

**Table S1 Protein and gRNA sequences of Cas $\pi$  systems.**

ID	Description	Sequences (N terminal – C terminal for protein; 5'-3' for nucleotides)
Cas $\pi$ -1-Protein	Native protein sequence of Cas $\pi$ -1 nuclease.	<p>MAKATKEVKSKRVEALRQVAYQRLERLERKA            QKIGAHLRKP GKAADLQSLHYLLHKVEVEYHD            IARNLEKDPTWTPKPKMRREKRAIVPESGPAAP            LPTTAKGEPGRPANRHIPPPVPLDSARIPEDQQS            MGQGSGRSWCSAPFVEVKLPPTQWSNVREK            LLKFRIEDDADIVRRWAEAKFGSIETARDGLRA            SAEIGTSPDVWRSFISRAISNGKKDFEPLLSLDD            DELTADATAAERVVRRWHQIDWVGRMLDSILET            VPSGVSKDTRSRVESRLKTFHSSVNSFELKKR            KDGTVERKRKHTNPQFPYLSAVSIDPDVVT            MEAVELLQMPEERFAKDPNDANGRMRLRVL            QAELGKARREALGRRGEKAPPWGRKVFRTGT            TRKREACLVDKEAQADGLYFALVMSGGPKI            DDKRFVYMDGQPLQSDWQLHNGVAGKAKSC            RAMPLILKHDFLRWYHRHIKNHDVNAPLEKRC            VHTTTQFVFEVPEDEKKGLQPRLFIRPVFKFYDP            VYEVPSHSIDKKPDCRYLIGIDRGVNYPYRAA            VYDCETNSIADKFVDGRKADWERIRNELAYH            QRRDLLRNSRASSAAIQREIRAIARIRKRERGL            NKVETVESIARLVDWAEENLGKCNFCVLEDL            SSNLSLGRNNRVKHIAAIKEALINQMRKRGYR            FKKSGKVDGVREESAWYTSAPVPSGWVAKKE            EVDGAWKADKTRPLARKIGSYCCCEEIDGLHL            RGVKGLGAKRLVLQSDDPSAPTRRRGFGSE            LFWDPYCTELCGHAFPGVVLDAFIGAFNIAL            RPLVREELGKKAKAVDLADRHQTLNPTVALRC            GVTAYEFVEVGGDPRGGLRKILLNPAEAVI*</p>
Cas $\pi$ -2-Protein	Native protein sequence of Cas $\pi$ -2 nuclease.	<p>MGKNRSSSSDLSPLERSLRKVGENRLERLRVRE            EKIRKHIEQHPRGKNDHQALHFLHQIEVERND            LYRNLKDPEYVPAKQRRERRQINVAKPPTRP            KKEKGPQPESTKYVIRPPVPGKNLPAFASKYEA            RDTRDDSYQDGRSWTSAPYVEVELPILGADKV            IQKLMKFVQKDESRVIRDWATKTYSSIEAAREA            LLVGAQVSEDVSVWRGLLAETKNAQNFAALS            DDQIEAAMSKEAKGADLRPRRAALLVAQRHW            VDQTVKAIKESAPSGVDKDTLDRRLRAGLRF            HTAANSKGHTNPQFPYLTAEKPVVPMESVVQS            VLAFLDDPDDQRYTKDKEDDKRHRVTVLQK            ELGKARPRKRLQLTPKWAGRPTVKGITISKRR            DAALVWDTSKENGLCLALPIGGMPKIDVEQFI</p>

		<p>YQDGTSLSDCQIASKTTKGAACAVLPLKPK  HDFLRWFTKHVENHNPDAPLERRCLHNTTQFV  IVDPEGPRPRLFVRPVFKFYDPGKTVPNHETW  KKPDCRYLVGIDRGINYVLRAVVVDTEEKKVI  ADIGLPGRKHEWRMIRDEIAYHQMRDLARNT  GKHASVVAKHVRALALARKKDRALGKFATVE  AVAELVKKCEQDYGSGNYCFVLEDLDMGAM  NLKRNNRVKHMAVMEEALVNQMRKQGYAYD  GRRGRVDGVRHEGAWYTSQVSPFGWWAKRD  EVEEA WKRDKTRPIGRKVG N WYEMPEPGQDG  DRPDTYRKGYWSKPKNAEGKPYGRNRFSVEP  GDEKPD AERRFCWGSELFWDPNVKSFKGKEFP  EGVVL DAD FVGALNIALRPLVNDGQGKGFKAE  DMAREHTILNPQFKIACQIPVYEFVEEDGDKW  AALRRIML*</p>
<p>Casp-3-Protein</p>	<p>Native protein  sequence of Casp-3  nuclease.</p>	<p>MGKNRSSSSDLSQLERSLRKVG ENRLERLRVR  GQKIRKHL EQHPRGKNDHQALHFLHQIEVER  NDLYRNLKDPEYV PKPAKR RRRERRQINVAQPP  TRPTKSVGPKPAPTTYVIPRPEPGRDLPAFASRY  KASDSRGEDDQDGRSWTAAPFVEVELPIQIAG  KILEKLRKYVQKDEREIVREWAVKTYGSIEAA  REPLLIGAQVSEDVSVWRGLLAETKNAQDFAA  LSDDQIEAAMSKEAKGSDLRPRRAALLVAQRH  WVDQTVKAIKESAPKGVDKDTLDRRLRAGLR  GFHTAANS GKHTNPQFPYLTPKEAKVPLESVV  NQVLEFLDDADDQRYVQVKVDDKKRHRVSHL  QKELGKARPRKRELELQRPKWAGRPTVQGTISK  RRDAALVWDTSK KENGLCLALPLGGLQKIDVE  RFIYQDGTSLSDCQIASKTSKKG AACALMPLK  PKHDFLRWYTKHVENHNADAPLERRCLHNTT  QFVIVDPEGQR PRLFIRPVFKFYDPGKAVPNTH  ETWKKPDCRYLVGIDRGINYVLRAVVVDIEKK  EVIADIHLQGD KHKWRMIRDEIAYHQMRDLA  SNTGKHPSVVARHVRALALARKKDRALGRFTT  VKAVADIVMQCENDY GSGNYCFVLEDLDMGK  MNLKRNNRVKHMAVMKEALVNQMRKRGYA  YDGRRGRADGVRYEGAWYTSQVSPFGWWAK  REEVEEA WKKDTSRPIGRKVG N WYEMPDPNE  EGKRS DVYRKGCWKKPQNASGKPYGRNRF CV  EPGDEKPD AQRRFSWGSELFWDPNVKSFKGKE  FP EGVVL DAD FVGALNIALRPLVNDGQGRGFT  ADKMAEAHTRLNPQFEIVCKIPVYEFIEEHGDK  RAKLRRIVL*</p>

Cas $\pi$ -4-Protein	Native protein sequence of Cas $\pi$ -4 nuclease.	MPKKTSTVALSPRDIRLRELGEKRLQRLRQREE KIRRHLESERGRDRDFQSLHFLHKKIEVERNDLY RNLYQNEGHEHYVPKPGKTKHRKELSLPSTELP SPPDEKKGPRPKKSRYVIPQVPGINLPRINRF GKSDQKSESDQEGRFWTSAPFIEVELPMLNAH RVIKALMRFVQKDERSVVRTWAVTKFGSIEAA REVLLAGALLQREPEIMRGFLQNIDPWGSLDE ELIRDEKAWRTVKLLAQKNWVDQIAKSIKDSA PKGVDKDTLDRRLRSLKAFHSAANSKGHTNP QFPYLTSEKPSANFESVVDSVLEFLDLEDKDRY TIKVDKRRHRVTALQKELGQAKPRVRLEQE RSRWAGHSYLQGTITRKRQASLVWDGHRTE GLALAIPLDGMKIDVQRYMYQDGTSLSDRQI TSKTKSEGKDCALMPLRFKHAFLRWYTKHVE NHVAEAPLERRCIHNTTQFVIVDPEGKHPRLFIR PVFKFYDSNKTIQNSNAPWCKPQCRYLIGIDRG INYVLRAVVVDTEEKAVIDDIPGRKREWRAI RQEIAFYQMRDLSKSAQERNRYVVALAKARR KDRSLGKTETVEAVAKLVQNCSERFEGGNYCF VLENLELGALNLKRNNRVKHLASMEEALYQM RKRGYFYNSRNRVDGVRWEAARYTSQVSPF GWWAKRDEVEKAKKQDKSMAIGRKIGEGYEG PQDDEIESHSTIYRQGRWMKLRNEEGKAYGRS RFVVQPEDLDPAQPRRFSWGSELFWDYPYQKEF KGKSFSQGVVLDADFGALNIALRPLVNDGKG KGFTTAMMAEAHVKLNPTFEIRCKIPVYEFIAE NDNSRAALRRIVI*
Cas $\pi$ -1-Repeat	Native repeat sequence of CRISPR-Cas $\pi$ -1 system.	GGCGCAGGACAAAATGCACACTCTAAAGGA ATGAAAG
Cas $\pi$ -2-Repeat	Native repeat sequence of CRISPR-Cas $\pi$ -2 system.	GTCGCAGGGGATCAAGAACGCTCTTAGGGAA TGAAAG
Cas $\pi$ -3-Repeat	Native repeat sequence of CRISPR-Cas $\pi$ -3 system.	GTCGCAGGGGATCAAGAACGCTCTTAGGGAA TGAAAG
Cas $\pi$ -4-Repeat	Native repeat sequence of CRISPR-Cas $\pi$ -4 system.	GTCGCATGAGGCGAGAAGCACTCTTAGGGAA TGAAAG
Cas $\pi$ -1-tracrRNA-region	Native tracrRNA region sequence of CRISPR-Cas $\pi$ -1 system.	TCTGCCGAAGACGCCGACGGAGCCTGGGCC GGAATCGTAGATCGAACGCGGCATCGAAGCC CTGCAGCCCTTCGGGGCCAAGGCGGCGCAGC AAGCCTCTTTCAGGCGGCAGAGTCCTTTAGA GTGT

Cas $\pi$ -2-tracrRNA-region	Native tracrRNA region sequence of CRISPR-Cas $\pi$ -2 system.	GTCTCGACTATGCCGTACCACTAGACCGAGC CTACACGGCACGCGGTCATAGCGTTAACCAA GGCGTGGTGACAAGCCTCTTTCAGGCGTCGG AACTTAAGAGCGTT
Cas $\pi$ -3-tracrRNA-region	Native tracrRNA region sequence of CRISPR-Cas $\pi$ -3 system.	CTACACTAAGCCTAAACGGCACGAGCGATAG CCCTGCGGGGATTCCCCAAAGCCCGTACGAC AAGCCTCTTTCAGGCGTCGGACACTTAAGAG CGTTAG
Cas $\pi$ -4-tracrRNA-region	Native tracrRNA region sequence of CRISPR-Cas $\pi$ -4 system.	GTTCCATCTCGATGCGGAACGGATACTACGC TGTAGTCTATACGACACGAGTGATAGCCCTG CGGGTTTCGCCCCTAAGTCCGTATGACAAGC CTCTTTCAGGCGGTGGACTTCTAAGAGTGCT