulatory cells
Sig_TrPNT=PD1/L1/CD80	Calculated	dimensionless	RO; see algebraic equations below	have on the Primed Naive T cells in the lymph nodes following their interaction
~- <u>8_111111111111000</u> 0	Curculated	annensiomess	Calculated with	Fraction of inhibitory effect that other factors
			RO; see algebraic	expressed by T Regulatory cells have on the
Sig_TrTeff = Other	0.15	dimensionless	equations below	Effector T cells in the tumor
			Calculated with RO; see algebraic	Fraction of CD80 receptors expressed on Effector T cells that are interacting with PD-L1 on the T
Sig_TrTeff=CD80	Calculated	dimensionless	equations below	Regulatory cells in the lymph nodes
			Calculated with	Fraction of PD-1 receptors expressed on Effector T
	C I I		RO; see algebraic	cells that are interacting with PD-L1 on the T
Sig_TrTeff=PD1	Calculated	dimensionless	equations below Calculated with	Regulatory cells in the lymph nodes Fraction of PD-L1 receptors expressed on Effector
			RO; see algebraic	Fraction of PD-L1 receptors expressed on Effector T cells that are interacting with PD-1 on the T
Sig_TrTeff=PDL1	Calculated	dimensionless	equations below	Regulatory cells in the lymph nodes
			Calculated with	Total inhibitory fraction that T Regulatory cells
Sig TrToff_Total	Colorit	dimension	RO; see algebraic	have on the Effector T cells in the tumor following
Sig_TrTeff=Total Sigma1_CTLA4	Calculated 0.99683982	dimensionless	equations below	their interaction Estimated leaky tissue reflection coefficient for
······	3	dimensionless	[56]	anti-CTLA-4 therapy
Sigma1_PD1	0.91219989			Estimated leaky tissue reflection coefficient for
Sigma1 DDI 1	3	dimensionless	[56]	anti-PD-1 therapy Estimated leaky tissue reflection coefficient for
Sigma1_PDL1	0.99014523 6	dimensionless	[56]	Estimated leaky tissue reflection coefficient for anti-PD-L1 therapy
	0	annensioffless	[50]	and the fit morapy

Variable	Value	Units	Source	Description
Sigma2_CTLA4	0.97448852		1561	Estimated tight tissue reflection coefficient for
Sigma2_PD1	0.89230685	dimensionless	[56]	anti-CTLA-4 therapy Estimated tight tissue reflection coefficient for
Sigilia2_1 D1	0.87230083	dimensionless	[56]	anti-PD-1 therapy
Sigma2_PDL1	0.98870285			Estimated tight tissue reflection coefficient for
Ci arre a L	7	dimensionless dimensionless	[56]	anti-PD-L1 therapy
SigmaL	0.2 0.03393437	dimensionless	[56] Calculated with	Lymphatic tissue reflection coefficient Maximum fraction of CD80 receptors expressed on
	8		RO; see algebraic	Effector T cells that are interacting with PD-L1 on
Sigmax_MDSCTeff=CD80		dimensionless	equations below	the MDSCs in the lymph nodes
	0.07390316 4		Calculated with	Maximum fraction of PD-1 receptors expressed on
Sigmax_MDSCTeff=PD1	4	dimensionless	RO; see algebraic equations below	Effector T cells that are interacting with PD-L1 on the MDSCs in the lymph nodes
Signuz_NDSCICI-IDI	0.02853033	dimensionless	Calculated with	Maximum fraction of PD-L1 receptors expressed
	9		RO; see algebraic	on Effector T cells that are interacting with PD-1
Sigmax_MDSCTeff=PDL1	0.02052004	dimensionless	equations below	on the MDSCs in the lymph nodes
	0.83953994 5		Calculated with RO; see algebraic	Maximum fraction of CD28 co-receptor interaction on Naive T cells by CD80 and CD86 on mAPC in
Sigmax_NT=CD28	5	dimensionless	equations below	the lymph nodes
8 -	0.013125		•	Maximum fraction of total CD80 receptors on
			Calculated with	Primed Naïve T cells that can interact with the PD-
Sigmax_PNT=CD80		dimensionless	RO; see algebraic equations below	L1 receptors on mAPCs during priming in the lymph nodes
Sigmun_111-CD00	0.564375	annensioniess	equations below	Maximum fraction of total CTLA-4 receptors on
			Calculated with	Primed Naïve T cells that can interact with the
			RO; see algebraic	CD80 and CD86 receptors on mAPCs during
Sigmax_PNT=CTLA4	0.02625	dimensionless	equations below	priming in the lymph nodes Maximum fraction of total PD-1 receptors on
	0.02025		Calculated with	Primed Naïve T cells that can interact with the PD-
			RO; see algebraic	L1 and PD-L2 receptors on mAPCs during priming
Sigmax_PNT=PD1	0.02/25	dimensionless	equations below	in the lymph nodes
	0.02625		Calculated with	Maximum fraction of total PD-L1 receptors on Primed Naïve T cells that can interact with the PD-
			RO; see algebraic	1 and CD80 receptors on mAPCs during priming in
Sigmax_PNT=PDL1		dimensionless	equations below	the lymph nodes
	0.03399172		Calculated with	Maximum fraction of PD-L1 receptors on Effector
Sigmax_T10a=PDL1	7	dimensionless	RO; see algebraic equations below	T cells that are occupied by PD-1 expressed on the T10 subset of cancer cells in the tumor
~	0.24079052			Maximum fraction of PD-1 receptors on Effector T
			Calculated with	cells that are occupied by PD-L1 and PD-L2
Sigmax_T10b=PD1		dimensionless	RO; see algebraic equations below	expressed on the T10 subset of cancer cells in the tumor
Sigmax_1100=rD1	0.10654076	unnensionness	Calculated with	Maximum fraction of CD80 receptors on Effector
	3		RO; see algebraic	T cells that are occupied by PD-L1 expressed on
Sigmax_T10c=CD80	0.04020050	dimensionless	equations below	the T10 subset of cancer cells in the tumor
	0.04820050		Calculated with RO; see algebraic	Maximum fraction of PD-L1 receptors on Effector T cells that are occupied by CD80 expressed on the
Sigmax_T11a=PDL1	1	dimensionless	equations below	T11 subset of cancer cells in the tumor
	0.22918360		Calculated with	Maximum fraction of PD-1 receptors on Effector T
Sigmax_T11b=PD1	7	dimensionless	RO; see algebraic equations below	cells that are occupied by PD-L1 expressed on the T11 subset of cancer cells in the tumor
Sigman_1110-1D1	0.04820050	unicusioness	Calculated with	Maximum fraction of PD-L1 receptors on Effector
	1		RO; see algebraic	T cells that are occupied by CD80 expressed on the
Sigmax_T12a=PDL1	0.06412400	dimensionless	equations below	T12 subset of cancer cells in the tumor
	0.06413499		Calculated with RO; see algebraic	Maximum fraction of PD-1 receptors on Effector T cells that are occupied by PD-L2 expressed on the
Sigmax_T12b=PD1		dimensionless	equations below	T12 subset of cancer cells in the tumor
_	0.04820050		Calculated with	Maximum fraction of PD-L1 receptors on Effector
Sigmov T120-DDI 1	1	dimonsionlas-	RO; see algebraic	T cells that are occupied by CD80 expressed on the
Sigmax_T13a=PDL1	0.26059594	dimensionless	equations below	T13 subset of cancer cells in the tumor Maximum fraction of PD-1 receptors on Effector T
			Calculated with	cells that are occupied by PD-L1 and PD-L2
() min m			RO; see algebraic	expressed on the T13 subset of cancer cells in the
Sigmax_T13b=PD1	0.07809972	dimensionless	equations below	tumor Maximum fraction of PD 1.1 recentors on Effector
	0.07809972		Calculated with	Maximum fraction of PD-L1 receptors on Effector T cells that are occupied by CD80 and PD-1
			RO; see algebraic	expressed on the T14 subset of cancer cells in the
Sigmax_T14a=PDL1	I	dimensionless	equations below	tumor

Variable	Value	Units	Source	Description
	0.20659550		Calculated with	Maximum fraction of PD-1 receptors on Effector T
	9		RO; see algebraic	cells that are occupied by PD-L1 expressed on the
Sigmax_T14b=PD1	0.10054075	dimensionless	equations below	T14 subset of cancer cells in the tumor
	0.10654076 2		Calculated with RO; see algebraic	Maximum fraction of CD80 receptors on Effector T cells that are occupied by PD-L1 expressed on
Sigmax_T14c=CD80	2	dimensionless	equations below	the T14 subset of cancer cells in the tumor
	0.07809972	diffensioness	equations below	Maximum fraction of PD-L1 receptors on Effector
	9		Calculated with	T cells that are occupied by CD80 and PD-1
			RO; see algebraic	expressed on the T15 subset of cancer cells in the
Sigmax_T15a=PDL1		dimensionless	equations below	tumor
	0.06413499		Calculated with	Maximum fraction of PD-1 receptors on Effector T
	1		RO; see algebraic	cells that are occupied by PD-L2 expressed on the
Sigmax_T15b=PD1	0.07809972	dimensionless	equations below	T15 subset of cancer cells in the tumor Maximum fraction of PD-L1 receptors on Effector
	9		Calculated with	T cells that are occupied by CD80 and PD-1
			RO; see algebraic	expressed on the T16 subset of cancer cells in the
Sigmax_T16a=PDL1		dimensionless	equations below	tumor
0 -	0.24079052		1	Maximum fraction of PD-1 receptors on Effector T
			Calculated with	cells that are occupied by PD-L1 and PD-L2
<b>m m a -</b> - <b>i</b>			RO; see algebraic	expressed on the T16 subset of cancer cells in the
Sigmax_T16b=PD1	0.10654055	dimensionless	equations below	tumor
	0.10654076		Calculated with	Maximum fraction of CD80 receptors on Effector
Sigmax T16c=CD80	3	dimensionless	RO; see algebraic equations below	T cells that are occupied by PD-L1 expressed on the T16 subset of cancer cells in the tumor
Sigmax_110c=CD80	0.03399172	unnensionness	Calculated with	Maximum fraction of PD-L1 receptors on Effector
	0.03399172		RO; see algebraic	T cells that are occupied by PD-1 expressed on the
Sigmax_T2=PDL1		dimensionless	equations below	T2 subset of cancer cells in the tumor
	0.20659550		Calculated with	Maximum fraction of PD-1 receptors on Effector T
	9		RO; see algebraic	cells that are occupied by PD-L1 expressed on the
Sigmax_T3a=PD1		dimensionless	equations below	T3 subset of cancer cells in the tumor
	0.10654075		Calculated with	Maximum fraction of CD80 receptors on Effector
Stamon T2L CD80	3	1	RO; see algebraic	T cells that are occupied by PD-L1 expressed on
Sigmax_T3b=CD80	0.06413499	dimensionless	equations below Calculated with	the T3 subset of cancer cells in the tumor Maximum fraction of PD-1 receptors on Effector T
	1		RO; see algebraic	cells that are occupied by PD-L2 expressed on the
Sigmax_T4=PD1	1	dimensionless	equations below	T4 subset of cancer cells in the tumor
0 -	0.04820050		Calculated with	Maximum fraction of PD-L1 receptors on Effector
	1		RO; see algebraic	T cells that are occupied by CD80 expressed on the
Sigmax_T5=PDL1		dimensionless	equations below	T5 subset of cancer cells in the tumor
	0.03399172		Calculated with	Maximum fraction of PD-L1 receptors on Effector
Sigmax_T6a=PDL1	7	dimensionless	RO; see algebraic equations below	T cells that are occupied by PD-1 expressed on the T6 subset of cancer cells in the tumor
Sigmax_10a=1DL1	0.20659550	unitensioniess	Calculated with	Maximum fraction of PD-1 receptors on Effector T
	9		RO; see algebraic	cells that are occupied by PD-L1 expressed on the
Sigmax_T6b=PD1	-	dimensionless	equations below	T6 subset of cancer cells in the tumor
	0.10654076		Calculated with	Maximum fraction of CD80 receptors on Effector
	1		RO; see algebraic	T cells that are occupied by PD-L1 expressed on
Sigmax_T6c=CD80	0.000000177	dimensionless	equations below	the T6 subset of cancer cells in the tumor
	0.03399172		Calculated with	Maximum fraction of PD-L1 receptors on Effector
Sigmax_T7a=PDL1	7	dimensionless	RO; see algebraic equations below	T cells that are occupied by PD-1 expressed on the T7 subset of cancer cells in the tumor
Sigman_1/a=1 DD1	0.06413499	annensionness	Calculated with	Maximum fraction of PD-1 receptors on Effector T
	1		RO; see algebraic	cells that are occupied by PD-L2 expressed on the
Sigmax_T7b=PD1		dimensionless	equations below	T7 subset of cancer cells in the tumor
	0.24079052			Maximum fraction of PD-1 receptors on Effector T
			Calculated with	cells that are occupied by PD-L1 and PD-L2
		1	RO; see algebraic	expressed on the T8 subset of cancer cells in the
Sigmax_T8a=PD1	0.10400105	dimensionless	equations below	tumor Maximum fraction of CD80 recontors on Effector
	0.10409185 5		Calculated with RO; see algebraic	Maximum fraction of CD80 receptors on Effector T cells that are occupied by PD-L1 expressed on
Sigmax_T8b=CD80	5	dimensionless	equations below	the T8 subset of cancer cells in the tumor
	0.07809972	annensionness	oquations below	Maximum fraction of PD-L1 receptors on Effector
	9		Calculated with	T cells that are occupied by PD-1 and CD80
			RO; see algebraic	expressed on the T9 subset of cancer cells in the
Sigmax_T9=PDL1		dimensionless	equations below	tumor
	0.0008355		Calculated with	Maximum fraction of CD80 and CD86 receptors
		1	RO; see algebraic	on mAPCs that are occupied by CTLA-4 expressed
Sigmax_TrAPCT=CTLA4		dimensionless	equations below	on T Regulatory cells in the tumor

Variable	Value	Units	Source	Description
	0.02030513			Maximum fraction of total CD80 receptors on
	9		Calculated with	Primed Naïve T cells that are involved in interacting with the PD-L1 receptors on Regulatory
Sigmax_TrPNT=CD80		dimensionless	RO; see algebraic equations below	T cells during priming in the lymph nodes
nginux_111111=0200	1	dimensioniess	Calculated with	Maximum level of inhibitory effects against
			RO; see algebraic	Primed Naive T cells by other factors expressed by
Sigmax_TrPNT=Other		dimensionless	equations below	T Regulatory cells
	0.03424112			Maximum fraction of total PD-1 receptors on
	9		Calculated with RO; see algebraic	Primed Naïve T cells that are involved in interacting with the PD-L1 receptors on Regulatory
Sigmax_TrPNT=PD1		dimensionless	equations below	T cells during priming in the lymph nodes
	0.01043527	unitensionitess	equations below	Maximum fraction of total PD-L1 receptors on
	6		Calculated with	Primed Naïve T cells that are involved in
			RO; see algebraic	interacting with the PD-1 receptors on Regulatory
igmax_TrPNT=PDL1	0.00000444	dimensionless	equations below	T cells during priming in the lymph nodes
	0.03393441 3		Calculated with	Maximum fraction of CD80 receptors expressed on
igmax_TrTeff=CD80	5	dimensionless	RO; see algebraic equations below	Effector T cells that are interacting with PD-L1 on the T Regulatory cells in the tumor
Igmax_111en=CD00	0.07390323	unitensioness	Calculated with	Maximum fraction of PD-1 receptors expressed on
	6		RO; see algebraic	Effector T cells that are interacting with PD-L1 on
igmax_TrTeff=PD1		dimensionless	equations below	the T Regulatory cells in the tumor
	0.02853037		Calculated with	Maximum fraction of PD-L1 receptors expressed
	1		RO; see algebraic	on Effector T cells that are interacting with PD-1
igmax_TrTeff=PDL1	0.2499.442.5	dimensionless	equations below	on the T Regulatory cells in the tumor
	0.24884436		Calculated as fraction of RO per	Weight of Effector T cell inhibition by signaling
	1		total RO; see	through CD80 receptors expressed on Effector T
			algebraic	cells that are interacting with PD-L1 on the
igweight_MDSCTeff=CD80		dimensionless	equations below	MDSCs in the tumor
	0.54193966		Calculated as	
	3		fraction of RO per	Weight of Effector T cell inhibition by signaling
			total RO; see	through PD-1 receptors expressed on Effector T
igweight_MDSCTeff=PD1		dimensionless	algebraic equations below	cells that are interacting with PD-L1 on the MDSCs in the tumor
igweight_wibbe ten=t bt	0.20921597	difficiisioness	Calculated as	
	6		fraction of RO per	Weight of Effector T cell inhibition by signaling
			total RO; see	through PD-L1 receptors expressed on Effector T
			algebraic	cells that are interacting with PD-1 on the MDSCs
igweight_MDSCTeff=PDL1	0.00000000	dimensionless	equations below	in the tumor
	0.02083333 3		Calculated as fraction of RO per	Weight of Primed Naive T cell inhibition by
	5		total RO; see	signaling through CD80 receptors on Primed Naïve
			algebraic	T cells that can interact with the PD-L1 receptors
igWeight_PNT=CD80		dimensionless	equations below	on mAPCs during priming in the lymph nodes
0 0 -	0.89583333		Calculated as	Weight of Primed Naive T cell inhibition by
	3		fraction of RO per	signaling through CTLA-4 receptors on Primed
			total RO; see	Naïve T cells that can interact with the CD80 and
igWeight_PNT=CTLA4		dimensionless	algebraic equations below	CD86 receptors on mAPCs during priming in the lymph nodes
ig Wight_1111-C1LA4	0.04166666	annensionness	Calculated as	Weight of Primed Naive T cell inhibition by
	7		fraction of RO per	signaling through PD-1 receptors on Primed Naïve
			total RO; see	T cells that can interact with the PD-L1 and PD-L2
			algebraic	receptors on mAPCs during priming in the lymph
igWeight_PNT=PD1	0.04166666	dimensionless	equations below	nodes
	0.04166666 7		Calculated as	Weight of Primed Naive T cell inhibition by
	/		fraction of RO per total RO; see	signaling through PD-L1 receptors on Primed Naïve T cells that can interact with the PD-1 and
			algebraic	CD80 receptors on mAPCs during priming in the
igWeight_PNT=PDL1		dimensionless	equations below	lymph nodes
0 0 -	0.08914155		Calculated as	
	7		fraction of RO per	Weight of Effector T cell inhibition by signaling
			total RO; see	through PD-L1 receptors on Effector T cells that
		1	algebraic	are occupied by PD-1 expressed on the T10 subset
igweight_T10a=PDL1	0.62146076	dimensionless	equations below	of cancer cells in the tumor
	0.63146076 7		Calculated as fraction of RO per	Weight of Effector T cell inhibition by signaling
	/		total RO; see	through PD-1 receptors on Effector T cells that are
			algebraic	occupied by PD-L1 and PD-L2 expressed on the
		dimensionless	equations below	T10 subset of cancer cells in the tumor

Variable	Value	Units	Source	Description
	0.27939767		Calculated as	Weight of Effected T cell inhibition has signation
	7		fraction of RO per total RO; see	Weight of Effector T cell inhibition by signaling through CD80 receptors on Effector T cells that are
			algebraic	occupied by PD-L1 expressed on the T10 subset of
Sigweight_T10c=CD80		dimensionless	equations below	cancer cells in the tumor
	0.17376806	unitensionitess	Calculated as	
	9		fraction of RO per	Weight of Effector T cell inhibition by signaling
			total RO; see	through PD-L1 receptors on Effector T cells that
			algebraic	are occupied by CD80 expressed on the T11 subset
Sigweight_T11a=PDL1		dimensionless	equations below	of cancer cells in the tumor
	0.82623193		Calculated as	
	1		fraction of RO per	Weight of Effector T cell inhibition by signaling
			total RO; see	through PD-1 receptors on Effector T cells that are
Signation to T11b_DD1		dimensionless	algebraic	occupied by PD-L1 expressed on the T11 subset of cancer cells in the tumor
Sigweight_T11b=PD1	0.42907633	dimensionless	equations below Calculated as	cancer cens in the tunior
	2		fraction of RO per	Weight of Effector T cell inhibition by signaling
	2		total RO; see	through PD-L1 receptors on Effector T cells that
			algebraic	are occupied by CD80 expressed on the T12 subset
Sigweight_T12a=PDL1		dimensionless	equations below	of cancer cells in the tumor
· · · · · · · · · · · · · · · · · · ·	0.57092366		Calculated as	
	8		fraction of RO per	Weight of Effector T cell inhibition by signaling
			total RO; see	through PD-1 receptors on Effector T cells that are
			algebraic	occupied by PD-L2 expressed on the T12 subset of
Sigweight_T12b=PD1		dimensionless	equations below	cancer cells in the tumor
	0.15609150		Calculated as	
	4		fraction of RO per	Weight of Effector T cell inhibition by signaling
			total RO; see	through PD-L1 receptors on Effector T cells that
			algebraic	are occupied by CD80 expressed on the T13 subset
Sigweight_T13a=PDL1	0.84200840	dimensionless	equations below	of cancer cells in the tumor
	0.84390849 6		Calculated as fraction of RO per	Weight of Effector T cell inhibition by signaling
	0		total RO; see	through PD-1 receptors on Effector T cells that are
			algebraic	occupied by PD-L1 and PD-L2 expressed on the
Sigweight_T13b=PD1		dimensionless	equations below	T13 subset of cancer cells in the tumor
Sig "eight_1100-101	0.19962306	unitensioniess	Calculated as	
	3		fraction of RO per	Weight of Effector T cell inhibition by signaling
	-		total RO; see	through PD-L1 receptors on Effector T cells that
			algebraic	are occupied by CD80 and PD-1 expressed on the
Sigweight_T14a=PDL1		dimensionless	equations below	T14 subset of cancer cells in the tumor
	0.52805853		Calculated as	
	6		fraction of RO per	Weight of Effector T cell inhibition by signaling
			total RO; see	through PD-1 receptors on Effector T cells that are
~			algebraic	occupied by PD-L1 expressed on the T14 subset of
Sigweight_T14b=PD1	0.07021040	dimensionless	equations below	cancer cells in the tumor
	0.27231840		Calculated as	Weight of Effector T call inhibition by signaling
	1		fraction of RO per total RO; see	Weight of Effector T cell inhibition by signaling through CD80 receptors on Effector T cells that are
			algebraic	occupied by PD-L1 expressed on the T14 subset of
Sigweight T14c=CD80		dimensionless	equations below	cancer cells in the tumor
	0.54909046	annensionness	Calculated as	
	7		fraction of RO per	Weight of Effector T cell inhibition by signaling
			total RO; see	through PD-L1 receptors on Effector T cells that
			algebraic	are occupied by CD80 and PD-1 expressed on the
Sigweight_T15a=PDL1		dimensionless	equations below	T15 subset of cancer cells in the tumor
	0.45090953		Calculated as	
	3		fraction of RO per	Weight of Effector T cell inhibition by signaling
			total RO; see	through PD-1 receptors on Effector T cells that are
			algebraic	occupied by PD-L2 expressed on the T15 subset of
Sigweight_T15b=PD1	0.10255565	dimensionless	equations below	cancer cells in the tumor
	0.18357789		Calculated as	
	3		fraction of RO per	Weight of Effector T cell inhibition by signaling
			total RO; see	through PD-L1 receptors on Effector T cells that
Signalight T1(- DDI 1		dimonsionlo	algebraic	are occupied by CD80 and PD-1 expressed on the
Sigweight_T16a=PDL1	0.56500102	dimensionless	equations below	T16 subset of cancer cells in the tumor Weight of Effector T cell inhibition by signaling
	0.56599193		Calculated as	through PD-1 receptors on Effector T cells that are
	1			
			fraction of RO per	Occupied by PD-LL and PD-L? expressed on the
Sigweight_T16b=PD1		dimensionless	fraction of RO per total RO; see	occupied by PD-L1 and PD-L2 expressed on the T16 subset of cancer cells in the tumor

Variable	Value	Units	Source	Description
			algebraic equations below	
Sigweight_T16c=CD80	0.25043017 6	dimensionless	Calculated as fraction of RO per total RO; see algebraic equations below	Weight of Effector T cell inhibition by signaling through CD80 receptors on Effector T cells that are occupied by PD-L1 expressed on the T16 subset of cancer cells in the tumor
	1		Calculated as fraction of RO per total RO; see algebraic	Weight of Effector T cell inhibition by signaling through PD-L1 receptors on Effector T cells that are occupied by PD-1 expressed on the T2 subset
Sigweight_T2=PDL1	0.65976232	dimensionless	equations below Calculated as	of cancer cells in the tumor
Signaight T2a-DD1	7	dimensionless	fraction of RO per total RO; see algebraic	Weight of Effector T cell inhibition by signaling through PD-1 receptors on Effector T cells that are occupied by PD-L1 expressed on the T3 subset of cancer cells in the tumor
Sigweight_T3a=PD1	0.34023767 3		equations below Calculated as fraction of RO per total RO; see algebraic	Weight of Effector T cell inhibition by signaling through CD80 receptors on Effector T cells that are occupied by PD-L1 expressed on the T3 subset of
Sigweight_T3b=CD80	1	dimensionless	equations below Calculated as	cancer cells in the tumor
Sigweight_T4=PD1	1	dimensionless	fraction of RO per total RO; see algebraic equations below	Weight of Effector T cell inhibition by signaling through PD-1 receptors on Effector T cells that are occupied by PD-L2 expressed on the T4 subset of cancer cells in the tumor
	1	dimension1	Calculated as fraction of RO per total RO; see algebraic	Weight of Effector T cell inhibition by signaling through PD-L1 receptors on Effector T cells that are occupied by CD80 expressed on the T5 subset
Sigweight_T5=PDL1 Sigweight_T6a=PDL1	0.09792274 6	dimensionless	equations below Calculated as fraction of RO per total RO; see algebraic equations below	of cancer cells in the tumor Weight of Effector T cell inhibition by signaling through PD-L1 receptors on Effector T cells that are occupied by PD-1 expressed on the T6 subset of cancer cells in the tumor
	0.59515657 4		Calculated as fraction of RO per total RO; see algebraic	Weight of Effector T cell inhibition by signaling through PD-1 receptors on Effector T cells that are occupied by PD-L1 expressed on the T6 subset of
Sigweight_T6b=PD1	0.30692068	dimensionless	equations below Calculated as	cancer cells in the tumor
Sigweight_T6c=CD80	0.50072000	dimensionless	fraction of RO per total RO; see algebraic equations below	Weight of Effector T cell inhibition by signaling through CD80 receptors on Effector T cells that are occupied by PD-L1 expressed on the T6 subset of cancer cells in the tumor
Sigweight_T7a=PDL1	0.34640643 8	dimensionless	Calculated as fraction of RO per total RO; see algebraic equations below	Weight of Effector T cell inhibition by signaling through PD-L1 receptors on Effector T cells that are occupied by PD-1 expressed on the T7 subset of cancer cells in the tumor
	0.65359356 2		Calculated as fraction of RO of total ROs in	Weight of Effector T cell inhibition by signaling through PD-1 receptors on Effector T cells that are occupied by PD-L2 expressed on the T7 subset of
Sigweight_T7b=PD1	0.69818157 6	dimensionless	signaling equation Calculated as fraction of RO per total RO; see algebraic	cancer cells in the tumor Weight of Effector T cell inhibition by signaling through PD-1 receptors on Effector T cells that are occupied by PD-L1 and PD-L2 expressed on the
Sigweight_T8a=PD1	0.30181842 4	dimensionless	equations below Calculated as fraction of RO per total RO; see algebraic	T8 subset of cancer cells in the tumor Weight of Effector T cell inhibition by signaling through CD80 receptors on Effector T cells that are occupied by PD-L1 expressed on the T8 subset of
Sigweight_T8b=CD80	1	dimensionless	equations below Calculated as	cancer cells in the tumor Weight of Effector T cell inhibition by signaling
Sigweight_T9=PDL1	1	dimensionless	fraction of RO per	through PD-L1 receptors on Effector T cells that

Variable	Value	Units	Source	Description
			total RO; see algebraic equations below	are occupied by PD-1 and CD80 expressed on the T9 subset of cancer cells in the tumor
	0.26666666 7		Calculated as fraction of RO per total RO; see algebraic	Weight of Primed Naive T cell inhibition by signaling through CD80 receptors on Primed Naïve T cells that are involved in interacting with the PD- L1 receptors on Regulatory T cells during priming
SigWeight_TrPNT=CD80	0.2	dimensionless	equations below Calculated as fraction of RO per total RO; see algebraic	in the lymph nodes Weight of of inhibitory effects against Primed Naive T cells by other factors expressed by T
SigWeight_TrPNT=Other	0.26666666 7	dimensionless	equations below Calculated as fraction of RO per	Regulatory cells Weight of Primed Naive T cell inhibition by signaling through PD-1 receptors on Primed Naïve
SigWeight_TrPNT=PD1		dimensionless	total RO; see algebraic equations below	T cells that are involved in interacting with the PD- L1 receptors on Regulatory T cells during priming in the lymph nodes
SigWeight_TrPNT=PDL1	0.26666666 7 0.24884436	dimensionless	Calculated as fraction of RO per total RO; see algebraic equations below Calculated as	Weight of Primed Naive T cell inhibition by signaling through PD-L1 receptors on Primed Naïve T cells that are involved in interacting with the PD-1 receptors on Regulatory T cells during priming in the lymph nodes
Sigweight_TrTeff=CD80	3	dimensionless	fraction of RO per total RO; see algebraic equations below	Weight of Effector T cell inhibition by signaling through CD80 receptors expressed on Effector T cells that are interacting with PD-L1 on the T Regulatory cells in the tumor
Sigweight_TrTeff=PD1	0.54193964	dimensionless	Calculated as fraction of RO per total RO; see algebraic equations below	Weight of Effector T cell inhibition by signaling through PD-1 receptors expressed on Effector T cells that are interacting with PD-L1 on the T Regulatory cells in the tumor
Sigweight_TrTeff=PDL1	0.20921599 7	dimensionless	Calculated as fraction of RO per total RO; see algebraic equations below	Weight of Effector T cell inhibition by signaling through PD-L1 receptors expressed on Effector T cells that are interacting with PD-1 on the T Regulatory cells in the tumor
Starting_Cancer_Diam_mm	15-80	mm	Set value; varied	The diameter of the tumor at which to start its growth in the simulation
Success_NT-mAPC	500	dimensionless	[60, 62, 72, 79, 82, 83]	The number of Naive T:mAPC interactions that would occur prior to a successful priming interaction
			[60, 62, 72, 79, 82,	The number of Primed Naive T:mAPC interactions that would occur prior to a successful priming interaction. The difference between the number of successful interactions prior to priming between the first and second stage is estimated by enhanced immunity through chemokines that attract the CD8+ T cells where the APCs and T cells have gathered in a more localized area during priming
Success_PNT-mAPC	50	dimensionless	84]	[84]. Number of Naïve T cells populations specific for different tumor antigens; in other words; the number of anti-tumor T cell clones in each lymph
T_Cell_Clonality	10-130	cell	[28, 30, 85]	number of anti-tumor 1 cell clones in each lymph node. The diffusion coefficient of Naive and Primed
T_Cell_Diffusion	10	µm²/min	[62, 72, 79, 86] [19, 40, 71, 72, 87,	Naive T cells in the lymph nodes during priming The maximum number of Naïve and Primed Naïve T cells that can interact with an mAPC at once (surface area of APCs is ~900 $\mu$ m ² as a sphere – from ~2500 $\mu$ m ³ [88] per APC – and APC:T contact area is ~50 $\mu$ m ² [40], but have been shown to range from 1 $\mu$ m ² to >70 $\mu$ m ² and even as much as 50% of a cell's surface area [19]). Note: all T cells were estimated to be the same size, and a surface area analysis was used for this estimation.
T_cells_per_mAPC	75	cell/cell	88]	Furthermore, the available surface area on the

Variable	Value	Units	Source	Description
				mAPCs was multiplied by a factor of 3-4-fold [19]
				to consider dendritic projections, which would increase the surface area relative to the volume.
T Density	Calculated	cell/µm ³	[72]	The density of total T cells in the lymph nodes
T_IVinject	1	hour	Can be varied	Injection time of antibody
				The number of Effector T cells that interact with
T_per_Cancer_Cell_Int	1	cell/cell	Can be varied	each cancer cell at once
				The maximum number of Effector T cells that can interact with a cancer at once. Note: all T cells
				were estimated to be the same size, and a surface
T_per_Cancer_Cell_max	10	cell/cell	[71, 72]	area analysis was used for this estimation.
				The maximum number of T (Naive, Primed Naive and Effector) cells that can interact with a T
				regulatory cell at once. Note: all T cells were
				estimated to be the same size, and a surface area
T_per_Tr_cell	10	cell/cell	[71, 72, 89]	analysis was used for this estimation.
			[90, 91]; estimated with fitting to PD1	The factor specifying homing of Effector T cells to
			monotherapy	extravasate into the tumor more so than into the
TCytokineHoming	100	dimensionless	tumor response	peripheral tissues, or to remain in the blood
TDLN_Radius	6203.50490 9		[70]	The radius of the lymph node region where T cell priming and interactions occur
IDEN_Kaulus	9	μm	[72]	Factor that is 0 or 1, which stops the immune
				response when the tumor has died, former, or
TheEnd	1	dimensionless	Assigned	allows the immune response to be active, latter
Time_Start_Therapy	Calculated	day	Function of tumor diameter	Recorded time when therapy began
Time_Start_Therapy	Calculated	uay	Function of tumor	Recorded time when tumor was sufficiently killed
Time_Tumor_Death	Calculated	day	diameter	by the immune response
T-mAPC_Cell_Size	12	μm	[72]	The diameter of a T cell undergoing priming The maximum time (24 hours) over which
				interaction during each priming stage are
T-mAPC_Inter_tmax_min	1440	min	[72]	considered.
Total_T_per_TDLN	5000000	cell	[3] Sum of all cancer	The total number of T cells in each lymph node
			checkpoint	The total immune checkpoint inhibiting effect on
Total_TC_Sig	Calculated	dimensionless	signaling modules	the Effector T cells by the tumor
				The maximum number of T Regulatory cells that can interact with a mAPC cell at once. Note: all T
				cells were estimated to be the same size, and an
				approximate surface area analysis was used for this
				estimation. Furthermore, the available surface area
				on the mAPCs was multiplied by a factor of 3-4- fold [19] to consider dendritic projections, which
			[19, 71, 72, 87,	would increase the surface area relative to the
Tr_cells_per_mAPC	75	cell/cell	88]	volume.
				The maximum number of T Regulatory cells that can interact with a T (Naive, Primed Naive and
				Effector) cell at once. Note: all T cells were
<b></b>	10	11 / 11	[71 72 00]	estimated to be the same size, and a surface area
Tr_per_T_cell	10	cell/cell	[71, 72, 89]	analysis was used for this estimation. Rate constant defining the half-life of interaction
Treg:mAPC_IntTime	0.0924	1/minute	[89]	between T Regulatory cells or MDSCs and mAPCs
				Rate constant defining the half-life of interaction
Treg:T_IntTime	0.1386	1/minute	[89]	between T Regulatory cells or MDSCs and T (Naive, Primed Naive and Effector) cells
	0.1000	1,		Rate constant defining the half-life of engagement
	0.05555		[59-61]; assumed	between T Regulatory cells and mAPCs or T
TregLN_Engage	0.05775	1/(mole*hour)	the same Assumed 0.1 of	(Naive, Primed Naive and Effector) cells Rate constant defining the half-life of engagement
			Effect:Target	between mAPCs or Effector T cells, and T
TregTMDSCEng	0.2079	1/hour	engagement time	Regulatory cells or MDSCs in the tumor
TrLN-mAPC_Cell_Size	12	μm	[72, 89]	The diameter of a T Regulatory cell interacting with mAPCs
THE COULDE	12	μιι	[12,09]	The diameter of a T Regulatory cell interacting
TrLN-PNT_Cell_Size	12	μm	[72, 89]	with Primed Naive T cells
Total Tumor Void Free	0.57	dimensionless	[13 16]	The fraction of tumor volume that is not occupied by cancer cells, consider vasculature
Total_Tumor_Void_Frac	0.57	dimensionless	[13, 16]	by cancer cens, consider vasculature

Variable	Value	Units	Source	Description
Tumor_Void_Fraction	0.5	dimensionless	[16]	The fraction of tumor volume that is not occupied by cancer cells, not consider vasculature
Tumor_volu_rraction	0.5	diffensioness	[10]	The approximate shortest radius of the ellipsoid
Tumor_Vol_Ellipse_c_ratio	0.5	dimensionless	[92]	tumor
			Calculated (cell SA times synapse	Volume of receptor interactions between Effector
			diameter); see	T cells and cancer cells in the T10 subgroup at the
V_T:C_10	Calculated	liter	equations below	immunological synapse
			Calculated (cell	
			SA times synapse diameter); see	Volume of receptor interactions between Effector T cells and cancer cells in the T11 subgroup at the
V_T:C_11	Calculated	liter	equations below	immunological synapse
			Calculated (cell	
			SA times synapse	Volume of receptor interactions between Effector
V_T:C_12	Calculated	liter	diameter); see equations below	T cells and cancer cells in the T12 subgroup at the immunological synapse
V_1.C_12	Calculated	Inter	Calculated (cell	minunological synapse
			SA times synapse	Volume of receptor interactions between Effector
			diameter); see	T cells and cancer cells in the T13 subgroup at the
V_T:C_13	Calculated	liter	equations below Calculated (cell	immunological synapse
			SA times synapse	Volume of receptor interactions between Effector
			diameter); see	T cells and cancer cells in the T14 subgroup at the
V_T:C_14	Calculated	liter	equations below	immunological synapse
			Calculated (cell SA times synapse	Volume of receptor interactions between Effector
			diameter); see	T cells and cancer cells in the T15 subgroup at the
V_T:C_15	Calculated	liter	equations below	immunological synapse
			Calculated (cell	
			SA times synapse diameter); see	Volume of receptor interactions between Effector T cells and cancer cells in the T16 subgroup at the
V_T:C_16	Calculated	liter	equations below	immunological synapse
			Calculated (cell	
			SA times synapse diameter); see	Volume of receptor interactions between Effector
V_T:C_2	Calculated	liter	equations below	T cells and cancer cells in the T2 subgroup at the immunological synapse
	Calculated		Calculated (cell	initialiological synapse
			SA times synapse	Volume of receptor interactions between Effector
V_T:C_3	Calculated	liter	diameter); see equations below	T cells and cancer cells in the T3 subgroup at the immunological synapse
v_1.c_5	Calculated	Inter	Calculated (cell	minunological synapse
			SA times synapse	Volume of receptor interactions between Effector
X T C A		1.	diameter); see	T cells and cancer cells in the T4 subgroup at the
V_T:C_4	Calculated	liter	equations below Calculated (cell	immunological synapse
			SA times synapse	Volume of receptor interactions between Effector
			diameter); see	T cells and cancer cells in the T5 subgroup at the
V_T:C_5	Calculated	liter	equations below Calculated (cell	immunological synapse
			SA times synapse	Volume of receptor interactions between Effector
			diameter); see	T cells and cancer cells in the T6 subgroup at the
V_T:C_6	Calculated	liter	equations below	immunological synapse
			Calculated (cell SA times synapse	Volume of receptor interactions between Effector
			diameter); see	T cells and cancer cells in the T7 subgroup at the
V_T:C_7	Calculated	liter	equations below	immunological synapse
			Calculated (cell	Volume of recentor interactions haters Effect
			SA times synapse diameter); see	Volume of receptor interactions between Effector T cells and cancer cells in the T8 subgroup at the
V_T:C_8	Calculated	liter	equations below	immunological synapse
			Calculated (cell	
	1		SA times synapse	Volume of receptor interactions between Effector
V_T:C_9	Calculated	liter	diameter); see equations below	T cells and cancer cells in the T9 subgroup at the immunological synapse
	2.72781403		squatons below	Volume of the central compartment for Anti-
Vc_CTLA4	4	liter	[15]	CTLA-4
Ve PD1	2.71673964 3	liter	[25]	Volume of the central compartment for Anti-PD-1
Vc_PD1	3	inter	[23]	volume of the central compartment for Anti-PD-1

Variable	Value	Units	Source	Description
	4.05159981			Volume of the central compartment for Anti-PD-
Vc_PDL1	4	liter	[26, 27]	L1
	2.7			Volume of blood through which Effector T cells
Vc_Teff		liter	[13, 93]	circulate throughout the body
Vex_Tmr	~50% (void			
	space) of			
	total tumor		[13] Calculated	
	volume	ml	dynamically	Volume of Tumor interstitium
Vext_Liver	361.8	ml	[13]	Volume of Liver interstitium
Vext_LN	34.7	ml	[13]	Volume of Lymph Node interstitium
Vext_Lungs	299.7	ml	[13]	Volume of Lungs interstitium
Vext_Spleen	34.7	ml	[13]	Volume of Spleen interstitium
VL	5.2	liter	[56]	Volume of Lymph
Vm	0.824	mg/day	[63]	Vmax for ADA saturation for Durvalumab
			Calculated (cell	
			SA times synapse	Volume of receptor interactions between Effector
			diameter); see	T cells and MDSCs at the immunological synapse
Vol_Cell-Rec_MDSC-TeffT	Calculated	liter	equations below	in the tumor
			Calculated (cell	
			SA times synapse	Volume of receptor interactions between mAPCs
			diameter); see	and T Regulatory cells at the immunological
Vol Cell-Rec Tr-APCT	Calculated	liter	equations below	synapse in the tumor
, on_con-rec_11-Ai Ci	Calculated	inter	Calculated (cell	synapse in the tunior
			SA times synapse	Volume of receptor interactions between mAPCs
			diameter); see	and T Regulatory cells at the immunological
Vol_Cell-Rec_Tr-mAPC	Calculated	liter	equations below	synapse in the lymph nodes
voi_cen-kec_11-marc	Calculated	Inter		synapse in the tymph nodes
			Calculated (cell	Valence of manufacture time to the terms of Deine d
			SA times synapse	Volume of receptor interactions between Primed
	G 1 1 1	1.	diameter); see	Naive T cells and T Regulatory cells at the
Vol_Cell-Rec_Tr-PNT	Calculated	liter	equations below	immunological synapse in the lymph nodes
			Calculated (cell	
			SA times synapse	Volume of receptor interactions between Effector
			diameter); see	T cells and T Regulatory cells at the
Vol_Cell-Rec_Tr-TeffT	Calculated	liter	equations below	immunological synapse in the tumor
				Volume of a single human lymph node
				(represented as a sphere) where the T cells reside
Vol_per_TDLN	1	ml	[94]	and undergo priming for probability calculations
			Calculated (cell	
			SA times synapse	Volume of receptor interactions between Naive T
			diameter); see	cells and mAPCs at the immunological synapse in
Volume_NT-Receptor_Int	Calculated	liter	equations below	the lymph nodes during priming
			Calculated (cell	
			SA times synapse	Volume of receptor interactions between Primed
			diameter); see	Naive T cells and mAPCs at the immunological
Volume_PNT-Receptor_Int	Calculated	liter	equations below	synapse in the lymph nodes during priming
			1	Volume of the tumor compartment for PK
Vt	0.01	liter	Estimated	calculations
				Average tumor volume considered diffusive
Vt_avg_const	33.5	cm^3	[68]	transport
Vtdln	5.2	liter	[56, 94]	Volume of total lymph
	Based on		[00, 7.]	
	Cancer_Vol		Calculated	Total tumor volume based on cancer cell number,
Vt_Teff	_cm3	liter	dynamically	void space and tumor vasculature
Vv GI	43	ml	[13]	Void space and tumor vasculature Vasculature volume of GI
Vv_GI Vv Liver	180.9	ml	[13]	Vasculature volume of Liver
Vv_Liver Vv_LN	17	ml		Vasculature volume of Liver Vasculature volume of Lymph Node
	99.9		[13]	
Vv_Lungs		ml	[13]	Vasculature volume of Lungs
Vv_Periph	1355.4	ml	[12]	Vasculature volume of Peripheral for Effector T
	17	1	[13]	cell trafficking
Vv_Spleen	17	ml	[13]	Vasculature volume of Spleen
Vv_Tmr	~7% of	ml		
	total tumor volume		[13] Calculated	Vasculature volume of Tumor based on fraction of
			dynamically	total tumor volume

Table S5 – Model Parameters (End)

Table S6 – Model Algebraic Equations (Start)

Parameter and Species Assignment Equation	Assignment Type
[%{CD80}{PD1}C] = Frac_PD1_Exp_Cancer*Frac_CD80_Exp_Cancer*(1-Frac_PDL2_Exp_Cancer)*(1-Frac_PDL1_Exp_Cancer)	Repeated
[% {CD80}C] = Frac_CD80_Exp_Cancer*(1-Frac_PDL1_Exp_Cancer)*(1-Frac_PDL2_Exp_Cancer)*(1- Frac_PD1_Exp_Cancer)	Repeated
[% {Other}C] = (1-Frac_PDL1_Exp_Cancer)*(1-Frac_CD80_Exp_Cancer)*(1-Frac_PDL2_Exp_Cancer)*(1-Frac_PD1_Exp_Cancer)	Repeated
[% {PD1} {80} {L1} {L2}C] = Frac_PDL1_Exp_Cancer*Frac_CD80_Exp_Cancer*Frac_PDL2_Exp_Cancer*Frac_PD1_Exp_Cancer	Repeated
[% {PD1}{80}{L1}C] = Frac_PD1_Exp_Cancer*Frac_CD80_Exp_Cancer*Frac_PDL1_Exp_Cancer*(1- Frac_PDL2_Exp_Cancer)	Repeated
[%{PD1}{80}{PDL2}C] = Frac_PD1_Exp_Cancer*Frac_CD80_Exp_Cancer*Frac_PDL2_Exp_Cancer*(1- Frac_PDL1_Exp_Cancer)	Repeated
[% {PD1} {L1} {L2}C] = Frac_PD1_Exp_Cancer*Frac_PDL1_Exp_Cancer*Frac_PDL2_Exp_Cancer*(1- Frac_CD80_Exp_Cancer)	Repeated
$[\% \{PD1\} \{L1\} C] = Frac_PD1_Exp_Cancer*Frac_PDL1_Exp_Cancer*(1-Frac_PDL2_Exp_Cancer)*(1-Frac_CD80_Exp_Cancer)$	Repeated
[% {PD1}{L2}C] = Frac_PD1_Exp_Cancer*Frac_PDL2_Exp_Cancer*(1-Frac_PDL1_Exp_Cancer)*(1- Frac_CD80_Exp_Cancer)	Repeated
[% {PD1}C] = Frac_PD1_Exp_Cancer*(1-Frac_PDL1_Exp_Cancer)*(1-Frac_PDL2_Exp_Cancer)*(1-Frac_CD80_Exp_Cancer)	Repeated
[%{PDL1}{80}{L2}C] = Frac_PDL1_Exp_Cancer*Frac_CD80_Exp_Cancer*Frac_PDL2_Exp_Cancer*(1- Frac_PD1_Exp_Cancer)	Repeated
[%{PDL1}{80}C] = Frac_CD80_Exp_Cancer*Frac_PDL1_Exp_Cancer*(1-Frac_PDL2_Exp_Cancer)*(1- Frac_PD1_Exp_Cancer)	Repeated
[%{PDL1}{PDL2}C] = Frac_PDL1_Exp_Cancer*Frac_PDL2_Exp_Cancer*(1-Frac_PD1_Exp_Cancer)*(1- Frac_CD80_Exp_Cancer)	Repeated
[% {PDL1 }C] = Frac_PDL1_Exp_Cancer*(1-Frac_PD1_Exp_Cancer)*(1-Frac_PDL2_Exp_Cancer)*(1- Frac_CD80_Exp_Cancer)	Repeated
[%{PDL2}{80}] = Frac_CD80_Exp_Cancer*Frac_PDL2_Exp_Cancer*(1-Frac_PDL1_Exp_Cancer)*(1- Frac_PD1_Exp_Cancer)	Repeated
[%{PDL2}C] = Frac_PDL2_Exp_Cancer*(1-Frac_PDL1_Exp_Cancer)*(1-Frac_PD1_Exp_Cancer)*(1-Frac_CD80_Exp_Cancer)	Repeated
[Blood-Lymph].CTLA4_mabB_ugml = ([Blood-Lymph].CTLA4_mabB*Ipilimumab_MW)/(Vc_CTLA4) [Blood-Lymph].Effector_T_Blood_Con = Effector_TB/(Vc_Teff * 5/2.7)	Repeated Repeated
[Blood-Lymph].Effector_T_TB = Effector_T * [Num_TDLN_Considered]	Repeated
$[Blood-Lymph]. Effector_T_TOTAL = EffT_P_f_Vasc+Effector_TT_Count+Effector_TB$	Repeated
[Blood-Lymph].PD1_mabB_ugml = ([Blood-Lymph].PD1_mabb*Nivolumab_MW)/Vc_PD1	Repeated
[Blood-Lymph].PDL1_mabB_ugml = ([Blood-Lymph].PDL1_mabb*Durvalumab_MW)/Vc_PDL1	Repeated
[CD28_POS-Sig_NT] = (POS_Sig_NT_CD80+POS_Sig_NT_CD86)/(POS_Sig_NT_CD80+POS_Sig_NT_CD86+NT_Int_CD28+1E-100*mole)	Repeated
[CD28_POS-to-Total] = (POS_Sig_PNT_CD80+POS_Sig_PNT_CD86)/(POS_Sig_PNT_CD80+POS_Sig_PNT_CD86+PNT_Int_CD28+1E- 100*mole)	Repeated
[CD80_PNT_NEG-to-Max] = [PNT_CD80-PDL1]/([PNT_Int_CD80] + [PNT_CD80-PDL1]+1E-100*mole)	Repeated
[CD80_receptors-per-mAPC] = 130000*mAPC_activation_level	Repeated
[CD80Sig_Tr-PNT] = [TrPNT_PDL1-CD80]/([TrPNT_PDL1-CD80] + [PNT-Tr_CD80] +1E-100*mole)	Repeated
[CD86_receptors-per-mAPC] = 208000*mAPC_activation_level	Repeated
[CTLA4_NEG-to-Total] = (NEG_Sig_PNT_CD80+NEG_Sig_PNT_CD80)/(NEG_Sig_PNT_CD80+NEG_Sig_PNT_CD86+PNT_CTLA4+CTLA4_m Ab_CTLA4+1E-100*mole)	Repeated
[CTLA4_receptors-Int-PNT] = [CD28_receptors-per-Tcell]*[CTLA4-to-CD28_Ratio_Int]	Repeated
[CTLA4_receptors-nInt-PNT] = [CD28_receptors-per-Tcell]*[CTLA4-to-CD28_Ratio_nInt]	Repeated
[CTLA4_receptors-Tr] = [CD28_receptors-per-Tcell]*[CTLA4-to-CD28_Ratio_Tr]	Repeated
[CTLA4Sig_TrLN-mAPC] = ([TrALN_CT_aCT])/([TrALN_CT_CD80] + [TrALN_CT_CD86] + [Tr-mAPC_CTLA4] + [TrALN_CT_aCT]+1E-100*mole)	Repeated
[CTLA4-to-CD28_Ratio_Int] = 0.035*(1+Antigen_Intensity*2)	Repeated
[CTLA4-to-CD28_Ratio_nInt] = 0.035	Repeated
[Max_#Cells_per_mm^3] = 1/[Cancer_Cell_Vol_mm3]	Initial
[PD1_PNT_NEG-to-Max] = ([PNT_PD1-PDL2]+[PNT_PD1-PDL1])/([PNT_Int_PD1] + [PNT_PD1-PDL2]+[PNT_PD1-PDL2]+[PNT_PD1] + [PD1mAb_PNT_PD1]+1E-100*mole)	Repeated
$[PD1Sig_Tr-PNT] = ([TrPNT_PDL1-PD1])/([TrPNT_PDL1-PD1] + [PNT-Tr_PD1] + [PNTTr_PD1_aPD1] + 1E-100*mole)$	Repeated
[PDL1_PNT_NEG-to-Max] = ([PNT_PDL1-CD80]+[PNT_PDL1-PD1])/([PNT_Int_PDL1] +[PNT_PDL1-CD80]+[PNT_PDL1-PD1] + [PDL1mAb-PNT_PDL1]+1E-100*mole)	Repeated

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[Prob_NT-mAPC_Interact] = (1-exp((-4*pi*[T- mAPC_Cell_Size]*T_Cell_Diffusion*mAPC_Total_Calc_Pr*Precursor_Frequen_NT*T_Density*[T- mAPC_Inter_tmax_min]*Antigen_Intensity)/(T_Cell_Clonality*[Success_NT-mAPC])))	Repeated
[Prob_PNT-mAPC_Interact] = (1-exp((-4*pi*[T- mAPC_Cell_Size]*T_Cell_Diffusion*mAPC_Total_Calc_Pr*Precursor_Frequen_PNT*T_Density*[T- mAPC_Inter_tmax_min]*Antigen_Intensity)/(T_Cell_Clonality*[Success_PNT-mAPC])))	Repeated
[Sig_MDSCTeff=CD80] = ([PDL1:CD80_MDSCT])/([PDL1:CD80_MDSCT] +[CD80_TeffT1] + 1E-100*mole)	Repeated
$[Sig_MDSCTeff=PD1] = ([PDL1:PD1_MDSCT])/([PDL1:PD1_MDSCT] + [PD1_TeffT1] + [PD1:aPD1_Teff1] + 1E-100*mole)$	Repeated
$[Sig_MDSCTeff=PDL1] = ([PD1:PDL1_MDSCT])/([PD1:PDL1_MDSCT] + [PDL1_TeffT1] + [PDL1:aPDL1_Teff1] + 1E-100*mole)$	Repeated
[Sig_MDSCTeff=Total] = (([Sigweight_MDSCTeff=CD80]*([Sig_MDSCTeff=CD80]/[Sigmax_MDSCTeff=CD80])+[Sigweight_MDSCTeff=PD1]*( [Sig_MDSCTeff=PD1]/[Sigmax_MDSCTeff=PD1])+[Sigweight_MDSCTeff=PDL1]*([Sig_MDSCTeff=PDL1])/[Sigmax_M DSCTeff=PD1]))^gamma_Sig1 / (1 + ([Sigweight_MDSCTeff=CD80]*([Sig_MDSCTeff=CD80]/[Sigmax_MDSCTeff=CD80])+[Sigweight_MDSCTeff=PD1]*([ Sig_MDSCTeff=PD1]/[Sigmax_MDSCTeff=PD1])+[Sigweight_MDSCTeff=PDL1]*([Sig_MDSCTeff=PDL1]/[Sigmax_M DSCTeff=PD1]/[Sigmax_MDSCTeff=PD1])+[Sigweight_MDSCTeff=PDL1]*([Sig_MDSCTeff=PDL1]/[Sigmax_M DSCTeff=PD1]))^gamma_Sig1))*(1-[Sig_MDSCTeff=Other])+[Sig_MDSCTeff=Other]	Repeated
$[Sig_NT=CD28] = ([CD28_POS-Sig_NT]/[Sigmax_NT=CD28])$	Repeated
[Sig_PNT=CTLA4/PD1/L//CD80] = ([SigWeight_PNT=CTLA4]*[CTLA4_NEG-to- Total]/[Sigmax_PNT=CTLA4]+[SigWeight_PNT=PD1]*[PD1_PNT_NEG-to- Max]/[Sigmax_PNT=PD1]+[SigWeight_PNT=PDL1]*[PDL1_PNT_NEG-to- Max]/[Sigmax_PNT=PDL1]+[SigWeight_PNT=CD80]*[CD80_PNT_NEG-to- Max]/[Sigmax_PNT=CD80])^gamma_Sig/(1+([SigWeight_PNT=CTLA4]*[CTLA4_NEG-to- Total]/[Sigmax_PNT=CTLA4]+[SigWeight_PNT=PD1]*[PD1_PNT_NEG-to- Max]/[Sigmax_PNT=CTLA4]+[SigWeight_PNT=PDL1]*[PD1_PNT_NEG-to- Max]/[Sigmax_PNT=PD1]+[SigWeight_PNT=CD80]*[CD80_PNT_NEG-to- Max]/[Sigmax_PNT=PD1]+[SigWeight_PNT=CD80]*[CD80_PNT_NEG-to- Max]/[Sigmax_PNT=PDL1]+[SigWeight_PNT=CD80]*[CD80_PNT_NEG-to-Max]/[Sigmax_PNT=CD80])^gamma_Sig)	Repeated
[Sig_T1=Total] = 1 [Sig_T10=Total] = (([Sigweight_T10a=PDL1]*[Sig_T10a=PDL1]/[Sigmax_T10a=PDL1] +	Repeated
$\label{eq:sigma} \begin{split} &[\text{Sigweight}_T10b=PD1]^*[\text{Sig}_T10b=PD1]/[\text{Sigmax}_T10b=PD1] + \\ &[\text{Sigweight}_T10c=CD80]^*[\text{Sig}_T10c=CD80]/[\text{Sigmax}_T10c=CD80]) ^gamma_\text{Sig}1/(1 + \\ &([\text{Sigweight}_T10a=PDL1]^*[\text{Sig}_T10a=PDL1]/[\text{Sigmax}_T10a=PDL1] + \\ &[\text{Sigweight}_T10b=PD1]^*[\text{Sig}_T10b=PD1]/[\text{Sigmax}_T10b=PD1] + \\ &[\text{Sigweight}_T10c=CD80]^*[\text{Sig}_T10c=CD80]/[\text{Sigmax}_T10c=CD80])^gamma_\text{Sig}1))^*(1-[\text{Sig}_T=Other]) + \\ &[\text{Sigweight}_T10c=CD80]^*[\text{Sig}_T=Other] + \\ &[\text{Sigweight}_T10c=CD80]^*[\text{Sig}_T=Other])^gamma_\text{Sig}1))^*(1-[\text{Sig}_T=Other]) + \\ &[\text{Sigweigh}_T10c=CD80]^*[\text{Sig}_T=Other] + \\ &[\text{Sigweigh}_T10c=CD80]^*[\text{Sig}_T=Other])^gamma_\text{Sig}1))^*(1-[\text{Sig}_T=Other])^gamma_\text{Sig}1) + \\ &[\text{Sigweigh}_T10c=CD80]^*[\text{Sig}_T=Other])^gamma_\text{Sig}1) + \\ &[\text{Sigweigh}_T10c=CD80]^*[\text{Sig}_T=Other] +$	Repeated
$[Sig_T10a=PDL1] = ([T10a=PDL1:PD1=C10a])/([T10a=PDL1:PD1=C10a] + [T10a=PDL1] + [T10a=PDL1] + 1E - 100*mole)$	Repeated
$[Sig_T10b=PD1] = ([T10b=PD1:PDL1=C10b] + [T10b=PD1:PDL2=C10c])/([T10b=PD1:PDL1=C10b] + [T10b=PD1:PDL2=C10c] + [T10b=PD1] + [T10b=PD1:aPD1] + 1E-100*mole)$	Repeated
$[Sig_T10c=CD80] = ([T10c=CD80:PDL1=C10b])/([T10c=CD80:PDL1=C10b] + [T10c=CD80] + 1E-100*mole)$	Repeated
$ [Sig_T11=Tota] = (([Sigweight_T11a=PDL1]*[Sig_T11a=PDL1]/[Sigmax_T11a=PDL1] + [Sigweight_T11b=PD1]*[Sig_T11b=PD1]/[Sigmax_T11b=PD1]) ^gamma_Sig1/(1 + ([Sigweight_T11a=PDL1]*[Sig_T11a=PDL1]/[Sigmax_T11a=PDL1] + [Sigweight_T11b=PD1]*[Sig_T11b=PD1]/[Sigmax_T11b=PD1])^gamma_Sig1))*(1-[Sig_T=Other])+[Sig_T=Other] \\                                   $	Repeated
[Sig_T11a=PDL1] = ([T11a=PDL1:CD80=C11b])/([T11a=PDL1:CD80=C11b] +[T11a=PDL1]+[T11a=PDL1]+1E- 100*mole)	Repeated
$[Sig_T11b=PD1] = ([T11b=PD1:PDL1=C11a])/([T11b=PD1:PDL1=C11a] + [T11b=PD1]+[T11b=PD1:aPD1] + 1E-100*mole)$	Repeated
$ [Sig_T12=Total] = (([Sigweight_T12a=PDL1]*[Sig_T12a=PDL1]/[Sigmax_T12a=PDL1] + [Sigweight_T12b=PD1]*[Sig_T12b=PD1]/[Sigmax_T12b=PD1]) ^gamma_Sig1/(1 + ([Sigweight_T12a=PDL1]*[Sig_T12a=PDL1]/[Sigmax_T12a=PDL1] + [Sigweight_T12b=PD1]*[Sig_T12b=PD1]/[Sigmax_T12b=PD1])^gamma_Sig1))*(1-[Sig_T=Other])+[Sig_T=Other] $	Repeated
$[Sig_{12a}=PDL1] = ([T12a=PDL1:CD80=C12b])/([T12a=PDL1:CD80=C12b] + [T12a=PDL1] + [T12a=PDL1:aPDL1] + 1E-100*mole)$	Repeated
$[Sig_T12b=PD1] = ([T12b=PD1:PDL2=C12a])/([T12b=PD1:PDL2=C12a] + [T12b=PD1] + [T12b=PD1:aPD1] + 1E-100*mole)$	Repeated
$ [Sig_T13=Total] = (([Sigweight_T13a=PDL1]* [Sig_T13a=PDL1]/[Sigmax_T13a=PDL1] + [Sigweight_T13b=PD1]* [Sig_T13b=PD1]/[Sigmax_T13b=PD1]) ^gamma_Sig1/(1 + ([Sigweight_T13a=PDL1]* [Sig_T13a=PDL1]/[Sigmax_T13a=PDL1] + [Sigweight_T13b=PD1]* [Sig_T13b=PD1]/[Sigmax_T13b=PD1])^gamma_Sig1))*(1-[Sig_T=Other])+[Sig_T=Other] $	Repeated
$[Sig_T13a=PDL1] = ([T13a=PDL1:CD80=C13c])/([T13a=PDL1:CD80=C13c]) + [T13a=PDL1] + [T$	Repeated
$[Sig_T13b=PD1] = ([T13b=PD1:PDL2=C13b] + [T13b=PD1:PDL1=C13a])/([T13b=PD1:PDL2=C13b] + [T13b=PD1:PDL1=C13a] + [T13b=PD1] + [T13b=PD1] + 1E-100*mole)$	Repeated
[Sig_T14=Total] = (([Sigweight_T14a=PDL1]*[Sig_T14a=PDL1]/[Sigmax_T14a=PDL1] + [Sigweight_T14b=PD1]*[Sig_T14b=PD1]/[Sigmax_T14b=PD1] + [Sigweight_T14c=CD80]*[Sig_T14c=CD80]/[Sigmax_T14c=CD80]) ^gamma_Sig1/(1 +	Repeated

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([Sigweight_T14a=PDL1]*[Sig_T14a=PDL1]/[Sigmax_T14a=PDL1] + [Sigweight_T14b=PD1]*[Sig_T14b=PD1]/[Sigmax_T14b=PD1] + [Sigweight_T14c=CD80]*[Sig_T14c=CD80]/[Sigmax_T14c=CD80])^gamma_Sig1))*(1-[Sig_T=Other])+[Sig_T=Other]	
$\begin{bmatrix} sig_{14a} = PDL1 \end{bmatrix} = ([T14a = PDL1:PD1 = C14a] + [T14a = PDL1:CD80 = C14c])/([T14a = PDL1:PD1 = C14a] + [T14a = PDL1:CD80 = C14c] + [T14a = PDL1:PD1 = C14a] + [T14a = PD1 = C14$	Repeated
$[Sig_T14b=PD1] = ([T14b=PD1:PDL1=C14b])/([T14b=PD1:PDL1=C14b] + [T14b=PD1] + [T14b=PD1:aPD1] + 1E-100*mole)$	Repeated
$ [Sig_T14c=CD80] = ([T14c=CD80:PDL1=C14b])/([T14c=CD80:PDL1=C14b] + [T14c=CD80] + [E-100*mole) \\ [Sig_T15=Total] = (([Sigweight_T15a=PDL1]*[Sig_T15a=PDL1]/[Sigmax_T15a=PDL1] + [Sigweight_T15b=PD1]*[Sig_T15b=PD1]/[Sigmax_T15b=PD1]) ^gamma_Sig1/(1 + ([Sigweight_T15a=PDL1]*[Sig_T15a=PDL1]/[Sigmax_T15a=PDL1] + [Sigweight_T15b=PD1]*[Sig_T15b=PD1]/[Sigmax_T15b=PD1]) ^gamma_Sig1))*(1-[Sig_T=Other])+[Sig_T=Other] $	Repeated Repeated
$ \begin{array}{l} [Sig_T15a=PDL1] = ([T15a=PDL1:CD80=C15c] + \\ [T15a=PDL1:PD1=C15a] / ([T15a=PDL1:CD80=C15c] + [T15a=PDL1:PD1=C15a] + [T15a=PDL1] + [T15a=PDL1:aPDL1] \\ + 1E-100^*mole) \end{array} $	Repeated
$[Sig_T15b=PD1] = ([T15b=PD1:PDL2=C15b])/([T15b=PD1:PDL2=C15b] + [T15b=PD1] + [T15b=PD1] + [E-100*mole] + [T15b=PD1] + [T15$	Repeated
$ \begin{split} & [Sig_T16=Total] = (([Sigweight_T16a=PDL1]*[Sig_T16a=PDL1]/[Sigmax_T16a=PDL1] + \\ & [Sigweight_T16b=PD1]*[Sig_T16b=PD1]/[Sigmax_T16b=PD1] + \\ & [Sigweight_T16c=CD80]*[Sig_T16c=CD80]/[Sigmax_T16c=CD80]) ^gamma_Sig1/(1 + \\ & ([Sigweight_T16a=PDL1]*[Sig_T16a=PDL1]/[Sigmax_T16a=PDL1] + \\ & [Sigweight_T16b=PD1]*[Sig_T16b=PD1]/[Sigmax_T16b=PD1] + \\ & [Sigweight_T16c=CD80]*[Sig_T16c=CD80]/[Sigmax_T16c=CD80])^gamma_Sig1))*(1-[Sig_T=Other])+[Sig_T=Other] \end{split} $	Repeated
$ [Sig_T16a=PDL1] = ([T16a=PDL1:PD1=C16a] + [T16a=PDL1:CD80=C16d] + [T16a=PDL1] + [T16a=PDL1:CD80=C16d] + [T16a=PDL1] + [T16a=PDL1:aPDL1] + 1E-100*mole) $	Repeated
Sig_T16b=PD1] = ([T16b=PD1:PDL2=C16c]+[T16b=PD1:PDL1=C16b])/([T16b=PD1:PDL2=C16c]+[T16b=PD1:PDL1=C16b] +[T16b=PD1]+[T16b=PD1:aPD1] +1E-100*mole)	Repeated
$[Sig_T16c=CD80] = ([T16c=CD80:PDL1=C16b])/([T16c=CD80:PDL1=C16b] + [T16c=CD80] + 1E-100*mole)$	Repeated
$[Sig_T2=PDL1] = ([T2=PDL1:PD1=C2])/([T2=PDL1:PD1=C2] + [T2=PDL1] + [T2=PDL1] + 1E-100*mole)$ $[Sig_T2=Total] = (([Sigweight_T2=PDL1]*[Sig_T2=PDL1]/[Sigmax_T2=PDL1]) ^gamma_Sig1/(1 + (Sigmax_T2=PDL1])) ^gamma_Sig1/(1 + (Sigmax_T2=PDL1)) ^gamma_Sig1/(1 + (Sigma$	Repeated Repeated
$      ([Sigweight_T2=PDL1]*[Sig_T2=PDL1]/[Sigmax_T2=PDL1])^gamma_Sig1))*(1-[Sig_T=Other])+[Sig_T=Other] \\       [Sig_T3=Total] = (([Sigweight_T3a=PD1]*[Sig_T3a=PD1]/[Sigmax_T3a=PD1] + [Sigweight_T3b=CD80]*[Sig_T3b=CD80]/[Sigmax_T3b=CD80]) ^gamma_Sig1/(1 + ([Sigweight_T3a=PD1]*[Sig_T3a=PD1]/[Sigmax_T3a=PD1] + [Sigweight_T3b=CD80]*[Sig_T3b=CD80]/[Sigmax_T3b=CD80])^gamma_Sig1))*(1-[Sig_T=Other])+[Sig_T=Other] $	Repeated
$[Sig_T3a=PD1] = ([T3a=PD1:PDL1=C3])/([T3a=PD1:PDL1=C3] + [T3a=PD1]+[T3a=PD1:aPD1] + 1E-100*mole)$	Repeated
Sig_T3b=CD80] = ([T3b=CD80:PDL1=C3])/([T3b=CD80:PDL1=C3] +[T3b=CD80] +1E-100*mole)	Repeated
Sig_T4=PD1] = ([T4=PD1:PDL2=C4])/([T4=PD1:PDL2=C4] +[T4=PD1]+[T4=PD1]aPD1] +1E-100*mole)	Repeated
$\label{eq:sig_tau} \begin{split} & [([Sigweight_T4=PD1]*[Sig_T4=PD1]/[Sigmax_T4=PD1])^{ gamma_Sig1/(1 + ([Sig_T4=PD1])^{ gamma_Sig1})*(1-[Sig_T4=PD1]/[Sigmax_T4=PD1])^{ gamma_Sig1})*(1-[Sig_T=Other])+[Sig_T4=PD1]/[Sigmax_T4=PD1])^{ gamma_Sig1})*(1-[Sig_T4=PD1])+[Sig_T4=PD1]/[Sigmax_T4=PD1])^{ gamma_Sig1})*(1-[Sig_T4=PD1])+[Sig_T4=PD1]/[Sigmax_T4=PD1])^{ gamma_Sig1})*(1-[Sig_T4=PD1])+[Sig_T4=PD1]/[Sigmax_T4=PD1])^{ gamma_Sig1})*(1-[Sig_T4=PD1])+[Sig_T4=PD1]/[Sigmax_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])+[Sig_T4=PD1]/[Sigmax_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])+[Sig_T4=PD1]/[Sigmax_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(Sigmax_Sig1))*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Sig_T4=PD1])*(1-[Si$	Repeated
[Sig_T5=PDL1] = ([T5=PDL1:CD80=C5])/([T5=PDL1:CD80=C5] +[T5=PDL1]+[T5=PDL1]+1E-100*mole) [Sig_T5=Total] = (([Sigweight_T5=PDL1]*[Sig_T5=PDL1]/[Sigmax_T5=PDL1])^ gamma_Sig1/(1 +	Repeated Repeated
$      ([Sigweight_T5=PDL1]*[Sig_T5=PDL1]/[Sigmax_T5=PDL1])^gamma_Sig1))*(1-[Sig_T=Other])+[Sig_T=Other] \\       [Sig_T6=Total] = (([Sigweight_T6a=PDL1]*[Sig_T6a=PDL1]/[Sigmax_T6a=PDL1] + \\        [Sigweight_T6b=PD1]*[Sig_T6b=PD1]/[Sigmax_T6b=PD1] + \\        [Sigweight_T6c=CD80]*[Sig_T6c=CD80]/[Sigmax_T6c=CD80])^gamma_Sig1/(1 + \\        ([Sigweight_T6a=PDL1]*[Sig_T6a=PDL1]/[Sigmax_T6a=PDL1] + \\        [Sigweight_T6b=PD1]*[Sig_T6b=PD1]/[Sigmax_T6b=PD1] + \\        [Sigweight_T6b=PD1]*[Sig_T6b=PD1]/[Sigmax_T6b=PD1] + \\        [Sigweight_T6b=PD1]*[Sig_T6b=PD1]/[Sigmax_T6b=PD1] + \\        [Sigweight_T6b=PD1]*[Sig_T6b=PD1]/[Sigmax_T6b=PD1] + \\         [Sigweight_T6b=PD1]*[Sig_T6b=PD1]/[Sigmax_T6b=PD1] + \\         [Sigweight_T6b=PD1]*[Sig_T6b=PD1]/[Sigmax_T6b=PD1] + \\                                  $	Repeated
[Sigweight_T6c=CD80]*[Sig_T6c=CD80]/[Sigmax_T6c=CD80])^gamma_Sig1))*(1-[Sig_T=Other])+[Sig_T=Other]	
$Sig_T6a=PDL1] = ([T6a=PDL1:PD1=C6a])/([T6a=PDL1:PD1=C6a] + [T6a=PDL1] + [T6a=PDL1] + 1E-100*mole)$	Repeated
Sig_T6b=PD1] = $([T6b=PD1:PDL1=C6b])/([T6b=PD1:PDL1=C6b] + [T6b=PD1] + [T6b=PD1] + 1E-100*mole)$	Repeated
Sig_T6c=CD80] = ([T6c=CD80:PDL1=C6b])/([T6c=CD80:PDL1=C6b] + [T6c=CD80] + 1E-100*mole)	Repeated
Sig_T7=Total] = (([Sigweight_T7a=PDL1]*[Sig_T7a=PDL1]/[Sigmax_T7a=PDL1] + Sigweight_T7b=PD1]*[Sig_T7b=PD1]/[Sigmax_T7b=PD1]) ^gamma_Sig1/(1 + [Sigweight_T7a=PDL1]*[Sig_T7a=PDL1]/[Sigmax_T7a=PDL1] + Sigweight_T7b=PD1]*[Sig_T7b=PD1]/[Sigmax_T7b=PD1])^gamma_Sig1))*(1-[Sig_T=Other])+[Sig_T=Other]	Repeated
$[Sig_T7a=PDL1] = ([T7a=PDL1:PD1=C7a])/([T7a=PDL1:PD1=C7a] + [T7a=PDL1] + [T7a=PDL1] + 1E-100*mole)$	Repeated
[Sig_T7b=PD1] = ([T7b=PD1:PDL2=C7b])/([T7b=PD1:PDL2=C7b] +[T7b=PD1]+[T7b=PD1:aPD1] +1E-100*mole) [Sig_T8=Total] = (([Sigweight_T8a=PD1]*[Sig_T8a=PD1]/[Sigmax_T8a=PD1] + [Sigweight_T8b=CD80]*[Sig_T8b=CD80]/[Sigmax_T8b=CD80]) ^gamma_Sig1/(1 +	Repeated Repeated
[Sigweight_185=CD80]*[Sig_185=CD80]/[Sigmax_185=CD80]) *gamma_Sig1/(1 + ([Sigweight_T8a=PD1]*[Sig_T8a=PD1]/[Sigmax_T8a=PD1] + [Sigweight_T8b=CD80]*[Sig_T8b=CD80]/[Sigmax_T8b=CD80])*gamma_Sig1))*(1-[Sig_T=Other])+[Sig_T=Other]	
$[Sig_T8a=PD1] = ([T8a=PD1:PDL1=C8a] + [T8a=PD1:PDL2=C8b])/([T8a=PD1:PDL1=C8a] + [T8a=PD1:PDL2=C8b] + [T8a=PD1] + [T8a=PD1:aPD1] + 1E-100*mole)$	Repeated

Parameter and Species Assignment Equation	Assignment Type
[Sig_T8b=CD80] = ([T8b=CD80:PDL1=C8a])/([T8b=CD80:PDL1=C8a] + [T8b=CD80] + 1E-100*mole)	Repeated
[Sig_T9=PDL1] = ([T9=PDL1-PD1=C9a] + [T9=PDL1-CD80=C9b])/([T9=PDL1-PD1=C9a] + [T9=PDL1-CD80=C9b] + [T9=PDL1]+ [T9=PDL1] + 12 + 12 + 12 + 12 + 12 + 12 + 12 +	Repeated
$[Sig_T9=Tota] = (([Sigweight_T9=PDL1]*[Sig_T9=PDL1]/[Sigmax_T9=PDL1]) ^gamma_Sig1/(1 + 1))$	Repeated
$([Sigweight_T9=PDL1]*[Sig_T9=PDL1]/[Sigmax_T9=PDL1])^{gamma_Sig1})*(1-[Sig_T=Other])+[Sig_T=Other])$	
[Sig_TrAPCT=CTLA4] = ([CTLA4:CD80_TrAT] + [CTLA4:CD86_TrAT])/ ([CTLA4:CD80_TrAT] + [CTLA4:CD86_TrAT] + [CD80_mAPCT] + [CD86_mAPCT] + [CTLA4_CTLA4-Trt] + 1E-100*mole)	Repeated
[Sig_TrAPCT=Total] = (([Sig_TrAPCT=CTLA4]/[Sigmax_TrAPCT=CTLA4])^gamma_Sig / (1 +	Repeated
([Sig_TrAPCT=CTLA4]/[Sigmax_TrAPCT=CTLA4])^gamma_Sig))*(1-[Sig_TrAPC = Other])+[Sig_TrAPC = Other]	1
[Sig_TrPNT=PD1/L1/CD80] = (([SigWeight_TrPNT=CD80]*[CD80Sig_Tr-PNT]/[Sigmax_TrPNT=CD80] + [SigWeight_TrPNT=PD1]*[PD1Sig_Tr-PNT]/[Sigmax_TrPNT=PD1] + [SigWeight_TrPNT=PDL1]*[PDL1Sig_Tr- PNT]/[Sigmax_TrPNT=PDL1])*[gamma_SigTr / (1 + ([SigWeight_TrPNT=CD80]*[CD80Sig_Tr- PNT]/[Sigmax_TrPNT=CD80] + [SigWeight_TrPNT=PD1]*[PD1Sig_Tr-PNT]/[Sigmax_TrPNT=PD1] + [SigWeight_TrPNT=PDL1]*[PDL1Sig_Tr-PNT]/[Sigmax_TrPNT=PD1])* [SigWeight_TrPNT=Other]*[[Sigmax_TrPNT=Other]])+ [SigWeight_TrPNT=Other]*([Sigmax_TrPNT=Other]))+ [SigWeight_TrPNT=Other]*([Sigmax_TrPNT=Other]))	Repeated
$[Sig_TrTeff=CD80] = ([PDL1:CD80_TrTeff])/([PDL1:CD80_TrTeff] + [CD80_TeffT] + 1E-100*mole)$	Repeated
$[Sig_TrTeff=PD1] = ([PD1:PD1_TrTeff])/([PD1:PD1_TrTeff] + [PD1_TeffT] + [PD1:aPD1_Teff] + 1E-100*mole)$ [Sig_TrTeff=PDL1] = ([PD1:PDL1_TrTeff])/([PD1:PDL1_TrTeff] + [PDL1_TeffT] + [PDL1:aPDL1_Teff] + 1E-100*mole)	Repeated Repeated
[Sig_TrTeff=Total] = (([Sigweight_TrTeff=PD1]*[Sig_TrTeff=PD1]/[Sigmax_TrTeff=PD1] +[Sigweight_TrTeff=PDL1]*[Sig_TrTeff=PDL1]/[Sigmax_TrTeff=PDL1] +[Sigweight_TrTeff=CD80]*[Sig_TrTeff=CD80]/[Sigmax_TrTeff=CD80])^gamma_Sig1/(1+([Sigweight_TrTeff=PD1]*[Si g_TrTeff=PD1]/[Sigmax_TrTeff=PD1] +[Sigweight_TrTeff=PDL1]*[Sig_TrTeff=PDL1]/[Sigmax_TrTeff=PDL1]	Repeated
+[Sigweight_TrTeff=CD80]*[Sig_TrTeff=CD80]/[Sigmax_TrTeff=CD80])^gamma_Sig1)) *(1-[Sig_TrTeff = Other]) +[Sig_TrTeff=Other]	
Other])+[Sig_TrTeff = Other] [Success_NT-mAPC] = 500	Repeated
$[Success_PNT-mAPC] = 50$	Repeated
$[V_T:C_10] = ((4*pi*(([T-mAPC_Cell_Size]/2)^2)*([T{PD1}{L1}{80}-(10+pi*((I-1))*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-1)*(I-$	Repeated
<pre>{PD1}{L1}{L2}C])*(Cancer_per_T_Cell_Int/Cancer_per_T_Cell_max)*15E-3)*(L/mole))*(1E-15)*(IS_Scaling) [V_T:C_11] = ((4*pi*(([T-mAPC_Cell_Size]/2)^2)*([T{PD1}{L1}- {PDL1}{80}C])*(Cancer_per_T_Cell_Int/Cancer_per_T_Cell_max)*15E-3)*(L/mole))*(1E-15)*(IS_Scaling)</pre>	Repeated
{PDL2}{80}C))*(Cancer per T_Cell_Int/Cancer per T_Cell max)*15E-3)*(L/mole))*(1E-15)*(IS_Scaling)	Repeated
$V_T:C_13] = ((4*pi*(([T-mAPC_Cell_Size]/2)^2)*([T{PD1}{L1}-{PD1}{L1}-{PDL1}{R0})*([T-mAPC_Cell_Size]/2)^2)*([T{PD1}{L1}-{PD1}{L1}-{PD1}{R0})*([T-mAPC_Cell_Size]/2)^2)*([T{PD1}{L1}-{PD1}{R0})*([T-mAPC_Cell_Size]/2)^2)*([T{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T-mAPC_Cell_Size]/2)^2)*([T{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}{R0})*([T{PD1}-{PD1}-{PD1}{R0})*([T{PD1}-{PD1}-{PD1}{R0})*([T{PD1}-{PD1}-{PD1}{R0})*([T{PD1}-{PD1}-{PD1}{R0})*([T{PD1}-{PD1}-{PD1}-{PD1}{R0})*([T{PD1}-{PD1}-{PD1}-{PD1}-{PD1}{R0})*([T{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}{R0})*([T{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{PD1}-{P$	Repeated
$ [V_T:C_14] = ((4*pi*(([T-mAPC_Cell_Size]/2)^2)*([T{PD1}{L1}{80}-(PD1}(L1)C))*(Cancer_per_T_Cell_Int/Cancer_per_T_Cell_max)*15E-3)*(L/mole))*(1E-15)*(IS_Scaling) $	Repeated
$ [V_T:C_15] = ((4*pi*(([T-mAPC_Cell_Size]/2)^2)*([T{PD1}{L1}-{PD1}{S0})*([Cancer_per_T_Cell_Int/Cancer_per_T_Cell_max)*15E-3)*(L/mole))*(1E-15)*(IS_Scaling) [V_T:C_16] = ((4*pi*(([T-mAPC_Cell_Size]/2)^2)*([T{PD1}{L1}{S0}-{PD1}{L1})*([T-mAPC_Cell_Size]/2)^2)*([T{PD1}{L1}])*([T{PD1}{L1}])*([T-mAPC_Cell_Size]/2)*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}{L1}])*([T{PD1}$	Repeated Repeated
$ \{V_1: (1^{-11}) = ((4^{+}pi^{+}((1^{-11})APC_Cell_Size)/2)^{2})^{(1^{+}PD1} \{L_1\}_{\{80\}}^{-} \\ \{PD1\}_{\{80\}} \{L_1\}_{\{L_2\}C]}^{(1^{-11})} (Cancer_per_T_Cell_Int/Cancer_per_T_Cell_max)^{*}(15E-3)^{*}(L/mole))^{*}(1E-15)^{*}(IS_Scaling) \\ [V_T:C_2] = ((4^{+}pi^{*}(((1^{-11})APC_Cell_Size)/2)^{2})^{(1^{+}PD1})^{-} \\ [V_T:C_2] = ((4^{+}pi^{*}(((1^{-11})APC_Cell_Size)/2)^{2})^{*}([1^{+}PD1]^{-})^{*}(IS_Scaling) \\ [V_T:C_2] = ((4^{+}pi^{*}((1^{-11})APC_Cell_Size)/2)^{*}([1^{+}PD1]^{-})^{*}(IS_Scaling) \\ [V_T:C_2] = ((4^{+}pi^{*}((1^{-1})APC_Cell_Size)/2)^{*}([1^{+}PD1]^{-})^{*}(IS_Scaling) \\ [V_T:C_2] = ((4^{+}pi^{*}((1^{-1})APC_Cell_Size)/2)^{*}([1^{+}PD1]^{-})^{*}(IS_Scaling) \\ [V_T:C_2] = ((4^{+}pi^{*}((1^{-1})APC_Cell_Size)/2)^{*}([1^{+}PD1]^{-})^{*}(IS_Scaling) \\ [V_T:C_2] = ((4^{+}pi^{*}((1^{-1})APC_Cell_Size)/2)^{*}([1^{+}PD1]^{+}(IS_Scaling)) \\ [V_T:C_2] = ((4^{+}pi^{*}((1^{+}PD1)^{+}(IS_Scaling)/2)^{*}(IS_Scaling)) \\ [V_T:C_2] = ((4^{+}pi^{*}(IS_Scaling)/2)^{*}(IS_Scaling))$	Repeated
(PD1 C])*(Cancer_per_T_Cell_Int/Cancer_per_T_Cell_max)*15E-3)*(L/mole))*(1E-15)*(IS_Scaling)	•
$V_T:C_3] = ((4*pi*(([T-mAPC_Cell_Size]/2)^2)*([T{PD1}{CD80}-(PDL1]C])*(Cancer_per_T_Cell_Int/Cancer_per_T_Cell_Size]/2)*(IE-15)*(IS_Scaling)$	Repeated
<pre>[V_T:C_4] = ((4*pi*(([T-mAPC_Cell_Size]/2)^2)*([T{PD1}- {PDL2}C])*(Cancer_per_T_Cell_Int/Cancer_per_T_Cell_max)*15E-3)*(L/mole))*(1E-15)*(IS_Scaling)</pre> [V_T:C_5] = ((4*pi*(([T-mAPC_Cell_Size]/2)^2)*([T{PDL1}-	Repeated Repeated
$(12102)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{-1}(1210)^{$	Repeated
V_T:C_6] = ((4*pi*(([T-mAPC_Cell_Size]/2)^2)*([T{PD1}{L1}{80}- {PD1}{L1}Cancer_per_T_Cell_Int/Cancer_per_T_Cell_max)*15E-3)*(L/mole))*(1E-15)*(IS_Scaling)	Repeated
$ \begin{bmatrix} V_T:C_7 \end{bmatrix} = ((4*pi*(([T-mAPC_Cell_Size]/2)^2)*([T{PD1}{L1}-{PD1}{L1}-{PD1}{L2}C))*(Cancer_per_T_Cell_Int/Cancer_per_T_Cell_max)*15E-3)*(L/mole))*(1E-15)*(IS_Scaling) \\ \begin{bmatrix} V_T:C_8 \end{bmatrix} = ((4*pi*(([T-mAPC_Cell_Size]/2)^2)*([T{PD1}{80}-{PD1}{R}))*([T-mAPC_Cell_Size]/2)^2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T{PD1}{R}))*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/2)*([T-mAPC_Cell_Size]/$	Repeated Repeated
$ v_1: c_0 = ((4^{p_1}((1-mAPC_Cell_Size)/2)^{-2})^{(1{PD1}}{00}^{-2} ((1{PD1})(0)^{-2})^{(1{PD1}}(0)^{-2})^{(1{PD1}}(0)^{-2})^{(1{PD1}}(0)^{-2})^{(1{PD1}}(0)^{-2})^{(1{PD1}}(0)^{-2})^{(1{PD1}}(0)^{-2})^{(1{PD1}}(0)^{-2})^{(1{PD1}}(0)^{-2})^{(1{PD1}}(0)^{-2})^{(1{PD1}}(0)^{-2})^{(1{PD1}}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1})}(0)^{-2})^{(1{PD1$	Repeated
$\label{eq:cds} $$ CD80 {PD1 C}: (Cancer_per_T_Cell_Int/Cancer_per_T_Cell_max)*15E-3} (L/mole) * (1E-15)* (IS_Scaling) $$ Vol_Cell-Rec_MDSC-TeffT] = ((4*pi*(([TrLN-PNT_Cell_Size]/2)^2)*(MDSCsT_EngTeff/T_per_Tr_cell)*15E-3))*(1E-15)* (IS_SCALING) $$ Vol_Cell-Rec_MDSC-TeffT] = ((4*pi*([TrLN-PNT_Cell_Size]/2)*(1E-15)* (IS_SCALING) $$ Vol_Cell-Rec_MDSC-TeffT] = ((4*pi*([TrLN-PNT_Cell_Size]/2)* (IS_SCALING) $$ Vol_Cell-Rec_MDSC-TeffT] = ((4*pi*([TrLN-PNT_Cell_Size]/2)* (IS_SCALING) $$ Vol_Cell-Rec_MDSC-TeffT] = ((4*pi*([TrLN-PNT_Cell_Size]/2)* (IS_SCALING) $$ Vol_CECLING) $$ Vol_CECLING $$	Repeated
15)*(IS_Scaling)*(L/mole) Vol_Cell-Rec_Tr-APCT] = ((4*pi*(([TrLN-mAPC_Cell_Size]/2)^2)*(TregT_EngAPC/mAPC_per_Tr_cell)*15E-3))*(1E- 15)*(IS_Scaling)*(L/mole)	Repeated
$[Vol_Cell-Rec_Tr-mAPC] = ((4*pi*(([TrLN-mAPC_Cell_Size]/2)^2)*(TregLN_mAPC1/mAPC_per_Tr_cell)*15E-3))*(1E-15)*(IS_Scaling)*(L/mole)$	Repeated
$\label{eq:cell-Rec_Tr-PNT} = ((4*pi*(([TrLN-PNT_Cell_Size]/2)^2)*([TregLN-PNT1]/T_per_Tr_cell)*15E-3))*(1E-15)*(IS_Scaling)*(L/mole)$	Repeated
$ [Vol_Cell-Rec_Tr-TeffT] = ((4*pi*(([TrLN-PNT_Cell_Size]/2)^2)*(TregT_EngTeff/T_per_Tr_cell)*15E-3))*(1E-15)*(IS_Scaling)*(L/mole) $	Repeated

Parameter and Species Assignment Equation	Assignment Type
$\label{eq:loss_star} [Volume_NT-Receptor_Int] = ((4*pi*(([T-mAPC_Cell_Size]/2)^2)*((mAPC_Int_P1)/mAPC_per_T_cell)*15E-3)*(1E-15)*(IS_Scaling)$	Repeated
$[Volume_PNT-Receptor_Int] = ((4*pi*(([T-mAPC_Cell_Size]/2)^2)*((mAPC_Int_P2)/mAPC_per_T_cell)*15E-3)*(L/mole))*(1E-15)*(IS_Scaling)$	Repeated
$Cancer_Cell_Vol_mm3 = (4/3)*pi*(([Cancer_Cell_Diam_um]/2000)^3)$	Initial
$Cancer_Diam_mm = ((6*Cancer)/(pi*Tumor_Vol_Ellipse_c_ratio*(1/((4/3)*pi*((Cancer_Cell_Diam_um/2000)^3)))*(1-Total_Tumor_Void_Frac)*mole))^{(1/3)}$	Repeated
$Cancer_Vol_cm3 = (4/3)*pi*(([Cancer_Diam_mm]/2)^2)*(([Cancer_Diam_mm]*[Tumor_Vol_Ellipse_c_ratio])/2000)$	Repeated
CTLA4Sig_TrLN = [TrLN_CT_aCT]/([TrLN_CT_aCT] + [TrLN_CTLA4] +1E-100*mole) Frac CD80 Exp Cancer = [%CD80 Exp Cancer]/100	Repeated
$Frac_PD1_Exp_Cancer = [%PD1_Exp_Cancer]/100$	Repeated Repeated
Frac PDL1 Exp Cancer = $[\%PDL1$ Exp Cancer]/100	Repeated
Frac_PDL2_Exp_Cancer = [%PDL2_Exp_Cancer]/100	Repeated
Liv_Spln_GI.Liver_Free_Sites = Adhesion_D_Lung_Liv_spln*Vv_Liver - EffT_Liver_b_Vasc-EffT_Liver_AR_Vasc	Repeated
Liv_Spln_GI.Spleen_Free_Sites = Adhesion_D_Lung_Liv_spln*Vv_Spleen-EffT_Spleen_b_Vasc-EffT_Spleen_AR_Vasc	Repeated
Lungs.Lung_Free_Sites = Adhesion_D_Lung_Liv_spln*Vv_Lungs - EffT_r_LungsVasc - EffT_AR_LungsVasc	Repeated
Lymph_Node.[Total_T_CD8-CD4] = Total_T_per_TDLN	Repeated
Lymph_Node.[TregLN-PNT1] = Lymph_Node.[TregLN-PNT]+0.001*mole	Repeated
Lymph_Node.CTLA4_mab_ugml = (Lymph_Node.CTLA4_mab*Ipilimumab_MW)/VL Lymph_Node.mAPC_cells_per_ml = mAPC/Vext_LN	Repeated Repeated
Lymph_Node.mAPC_lens_per_min = mAPC/vext_Lixt Lymph_Node.mAPC_Int_P1 = 0.001*mole+gt(Naive_T1,0)*gt(Primed_Naive_T1+Naive_T1,0)*( Naive_T1*[mAPC_per_T_cell] * gt(((Naive_T1 * mAPC)/(Primed_Naive_T1 + Naive_T1+1E-100*mole)) / (Naive_T1 *[mAPC_per_T_cell]+1E-100*mole),1) + (Naive_T1/(Primed_Naive_T1 + Naive_T1+1E-100*mole)) *mAPC* le(((Naive_T1 * mAPC)/(Primed_Naive_T1 + Naive_T1+1E-100*mole)) / (Naive_T1 * [mAPC_per_T_cell]+1E- 100*mole),1))	Repeated
Lymph_Node.mAPC_Int_P2 = 0.001*mole+gt(Primed_Naive_T1,0)*gt(Primed_Naive_T1+Naive_T1,0)*(Primed_Naive_T1*[mAPC_per_T_cell] * gt(((Primed_Naive_T1 * mAPC)/(Primed_Naive_T1 + Naive_T1+1E-100*mole)) / (Primed_Naive_T1 *[mAPC_per_T_cell]+ 1E-100*mole),1) + (Primed_Naive_T1/(Primed_Naive_T1 + Naive_T1+1E-100*mole)) *mAPC* le(((Primed_Naive_T1 * mAPC)/(Primed_Naive_T1 + Naive_T1+1E-100*mole)) / (Primed_Naive_T1 *[mAPC_per_T_cell]+ 1E-100*mole),1))	Repeated
Lymph_Node.mAPC_nInt = (mAPC - mAPC_Int_P1 - mAPC_Int_P2) * ge(mAPC - mAPC_Int_P1 - mAPC_Int_P2,0)	Repeated
Lymph_Node.mAPC_Total_Calc_Pr = (mAPC-mAPC_Int_P1-mAPC_Int_P2)*ge(mAPC-mAPC_Int_P1-mAPC_Int_P2,0) Lymph_Node.mAPC1 = mAPC - [TregLN_mAPC]	Repeated Repeated
Lymph_Node.Naive_T = Lymph_Node.Naive_T0	Initial
Lymph_Node.Naive_T0 = T_Cell_Clonality * [Copies-per-T_Cell_Clone]	Repeated
Lymph_Node.Naive_T2 = Naive_T - [TregLN-NT]	Repeated
Lymph_Node.NT1_Int1 = Naive_T+0.001*mole	Repeated
Lymph_Node.PD1_mabLN_ugml = (Lymph_Node.PD1_mab*Nivolumab_MW)/VL	Repeated
Lymph_Node.PDL1_mabLN_ugml = (Lymph_Node.PDL1_mab*Durvalumab_MW)/VL	Repeated
Lymph_Node.PNT1_Int = Lymph_Node.Primed_Naive_T1+0.001*mole Lymph_Node.Primed_Naive_T2 = Primed_Naive_T - [TregLN-PNT]	Repeated
Lympn_Node.rrimed_Naive_12 = Primed_Naive_1 - [TregLN-PN1] Lymph_Node.TregLN = ((Naive_T0)*([%_Tr_LN]/[%_NT_LN]) - TregLN_mAPC - [TregLN-NT] - [TregLN-	Repeated Repeated
PNT])*gt(mAPC,0)*(1-[CTLA4Sig_TrLN])	1
Lymph_Node.TregLN_mAPC1 = Lymph_Node.TregLN_mAPC + 0.001*mole Peripheral.CTLA4_leaky_ugml = (Peripheral.CTLA4_mabP_leaky*Ipilimumab_MW)/(0.35*ISF)	Repeated Repeated
Peripheral.CTLA4 tight ugml = (Peripheral.CTLA4 mabP tight*Ipilimumab MW)/(0.55*ISF)	Repeated
Peripheral.PD1_leaky_ugml = (Peripheral.PD1_mabP_leaky*Nivolumab_MW)/(0.35*ISF)	Repeated
Peripheral.PD1_tight_ugml = (Peripheral.PD1_mabP_tight*Nivolumab_MW)/(0.65*ISF)	Repeated
Peripheral.PDL1_leaky_ugml = (Peripheral.PDL1_mabP_leaky*Durvalumab_MW)/(0.35*ISF)	Repeated
Peripheral.PDL1_tight_ugml = (Peripheral.PDL1_mabP_tight*Durvalumab_MW)/(0.65*ISF)	Repeated
Precursor_Frequen_NT = Naive_T/[Total_T_CD8-CD4]	Repeated
Precursor_Frequen_PNT = Primed_Naive_T/[Total_T_CD8-CD4] Starting_Cancer_Diam_mm = Cancer_mm_Start_Therapy*0.95	Repeated Repeated
T Density = [Total T CD8-CD4]/((4/3)*pi*TDLN Radius^3)	Repeated
$TDLN_Radius = 10000*([Vol_per_TDLN]*(3/(4*pi)))^{(1/3)}$	Repeated
$ Total_TC_Sig = [Sig_T1=Total]*[% {Other}C] + [Sig_T2=Total]*[% {PD1}C] + [Sig_T3=Total]*[% {PDL1}C] + [Sig_T4=Total]*[% {PDL2}C] + [Sig_T5=Total]*[% {PD1}{L1}C] + [Sig_T7=Total]*[% {PD1}{L2}C] + [Sig_T8=Total]*[% {PDL1}{PDL2}C] + [Sig_T9=Total]*[% {PD1}{L1}C] + [Sig_T10=Total]*[% {PD1}{L2}C] + [Sig_T11=Total]*[% {PDL1}{80}C] + [Sig_T12=Total]*[% {PDL2}{80}C] + [Sig_T13=Total]*[% {PDL1}{80}{L2}C] + [Sig_T14=Total]*[% {PDL1}{80}{L1}C] + [Sig_T15=Total]*[% {PDL1}{80}{L2}C] + [Sig_T16=Total]*[% {PDL1}{80}{L1}C] + [Sig_T15=Total]*[% {PDL1}{80}{L1}C] + [Sig_T15=Total]*[% {PDL1}{80}{L1}C] + [Sig_T16=Total]*[% {PD1}{80}{L1}C] + [Sig_T15=Total]*[% {PDL2}C] + [Sig_T16=Total]*[% {PD1}{80}{L1}C] + [Sig_T15=Total]*[% {PD1}{80}{L1}C] + [Sig_T16=Total]*[% {PD1}{80}{L1}C] + [Sig_T15=Total]*[% {PD1}{80}{L1}C] + [Sig_T16=Total]*[% {PD1}{80}{L1}C] + [Sig_T16=Tota][% {PD1}{80}{L1}C] + [Sig_T16=Tota][Sig_T16=Tota][% {PD1}{80}{L1}C] + [Sig_T16=Tota][Sig_T16=Tota][Sig_T16=Tota][Sig_T16=Tota][Sig_T16=Tota][Sig_T16=Tota][Sig_T16=Tota][Sig_T16=Tota][Sig_T16=Tota][Sig_T16=Tota][Sig_T16=Tota][Sig_T16=Tota][Sig_T16=Tota][S$	Repeated
Total_Tumor_Void_Frac = Tumor_Void_Fraction + Frac_Vv_Tmr	Repeated
Tumor. $[C\{CD80\}] = 0.001*mole+TC1*[\%\{CD80\}C]$	Repeated
Tumor.[C{PD1}] = 0.001*mole+TC1*[%{PD1}C]	Repeated
Tumor. $[C{PD1}{CD80}] = 0.001$ *mole+TC1*[%{CD80}{PD1}C]	Repeated

Parameter and Species Assignment Equation	Assignment Type
Tumor. $[C{PD1}{PDL1}] = 0.001*mole+TC1*[%{PD1}{L1}C]$	Repeated
Tumor. $[C{PD1}{PDL1}{CD80}] = 0.001*mole+TC1*[%{PD1}{80}{L1}C]$	Repeated
Tumor. $[C{PD1}{PDL1}{PDL2}] = 0.001*mole+TC1*[%{PD1}{L1}{L2}C]$	Repeated
Tumor. $[C{PD1}{PDL1}{PDL2}{CD80}] = 0.001*mole+TC1*[%{PD1}{80}{L1}{L2}C]$	Repeated
Tumor. $[C{PD1}{PDL2}] = 0.001*mole+TC1*[%{PD1}{L2}C]$	Repeated
Tumor. $[C{PD1}{PDL2}{CD80}] = 0.001 * mole + TC1 * [%{PD1}{80}{PDL2}C]$	Repeated
Tumor.[C{PDL1}] = 0.001*mole+TC1*[%{PDL1}C]	Repeated
Tumor. $[C{PDL1}{CD80}] = 0.001*mole+TC1*[%{PDL1}{80}C]$	Repeated
Tumor. $[C{PDL1}{PDL2}] = 0.001*mole+TC1*[%{PDL1}{PDL2}C]$	Repeated
Tumor.[C{PDL1}{PDL2}{CD80}] = $0.001$ *mole+TC1*[%{PDL1}{80}{L2}C]	Repeated
Tumor.[C{PDL2}] = 0.001*mole+TC1*[%{PDL2}C]	Repeated
Tumor.[C{PDL2}{CD80}] = $0.001$ *mole+TC1*[%{PDL2}{80}C]	Repeated
Tumor.[T{PD1}{80}-{PDL1}{PDL2}C] = 0.001*mole+TC2*[%{PDL1}{PDL2}C]	Repeated
Tumor. $[T{PD1}{CD80}-{PDL1}C] = 0.001*mole+TC2*[%{PDL1}C]$	Repeated
Tumor. $[T{PD1}{L1}{80}-{PD1}{80}{L1}{L2}C] = 0.001*mole+TC2*[%{PD1}{80}{L1}{L2}C]$	Repeated
$Tumor.[T{PD1}{L1}{80}-{PD1}{80}{L1}C] = 0.001*mole+TC2*[%{PD1}{80}{L1}C]$	Repeated
Tumor. $[T{PD1}{L1}{80}-{PD1}{L1}{L2}C] = 0.001*mole+TC2*[%{PD1}{L1}{L2}C]$	Repeated
Tumor. $[T{PD1}{L1}{B0}-{PD1}{L1}C] = 0.001*mole+TC2*[%{PD1}{L1}C]$	Repeated
Tumor. $[T{PD1}{L1}{PD1}{80}{PDL2}C] = 0.001*mole+TC2*[%{PD1}{80}{PDL2}C]$	Repeated
$Tumor.[T{PD1}{L1}{PD1}{L2}C] = 0.001*mole+TC2*[%{PD1}{L2}C]$	Repeated
Tumor. $[T{PD1}{L1}-{PDL1}{80}{L2}C] = 0.001*mole+TC2*[%{PDL1}{80}{L2}C]$	Repeated
Tumor.[T{PD1}{L1}-{PDL1}{80}C] = $0.001*$ mole+TC2*[%{PDL1}{80}C]	Repeated
$Tumor.[T{PD1}{L1}-{PDL2}{80}C] = 0.001*mole+TC2*[%{PDL2}{80}C]$	Repeated
$Tumor.[T{PD1}-{PDL2}C] = 0.001*mole+TC2*[%{PDL2}C]$	Repeated
Tumor. $[T{PDL}] - {CD80}{PD1}C] = 0.001 mole + TC2 *[%{CD80}{PD1}C]$	Repeated
$Tumor.[T{PDL1}-{CD80}C] = 0.001 \text{ mole}+TC2^{*}[\% {CD80}C]$	Repeated
Tumor. $[T{PDL}] - {PD1}C = 0.001 \text{ mole} + TC2*[% {PD1}C]$	Repeated
Tumor. Cancer =	Initial
(4/3)*pi*((Starting_Cancer_Diam_mm/2)^2)*((Starting_Cancer_Diam_mm*Tumor_Vol_Ellipse_c_ratio)/2)*(1/((4/3)*pi*((	Initia
Cancer_Cell_Diam_um/2000)^3)))*(1-Total_Tumor_Void_Frac)*mole	
Tumor.Cancer1 = (Cancer-TC1)*ge(Cancer-TC1,0)	Repeated
Tumor.CTLA4_mabt_ugml = (Tumor.CTLA4_mabt*Ipilimumab_MW)/Vex_Tmr	Repeated
Tumor.Effector_TT_C_Eng = (Effector_TT-TregT_Teff - MDSCsT_Teff - TC2-T_Recover_Can_Dead)*ge(Effector_TT-	Repeated
TC2-T_Recover_Can_Dead,0)	Repeated
Tumor.Effector_TT_Count = Effector_TT + Effector_TT_Res	Repeated
Tumor.Effector_TT_MDSCs = Effector_TT-TregT_Teff - MDSCsT_Teff - TC1	Repeated
Tumor.Effector TT_per_mL = Effector_TT_Count/Vex_Tmr	Repeated
Tumor.Effector_TT_per_Treg = (Effector_TT_Count/(Cancer*[%T_Tregs_per_Cancer]/100))*ge(Cancer,10*mole)	Repeated
Tumor.Effector_TT_TregT = Effector_TT-TregT_Teff - MDSCsT_Teff - TC1	Repeated
Tumor.mAPCT_EngTregT = mAPC_T+0.001*mole	Repeated
Tumor.MDSC_T = (Cancer*[%T_Tregs_per_Cancer]/100)*[MDSCs_per_Treg] -MDSCsT_Teff	Repeated
Tumor.MDSCsT_EngTeff = MDSCsT_Teff+0.001*mole	Repeated
Tumor.PD1 mab1 ugml = (Tumor.PD1 mabt*Nivolumab MW)/Vex Tmr	Repeated
Tumor.PDL1_mabT_ugml = (Tumor.PDL1_mabt*Durvalumab_MW)/Vex_Tmr	Repeated
Tumor.TC2 = TC1*T_per_Cancer_Cell_Int	Repeated
Tumor.Teff_EngMDSC = MDSCsT_Teff+0.001*mole	Repeated
Tumor.Teff_EngTregT = TregT_Teff+0.001*mole	Repeated
Tumor.Tmr_Free_Sites = Vv_Tmr*Adhesion_Density_Tmr-EffT_b_Vasc-EffT_AR_Vasc	Repeated
Tumor.TregT = (((Cancer*[%T Tregs per Cancer]/100)) - TregT Teff)*(1-[Sig TrAPCT=Total])	Repeated
Tumor.TregT_EngAPC = mAPC_T+0.001*mole	Repeated
Tumor.TregT_EngTeff = TregT_Teff+0.001*mole	Repeated
Vex_Tmr = (Total_Tumor_Void_Frac - Frac_Vv_Tmr)*Vt_Teff	Repeated
$Vex_1mn = (10tar_1mnor_vold_1rac - 1rac_vv_1mn)$ $Ve_1en$ $Vt = Vex_1mr + ml_correct$	Repeated
$vt = vex_1 m + m_conect$ $Vt_Teff = ([Cancer_Vol_cm3]*0.001+1E-20)*L$	Repeated
Vv_Tmr = Vt_Teff*Frac_Vv_Tmr	Repeated

Table S6 – Model Algebraic Equations (End)

Table S7 – Model Discontinuous Equation Sets (Start)

Trigger	Event Functions	Description
CTLA4_counter_on<=time	CTLA4_counter_off = time+0.0625*day;CTLA4mAb =	CTLA4 counter for
	CTLA4mAb_Dose*EndTherapy	dosing

Trigger	Event Functions	Description
CTLA4_counter_off<=time	$CTLA4_counter_on = time+Dose_sched_CTLA4 - 0.0695*dewCTLA4 - 0.0$	CTLA4 counter for
time>=CTLA4_change_schedule	0.0625*day;CTLA4mAb = 0*(mg/kg) CTLA4mAb = 0*(mg/kg);CTLA4mAb_Dose = CTLA4mAb_New_Dose;New_sched_CTLA4 = 365*day + time;Dose_sched_CTLA4 = New_sched_CTLA4	dosing CTLA4 change schedule for dosing
PD1_counter_on<=time	PD1_counter_off = time+0.0416666*day;PD1mAb = PD1mAb Dose*EndTherapy	PD1 counter for dosing
PD1_counter_off<=time	PD1_counter_on = time+Dose_sched_PD1 - 0.0416666*day;PD1mAb = 0*(mg/kg)	PD1 counter for dosing
time>=PD1_change_schedule	PD1mAb = 0*(mg/kg);PD1mAb_Dose = PD1mAb_New_Dose;Dose_sched_PD1 = New_sched_PD1;PD1_change_schedule = 1500*day	PD1 change schedule for dosing
PDL1_counter_off<=time	PDL1_counter_on = time+Dose_sched_PDL1 - 0.0416666*day;PDL1mAb = 0*(mg/kg)	PDL1 counter for dosing
time>=PDL1_change_schedule	PDL1mAb = 0*(mg/kg);PDL1mAb_Dose = PDL1mAb_New_Dose;Dose_sched_PDL1 = New_sched_PDL1;PDL1_change_schedule = 1500*day	PDL1 change schedule for dosing
PDL1_counter_on<=time	PDL1_counter_off = time+0.0416666*day;PDL1mAb = PDL1mAb_Dose*EndTherapy	PDL1 counter for dosing
Cancer<=1*mole	TheEnd = 0	End extravasation at tumor death
Cancer<=1.446759259259259e+05*mole	EndTherapy = 0;Time_Tumor_Death = time	Stop therapy at tumor death
Cancer_Diam_mm>=Cancer_mm_Start_Therapy	CTLA4mAb_Dose = CTLA4_DoseSet*(mg/kg);CTLA4_counter_on = time+0.0001*day;CTLA4_counter_off = CTLA4_counter_on + 0.0625*day;CTLA4_change_schedule = time + 64*day;Cancer_mm_Start_Therapy = Cancer_mm_Start_Therapy =100;Time_Start_Therapy =	
Cancer_Diam_mm>=Cancer_mm_Start_Therapy	<pre>time;TCytokineHoming = 100 CTLA4mAb_Dose = CTLA4_DoseSet* (mg/kg);CTLA4_counter_on = time+0.0001*day;CTLA4_counter_off = CTLA4_counter_on + 0.0625*day;CTLA4_change_schedule = time + 64*day;PD1_counter_onf = PD1_counter_on + 0.0416666*day;PD1mAb_Dose = PD1_DoseSet* (mg/kg);PD1_change_schedule = time + 64*day;Cancer_mm_Start_Therapy = Cancer_mm_Start_Therapy = Cancer_mm_Start_Therapy = time;TCytokineHoming = 100</pre>	CTLA4 dosing CTLA4 and PD1 dosing
Cancer_Diam_mm>=Cancer_mm_Start_Therapy	CTLA4mAb_Dose = CTLA4_DoseSet* (mg/kg);CTLA4_counter_on = time+0.0001*day;CTLA4_counter_off = CTLA4_counter_on + 0.0625*day;CTLA4_change_schedule = time + 64*day;PD1_counter_on = time+85.0001*day;PD1_counter_off = PD1_counter_on + 0.0416666*day;PD1mAb_Dose = PD1_DoseSet* (mg/kg);Cancer_mm_Start_Therapy = Cancer_mm_Start_Therapy*100;Time_Start_Therapy = time;TCytokineHoming = 100	CTLA4 then PD1 dosing
Cancer_Diam_mm>=Cancer_mm_Start_Therapy && time<=150*day	PD1mAb_Dose = PD1_DoseSet* (mg/kg);PD1_counter_on = time+0.0001*day;PD1_counter_off = PD1_counter_on + 0.0416666*day;PD1_change_schedule = time + 71.0001*day;CTLA4_counter_on = time+85.0001*day;CTLA4_counter_off = CTLA4_counter_on + 0.0625*day;CTLA4_change_schedule = time + 64*day + 85.0001*day;CTLA4_change_schedule = time + 64*day + 85.0001*day;CTLA4_nab_Dose = CTLA4_DoseSet* (mg/kg);Cancer_mm_Start_Therapy = Cancer_mm_Start_Therapy = time;TCytokineHoming = 100	PD1 then CTLA4 dosing: set CTLA4 and PD1 dosing

Trigger	Event Functions	Description
Cancer_Diam_mm>=Cancer_mm_Start_Therapy	PD1_counter_on = time+0.0001*day;PD1_counter_off = PD1_counter_on + 0.0416666*day;PD1mAb_Dose = PD1_DoseSet*(mg/kg);Cancer_mm_Start_Therapy =	
Cancer_Diam_mm>=Cancer_mm_Start_Therapy	Cancer_mm_Start_Therapy*100;Time_Start_Therapy = time;TCytokineHoming = 100 PDL1mAb_Dose = PDL1_DoseSet*	PD1 dosing
	(mg/kg);PD1mAb_Dose = PD1_DoseSet* (mg/kg);PDL1_counter_on = time+0.0001*day;PD1_counter_on =	
	time+0.0001*day;PDL1_counter_off = PDL1_counter_on + 0.0416666*day;PD1_counter_off = PD1_counter_on + 0.0416666*day;Cancer_mm_Start_Therapy =	
Cancer Diem mm -Concer mm Start Thereau	Cancer_mm_Start_Therapy*100;Time_Start_Therapy = time;TCytokineHoming = 100	PD1 and PDL1 dosing
Cancer_Diam_mm>=Cancer_mm_Start_Therapy	PDL1_counter_on = time+0.0001*day;PDL1_counter_off = PDL1_counter_on + 0.0416666*day;PDL1mAb_Dose = PDL1_DoseSet*(mg/kg);Cancer_mm_Start_Therapy =	
Cancer_Diam_mm>=Cancer_mm_Start_Therapy	Cancer_mm_Start_Therapy*100;Time_Start_Therapy = time;TCytokineHoming = 100 CTLA4mAb_Dose = CTLA4_DoseSet*	PDL1 dosing
	(mg/kg);CTLA4_counter_on = time+0.0001*day;CTLA4_counter_off = CTLA4_counter_on + 0.0625*day;CTLA4_change_schedule = time +	
	64*day;PDL1_counter_on = time+0.0001*day;PDL1_counter_off = PDL1_counter_on + 0.0416666*day;PDL1mAb_Dose = PDL1_DoseSet*	
	(mg/kg);PDL1_change_schedule = time + 64*day;Cancer_mm_Start_Therapy = Cancer_mm_Start_Therapy*100;Time_Start_Therapy =	CTLA4 and PDL1
	time;TCytokineHoming = 100	dosing
Cancer_Diam_mm>=Cancer_mm_Start_Therapy	CTLA4mAb_Dose = CTLA4_DoseSet* (mg/kg);CTLA4_counter_on = time+0.0001*day;CTLA4_counter_off = CTLA4_counter_off =	
	CTLA4_counter_on + 0.0625*day;CTLA4_change_schedule = time + 64*day;PDL1_counter_on =	
	<pre>time+0.0001*day;PDL1_counter_off = PDL1_counter_on + 0.0416666*day;PDL1mAb_Dose = PDL1_DoseSet* (mg/kg);PDL1_change_schedule = time +</pre>	
	64*day;PD1_counter_on = time+0.0001*day;PD1_counter_off = PD1_counter_on + 0.0416666*day;PD1mAb_Dose = PD1_DoseSet*	
	(mg/kg);PD1_change_schedule = time + 64*day;Cancer_mm_Start_Therapy = Cancer_mm_Start_Therapy*100;Time_Start_Therapy =	CTLA4, PD1 and
time>=Time_Start_Therapy + 163*day	time;TCytokineHoming = 100 PD1mAb_New_Dose = PD1_DoseSet*	PDL1 dosing
	(mg/kg);PD1_change_schedule = 2000*day;PD1mAb_Dose = PD1_DoseSet* (mg/kg);TCytokineHoming = 100	PD1 then CTLA4 therapy: set delayed PD1 dosing
Cancer_Diam_mm>=Cancer_mm_Start_Therapy	Time_Start_Therapy = time	Time to start therapy once tumor diameter reaches a certain threshold

Table S7 – Model Discontinuous Equation Sets (End)

Table S8 – Model Compartment Volumes (Start)
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Compartment	Variable	Volume	Units	Reference	Description
Blood-Lymph	Vc_CTLA4	2.727814034	liter	[15]	Volume of the central compartment for Anti-CTLA-4
Blood-Lymph	Vc_PD1	2.716739643	liter	[25]	Volume of the central compartment for Anti-PD-1
Blood-Lymph	Vc_PDL1	4.051599814	liter	[26, 27]	Volume of the central compartment for Anti-PD-L1

Compartment	Variable	Volume	Units	Reference	Description
		2.7			Volume of blood through which Effector T cells circulate
Blood-Lymph	Vc_Teff	10	liter	[13, 93]	throughout the body
Liv_Spln_GI	Vv_GI	43	ml	[13]	Vasculature volume of GI for Effector T cell trafficking
Liv_Spln_GI	Vext_Liver	361.8	ml	[13]	Volume of Liver interstitium for Effector T cell trafficking
Liv_Spln_GI	Vv_Liver	180.9	ml	[13]	Vasculature volume of Liver for Effector T cell trafficking
	Vext_Spleen	34.7			Volume of Spleen interstitium for Effector T cell
Liv_Spln_GI			ml	[13]	trafficking
	Vv_Spleen	17	ml		Vasculature volume of Spleen for Effector T cell
Liv_Spln_GI				[13]	trafficking
	Vext_Lungs	299.7			Volume of Lungs interstitium for Effector T cell
Lungs			ml	[13]	trafficking
Lungs	Vv_Lungs	99.9	ml	[13]	Vasculature volume of Lungs for Effector T cell trafficking
	Vext_LN	34.7			Volume of Lymph Node interstitium for Effector T cell
Lymph_Node			ml	[13]	trafficking
Lymph_Node	VL	5.2	liter	[56, 94]	Volume of total Lymph for antibody PK
Lymph_Node	Vtdln	5.2	liter	[56, 94]	Volume of total Lymph for antibody PK
Lymph Node	Vv_LN	17	ml	[13]	Vasculature volume of Lymph Node for Effector T cell trafficking
Peripheral	ISF	15.9	liter	[56]	Volume of interstitial fluid (ISF) is tissues for antibody PK
	Vv_Periph	1355.4	ml	[]	Vasculature volume of Peripheral (other tissue not
Peripheral	· · · · · · · · · ·			[13]	accounted for) for Effector T cell trafficking
	Vex Tmr	~50% (void		[13]	
		space) of total		Calculated	
Tumor		tumor volume	ml	dynamically	Volume of Tumor interstitium
	Vt Teff	Based on		Calculated	Total tumor volume calculated from cancer cell number,
Tumor		Cancer_Vol_cm3	liter	dynamically	void space and tumor vasculature
	Vv Tmr	~7% of total	ml	[13]	······································
		tumor volume		Calculated	Vasculature volume of Tumor based on fraction of total
Tumor		tunior volunio		dynamically	tumor volume

Table S8 – Model Compartment Volumes (End)

## Table S9 – Parameters Varied in Virtual Clinical Trials (Start)

Parameter Name in Model	Value Range	Units	Source	Description
%PDL1_Exp_Cancer	40-90; Median: 75	dimensionless	[11]	Percent of cancer cells of total cancer cells that are PD-L1 positive that interact with the Effector T cells in the tumor compartment.
	0-0.25; Median: 0.13	dimensionless	Assumed as recruited by tumor	Defines the percentage of Regulatory T cells in the tumor compartment as a percent of total tumor cells.
%T_Tregs_per_Cancer	5-35; Median: 20	dimensionless	[1, 3-5]	Percent Regulatory T cells of total T cells in each lymph node.
Antigen_Intensity	Assigned from 0.8-1.0 for melanoma (on a scale of 0.1- 1.0); Median: 0.9	dimensionless	Upper range of cancer types [14]	Defines the strength of the TAA/TSA that are involved in priming of the T cells in the lymph nodes. Also known as antigen strength.
AntSpread	$x = 2$ (Where it is used as $10^x$ )	dimensionless	Estimated during fitting to anti-PD-1 data	Sets the number of TAA/TSA released per cancer cell upon natural death and decay or following cytotoxic killing. The value is used to set a multiple of cancer cells in the formation of debris for APC maturation.
Cancer_mm_Start_Therapy	15-80; Median: 40	mm	Approximated based on reported literature range	Diameter of the tumor when to start the therapeutic regimen.
Chemokine	100	dimensionless	Estimated during fitting to anti-PD-1 data	The chemokine factor to promote extravasation of effector T cells into the tumor.

Parameter Name in Model	Value Range	Units	Source	Description
T_Cell_Clonality	10-130; Median: 70	cell	[28, 30, 85]	Number of Naïve T cells populations specific for different tumor antigens; in other words; the number of anti-tumor T cell clones in each lymph node.

Table S9 – Parameters Varied in Virtual Clinical Trials (End)

Table S10 -	Parameters	Varied in	Sensitivity	Analysis (Start)
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Parameter Name in Model	Value Range	Units	Source	Description
				Percent of cancer cells of total cancer cells that are
%CD80 Exp Cancer	1-100	dimensionless	[6-8]	CD80 positive that interact with the Effector T cells in the tumor compartment.
/veboo_Exp_cancer	1 100	dimensionness	[0 0]	Percent of cancer cells of total cancer cells that are
				PD-1 positive that interact with the Effector T cells
%PD1_Exp_Cancer	1-100	dimensionless	[9]	in the tumor compartment.
- •-				Percent of cancer cells of total cancer cells that are
				PD-L1 positive that interact with the Effector T
%PDL1_Exp_Cancer	1-100	dimensionless	[11]	cells in the tumor compartment.
				Percent of cancer cells of total cancer cells that are
				PD-L2 positive that interact with the Effector T
%PDL2_Exp_Cancer	1-100	dimensionless	[12]	cells in the tumor compartment.
			Assumed as	Defines the percentage of Regulatory T cells in the
	0.0.05		recruited by	tumor compartment as a percent of total tumor
%T_Tregs_per_Cancer	0-0.25	dimensionless	tumor	cells.
9/ T- IN	5 25	dimension1c	[1 2 5]	Percent Regulatory T cells of total T cells in each
%_Tr_LN	5-35	dimensionless	[1, 3-5]	lymph node.
	Assigned from 0.8-1.0 for		Upper range of	Defines the strength of the TAA/TCA that are
	melanoma (on a		Upper range of cancer types	Defines the strength of the TAA/TSA that are involved in priming of the T cells in the lymph
Antigen_Intensity	scale of 0.1-1.0)	dimensionless	[14]	nodes. Also known as antigen strength.
Anugen_Intensity	scale of 0.1-1.0)	unnensionness	Estimated	Sets the number of TAA/TSA released per cancer
			during fitting to	cell upon natural death and decay or following
	x = 1-5 (Where		anti-PD-1 data	cytotoxic killing. The value is used to set a
	it is used as		and varied	multiple of cancer cells in the formation of debris
AntSpread	$10^{x}$	dimensionless	across range	for APC maturation.
» <b>F</b>	/		Assigned based	
			on reported	Longest diameter of the tumor when to start the
Cancer_mm_Start_Therapy	5-80	mm	literature range	therapeutic regimen.
			Estimated	
			during anti-PD-	
			1 therapy	
			fitting; varied in	
			sensitivity	The chemokine factor to promote extravasation of
Chemokine	50-500	dimensionless	analysis	effector T cells into the tumor.
	0.2.10		Based on	
CTLA4_DoseSet	0.3-10	mg/kg	regimen	Dose of anti-CTLA-4 therapy
mADC activation lavel	0110	dimensionless	[12]	The fraction of CD80 and CD86 expression on the mAPCs from 0.1-1.
mAPC_activation_level	0.1-1.0	umensionless	[13] Varied across	marcs from 0.1-1.
			range (5-95%)	
			and estimated	The fraction of tumor debris that is considered to
			during fitting to	not be transported to the lymph nodes and is
mAPC_Debis_T_Inact	0.05-0.95	dimensionless	anti-PD-1 data	removed from the system.
	2.00 0.90		Based on	
PD1_DoseSet	0.03-2	mg/kg	regimen	Dose administered of anti-PD-1 therapy.
			Based on	
PDL1_DoseSet	0.003-0.1	mg/kg	regimen	Dose administered of anti-PD-L1 therapy.
				Proliferation rate of cancer cells that defines the
				volumetric doubling time of the tumor.
				64 day metastatic doubling: 0.010955675075414
	64-144 day			144 day non-metastatic doubling:
Rate_Tumor_Growth	doubling time	1/day	[81]	0.004913635262592.

Parameter Name in Model	Value Range	Units	Source	Description
T Cell Clonality	5-130	cell	[28, 30, 85]	Number of Naïve T cells populations specific for different tumor antigens; in other words; the number of anti-tumor T cell clones in each lymph node.

Table S10 Parameters Varied in Sensitivity Analysis (End)

Table S11 –	Conditions S	pecific to Each	Clinical Scenario	Simulated (Start)
I GOIC DII	Contaitions o	pecific to Buch	Chillean Scenario	Simulated (Start)

Fig ·	Tiral	Dose/Regimen	Patients Simulated	Parameter ranges and medians
2	Anti-PD-1	3 mg/kg, Q2W	200	Same for all simulations: Table S9 for references and ranges. Latin Hypercube Sampling (LHS) with equal distribution was utilized for simulations.
3	Anti-PD-1 with Anti-CTLA-4	3 mg/kg anti-CTLA-4 and 1 mg/kg anti-PD-1 Q3W, 4 doses combo; while anti-PD-1, 8 doses; then, combo Q12W	47	
4	Anti-PD-L1	20 mg/kg, Q2W	200	
5	Anti-PD-1 and Anti-CTLA-4 Sequential Therapy	<ul> <li>3 mg/kg anti-CTLA-4 and 3 mg/kg anti-PD-1</li> <li>a) Q3W anti-CTLA-4, 4 doses; Q2W anti-PD-1</li> <li>b) Q2W anti-PD-1, 6 doses; Q3W anti-CTLA-4, 4 doses; Q2W anti-PD-1</li> </ul>	200	
<b>S1</b>	Anti-CTLA-4	3 and 10 mg/kg, Q3W, 4 doses; then, Q12W	200	
S2	Anti-PD-L1 with Anti-CTLA-4	1 mg/kg anti-CTLA-4 and 20 mg/kg anti-PD-L1 Q3W, 4 doses combo; anti-PD-L1 Q2W	200	
<b>S</b> 3	Anti-PD-1 with Anti-PD-L1	3 mg/kg anti-PD-1 and 20 mg/kg anti-PD-L1, Q2W	200	

Table S11 – Conditions Specific to Each Clinical Scenario Simulated (End)

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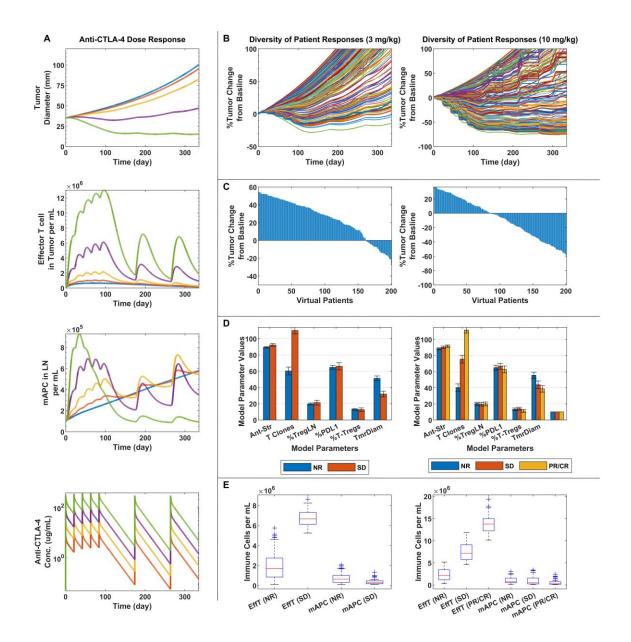
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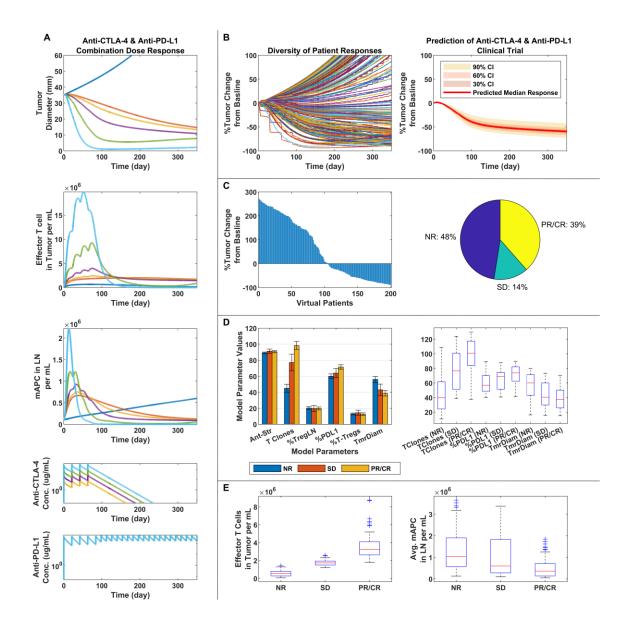
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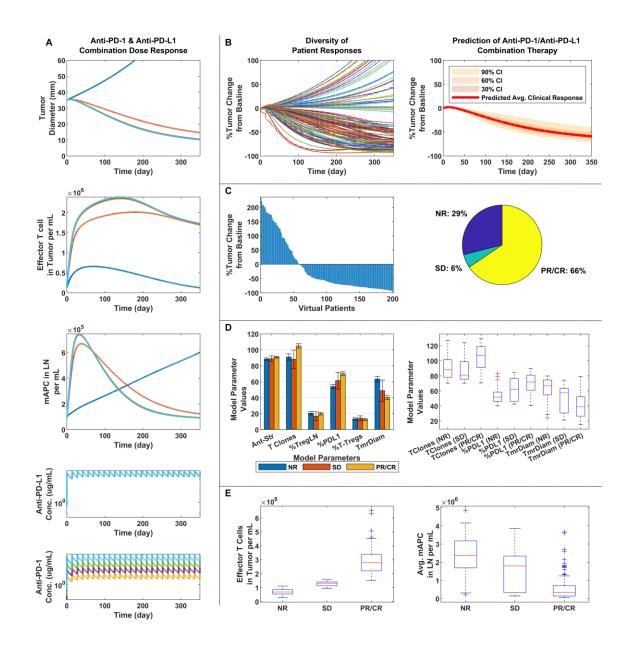


**Figure S1. Dose response anti-CTLA-4 mono-therapy. A)** From top to bottom: Tumor response to anti-CTLA-4 therapy at doses of 0.3, 1, 3 and 10 mg/kg as represented by the colors in the bottom figure in ascending order; the blue line indicates no therapy in the top figure. Then, Effector T cell density in the tumor (second from the top), mAPC density in the lymph nodes (third from the top) and finally, the PK of anti-CTLA-4 at the given doses. B) Diversity of tumor response for 3 mg/kg (left) and 10 mg/kg (right). **C)** Waterfall plot of VPs at 3 mg/kg (left) and 10 mg/kg (right). **D)** Bar graph comparison parameters varied in model for each type of responder at 3 mg/kg (left) and 10 mg/kg (right). **E)** Max Effector T cell density in the tumor and average mAPC density in the lymph nodes for each responder category at 3 mg/kg (left) and 10 mg/kg (right).



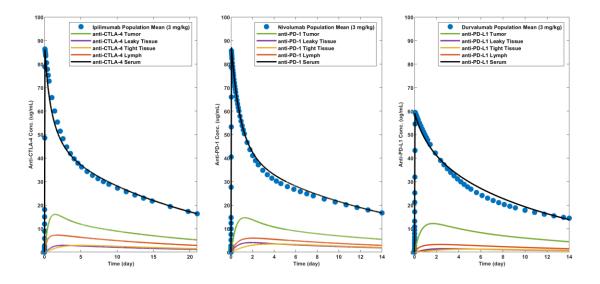
**Figure S2.** Dose response and clinical validation of anti-CTLA-4/anti-PD-L1 combo-therapy. A) From top to bottom: Tumor response to combination therapy at doses of 0.3, 1, 3 and 10 mg/kg of anti-CTLA-4, as represented by the colors in the second from the bottom figure in ascending order and 20 mg/kg for anti-PD-L1 was used for all simulations; the blue line indicates no therapy (top figure), and orange indicates only anti-PD-L1. Then, Effector T cell density in the tumor (second from the top), mAPC density in the lymph nodes (third from the top) and finally, the PK of anti-CTLA-4 and lastly, anti-PD-L1 at the given doses. For all following figures, 20 mg/kg anti-PD-L1 and 1 mg/kg anti-CTLA-4 were used, following the same regimen. **B)** Diversity of tumor response (left), prediction of median clinical response data (right). **C)** Waterfall plot of VPs (left) and pie chart (right) with percent of virtual non-responders (NR), stable disease (SD) and partial or complete responders (PR/CR). **D)** Bar graph comparison parameters varied in model for each responder type (left) and box plots of significant differentiators (right). **E)** Max

Effector T cell density in the tumor (left) and average mAPC density in the lymph nodes (right) for each responder category.

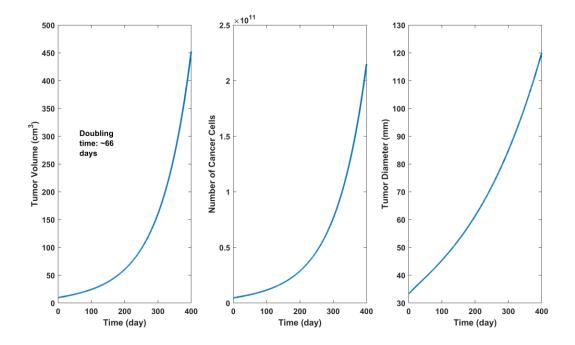


**Figure S3. Dose response and clinical validation of anti-PD-1/anti-PD-L1 combo-therapy. A)** From top to bottom: Tumor response to combination therapy at doses of 0.3, 1, 3 and 10 mg/kg of anti-PD-1, as represented by the colors in the bottom figure in ascending order and 20 mg/kg for anti-PD-L1 was used for all simulations; the blue line indicates no therapy (top figure), and orange indicates only anti-PD-L1. Then, Effector T cell density in the tumor (second from the top), mAPC density in the lymph nodes (third from the top) and finally, the PK of anti-PD-L1 and lastly, anti-PD-1 at the given doses. For all following

figures, 20 mg/kg anti-PD-L1 and 3 mg/kg anti-PD-1 was used, following the same regimen. **B)** Diversity of tumor response (left), prediction of median clinical response data (right). **C)** Waterfall plot of VPs (left) and pie chart (right) with percent of virtual non-responders (NR), stable disease (SD) and partial or complete responders (PR/CR). **D)** Bar graph comparison parameters varied in model for each responder type (left) and box plots of significant differentiators (right). **E)** Max Effector T cell density in the tumor (left) and average mAPC density in the lymph nodes (right) for each responder category.

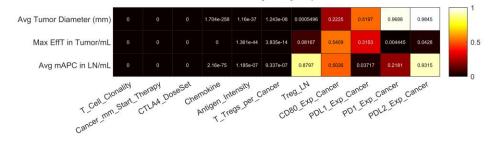


**Figure S4.** Pharmacokinetics of A) anti-CTLA-4, B) anti-PD-1 and C) anti-PD-L1 at 3 mg/kg each in the serum, tumor, leaky and tight tissues, lymph and serum. Results are based on a minimal-PBPK model, combined with tumor transport equations with diffusion across the vascular surface area.



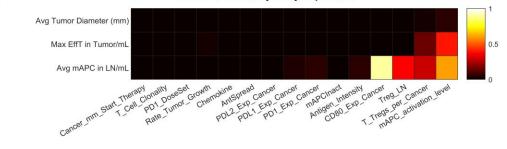
**Figure S5. Simulation of tumor volume doubling time (left) and associated number of cancer cells (middle) and tumor diameter (right).** A tumor doubling time of ~66 days was used for all model simulations. Variability in tumor growth was an emergent outcome for each simulation in the model.

Anti-CTLA-4 Sensitivity Analysis p-values





Anti-PD-1 Sensitivity Analysis p-values



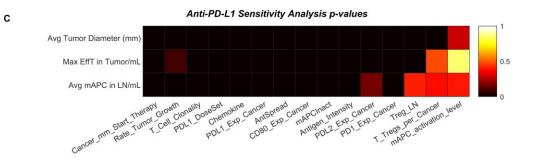


Figure S6. Sensitivity analysis p-values for A) anti-CTLA-4, B) anti-PD-1 and C) anti-PD-L1.

Α

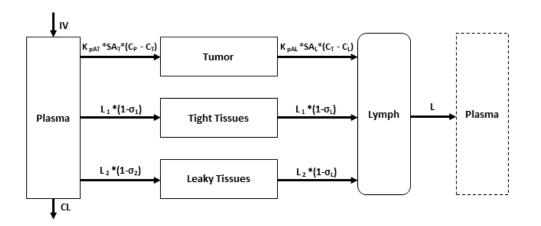
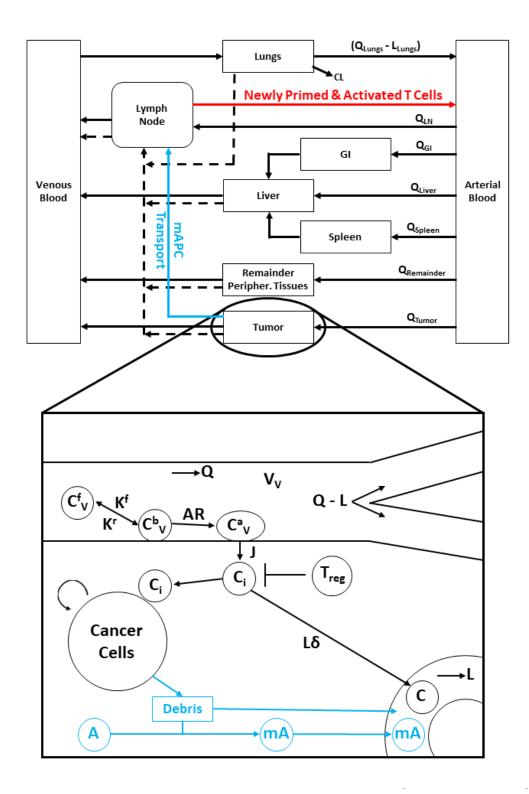
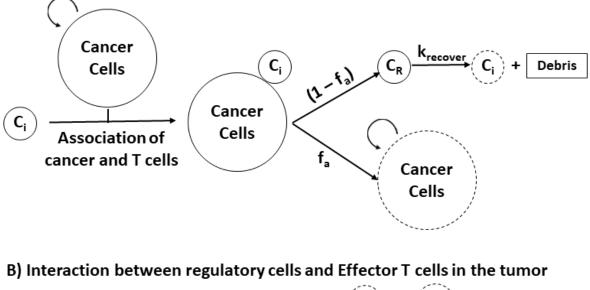


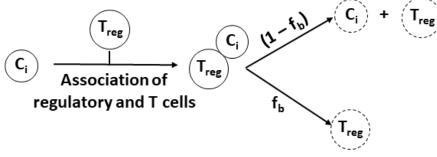
Figure S7. Minimal PBPK model of antibody distribution used in the QSP model.



**Figure S8. PBPK model cell trafficking used in the QSP model.** Model PBPK of Effector T cell (C) trafficking through the tissues in the model via the blood (solid black lines) and lymph (dotted black

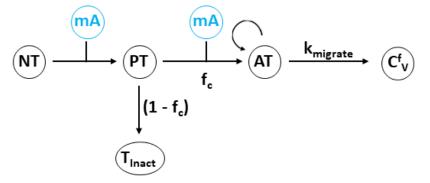
lines). Also represented is the trafficking of newly primed and activated Effector T cells from the lymph node to the blood for redistribution (solid red line) the trafficking of mature APCs (solid blue line) to the lymph nodes for priming and activation of naïve T cells to Effector T cells. Cancer Debris also enter the lymph fluid and is brought to the lymph node from the tumor. The bottom panel shows how free Effector cells ( $C_V$ ) in the tumor vasculature are bound the vascular wall ( $C_V$ ), arrested ( $C_V$ ), extravasated (via rate J) into the interstitial space ( $C_i$ ) to interact with the cancer cells. Regulatory cells ( $T_{reg}$ ) inhibit the activity of the Effector cells in the tumor and APCs (A) pick up debris to become mAPC (mA). Effector cells can exit the interstitial space (via rate L $\delta$ ) and recirculate through the lymphatic system.





A) Interaction between cancer and Effector T cells in the tumor

C) Priming and activation of naïve T cells in the tumor draining lymph node



**Figure S9. Abstract representation of cell-cell interactions in the model.** A) Effector T cells in the interstitial space of the tumor (C_i) interact with cancer cells to form a bound complex (at a rate defined

by the De Pillis-Radunskaya equation described in the methods, equation 1.3). The complex then dissociates with the regeneration of cancer cells and Effector cells relative to the fraction of active checkpoint signaling ( $f_a$ ). If checkpoint signaling is fully active at inhibiting the Effector cells, for example, then only the cancer cells are regenerated (f_a = 1). Alternatively, is antibodies block the signaling to full effect ( $f_a = 0$ ), then only the Effector cells emerge from the bound interaction; along with cancer cell debris that can promote further priming and activation of Effector cells in the lymph nodes. The value of signaling comes out to be between 0 and 1 and is dependent on the checkpoint signaling and interactions with the antibodies that block it. The emerging Effector T cells undergo a recovery delay ( $C_R$ ) before engaging in interactions with other cancers cells. B) Similarly, as described above, Effector T cells in the tumor interstitial space can interact with regulatory cells ( $T_{reg}$ ) to form a state variable representing a bound complex. The dissociation of the bound complex determines to what extent the Effector cells are regenerated, which is directly a function of the checkpoint signaling ( $f_b$ ). C) Mature APCs (mA) interact with naïve and primed T cells (NT and PT, respectively) during two priming stages in the lymph node. Depending on the extent of checkpoint signaling ( $f_c$ ), primed T cells either become anergic ( $T_{\text{Inact}}$ ) and/or activated T cells (AT); the latter proliferate and become Effector T cells ( $C_V$ ) that migrate out into peripheral circulation.