

CLUSTAL Omega(1.2.4) multiple sequence alignment

```
Homo_sapiens_(Human) --MEGRGPYRIYDPGGVSPSG--E-ASAFAERLVKENSRLKEKMQGKMLGELLEESQM 54
Mus_musculus_(Mouse) --MEGRGPYRIYDPGGSTPLG--E-VSAAFERLVEENLRKLMQGIKMLGELLEESQM 54
Rattus_norvegicus_(Rat) --MEGRGPYRIYDPGGSTPLG--E-EVSAAFDRLEENLRKLGKIQGKMLGELLEESQM 55
Felis_catus_(Cat)_(Felis_silvestris_catus) --MEGRGPYRIYDPGGVPPG--E-ASAFAERLVEENLRKLMQGIKMLGELLEESQM 54
Pan_troglodytes_(Chimpanzee) --MEGRGPYRIYDPGGVSPSG--E-ASTAFERLVKENSRLKEKMQGKMLGELLEESQM 54
Gallus_gallus_(Chicken) MAAMEGRGPYRIYDPGGGTE---ENGSTAFERLVEENLRKLMQGIKMLGELLEESQM 56
Anolis_carolinensis_(Green_anole)_(American_chameleon) --MEGKGPYRIYDPGGGT---EEESAALKELLENLRKLMQGIKMLGELLEESQM 53
Monodelphis_domestica_(Gray_short-tailed opossum) --MEGRGPYRIYDPGGEGKQG--E-ASAFAERLVEENLRKLMQGIKMLGELLEESQM 54
Ictidomys_tridecemlineatus_(Thirteen-lined_ground_squirrel)_(Spermophilus_tridecemlineatus) --MEGRGPYRIYDPGGVPPG--E-ASAFAERLVEENLRKLMQGIKMLGELLEESQM 54
Myotis_lucifugus_(Little_brown_bat) --MEGRGPYRIYDPGGVPPG--E-ASTAFERLVEENLRKLMQGIKMLGELLEESQM 54
Otolemur_garnettii_(Small-eared_galago)_(Garnett's_greater_bushbaby) --MEGRGPYRIYDPGGVPPG--E-ASAFAERLVEENLRKLMQGIKMLGELLEESQM 54
Mustela_putorius_furo_(European_domestic_ferret)_(Mustela_furo) --MEGRGPYRIYDPGGGLPLG--E-ASATFERLVEENLRKLMQGIKMLGELLEESQM 54
Ficedula_albicollis_(Collared_flycatcher)_(Muscicapa_albicollis) --MEGTGPYHIYDPGGGSE---ENGSTALERLVEENLRKLMQGIKMLGELLEESQM 53
Chlorocebus_sabaeus_(Green_monkey)_(Cercopithecus_sabaeus) --MEGRGPYRIYDPGGVSPSG--E-ASTAFERLVKENSRLKEKMQGKMLGELLEESQM 54
Taeniopygia_guttata_(Zebra_finch)_(Poephila_guttata) --MEGRGPYHIYDPGGGSE---ENGSTALERLVEENLRKLMQGIKMLGELLEESQM 53
Pongo_abelii_(Sumatran_orangutan)_(Pongo_pygmaeus_abelii) --MEGRGPYRIYDPGGVSPSG--E-ASAFAERLVKENSRLKEKMQGKMLGELLEESQM 54
Macaca_fascicularis_(Crab-eating_macaque)_(Cynomolgus_monkey) --MEGRGPYRIYDPGGVSPSG--E-ASAFAERLVKENSRLKEKMQGKMLGELLEESQM 54
Pelodiscus_sinensis_(Chinese_softshell_turtle)_(Trionyx_sinensis) --MEGKGPYRIYDPGGGTQ---EAAAFAERLVEENLRKLMQGIKMLGELLEESQM 53
Bos_taurus_(Bovine) --MEGRGPYRIYDPGGVPLG--E-ASAFAERLVEENLRKLMQGIKMLGELLEESQM 54
Pan_paniscus_(Pygmy_chimpanzee)_(Bonobo) --MEGRGPYRIYDPGGVSPSG--E-ASAFAERLVKENSRLKEKMQGKMLGELLEESQM 54
Capra_hircus_(Goat) --MEGRGPYRIYDPGGVPLG--E-ASAFAERLVKENSRLKEKMQGKMLGELLEESQM 54
Danio_rerio_(Zebrafish)_(Brachydanio_rerio) --MEGKGPYRIYDPGGSDCQKDEASSLYRQLLEENTVLRKMLKSLGLDLEESQA 57
Xenopus_tropicalis_(Western_clawed_frog) --MESKGPYRIYDPGGSEPS--S-TNKGVQTLMKDNPALRESMEGIRSLGELLEESN 54
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Homo_sapiens_(Human) EATRLRQKAEELVKD-----NELLPPSPSLGSDPLAELTGKDSNVTS--PTAPA-- 104
Mus_musculus_(Mouse) EASRLRQKAEELVKDSELS-----PPTSPAPSLVSDFLAELTGQDTKVQVH--PATSTAA 107
Rattus_norvegicus_(Rat) EASRLRQKAEELVRDSELP-----PPPPAPSLVSDFLAELTGQDTKVQVH--PTTTTT 108
Felis_catus_(Cat)_(Felis_silvestris_catus) EASRLRQKAEELVKD-----SELLPPSPSLGSDFDHLAELTGKADVPAA--PADPA-- 104
Pan_troglodytes_(Chimpanzee) EATRLRQKAEELVKD-----NELLPPSPSLGSDFDHLAELTGKDSNVTS--PTAPA-- 104
Gallus_gallus_(Chicken) EASRLRQKAEELVKDNKMLI-----ASSALELVEETGGAPE--HSSALAAPGS- 103
Anolis_carolinensis_(Green_anole)_(American_chameleon) EASRLRQKVEDLVQNDILR-----LTSLLDKLAETAGEPDL--CSSSDVPGGE- 100
Monodelphis_domestica_(Gray_short-tailed opossum) EASRLRQKVEELAKDNEI-----LQSPSSFDLAEELSGGNTLELP--PVMNAGS 105
Ictidomys_tridecemlineatus_(Thirteen-lined_ground_squirrel)_(Spermophilus_tridecemlineatus) EASRLRQKAEELVKDNE-----PHPPCPSSLSDFLAELTGEDTNPAP--PVAPA-- 103
Myotis_lucifugus_(Little_brown_bat) EASRLRQKAEELVQDSELGKDRQLPPSPPTLTSFDHLPELTKGDANVPAP--PADPA-- 110
Otolemur_garnettii_(Small-eared_galago)_(Garnett's_greater_bushbaby) EASRLRQKAEELVKD-----NEPLPPSPSLGSDFDHLAELTGDPNVVAT--PTAPT-- 104
Mustela_putorius_furo_(European_domestic_ferret)_(Mustela_furo) EASRLRQKAEELVKD-----SELLPTSPSLGSDFDHLAELLRKADGAGPAP--PADPA-- 104
Ficedula_albicollis_(Collared_flycatcher)_(Muscicapa_albicollis) EASRLRQKAEELVKDNKMLI-----GSSLENLKVETGAVGP--PSFARAAPGS- 100
Chlorocebus_sabaeus_(Green_monkey)_(Cercopithecus_sabaeus) EATRLRQKAEELVKD-----NELLPPSPSLGSDFDHLAELTGKDSNVATP--PTAPA-- 104
Taeniopygia_guttata_(Zebra_finch)_(Poephila_guttata) EASRLRQKAEELVKDNKMLI-----GSSLEDLNPLEGRERLEVCSPKAGHCI- 102
Pongo_abelii_(Sumatran_orangutan)_(Pongo_pygmaeus_abelii) EATRLRQKAEELVKD-----NELLPPSPSLGSDFDHLAELTGKDSNVATP--PTAPA-- 104
Macaca_fascicularis_(Crab-eating_macaque)_(Cynomolgus_monkey) EATRLRQKAEELVKD-----NELLPPSPSLGSDFDHLAELTGKDSNVATP--PTAPA-- 104
Pelodiscus_sinensis_(Chinese_softshell_turtle)_(Trionyx_sinensis) EASRLRQKVEDLVKDNEMLR-----S-SFDFKLAETGGDAE--PNQSPGTGPK- 99
Bos_taurus_(Bovine) EASRLRQKAEELVKD-----SELPSPSSPLASFDLAEKLAGDITAVPAP--PADPA-- 104
Pan_paniscus_(Pygmy_chimpanzee)_(Bonobo) EATRLRQKAEELVKD-----NELLPPSPSLGSDFDHLAELTGKDSNVTS--PTAPA-- 104
Capra_hircus_(Goat) EASRLRQKAEELVKD-----SELPSPSSPLASFDLAEKLAGDITAVPAP--PADPA-- 104
Danio_rerio_(Zebrafish)_(Brachydanio_rerio) EAAKLRKVEELVRDNEVLKSSATFSASSLGMFNP-VQTEHGHGRH-----GHPT-- 108
Xenopus_tropicalis_(Western_clawed_frog) EYVRLRQKAEELVKDNKHLHSSAMDSQ---PSFL---EETVLRKLSAGSEAEGLQ- 106
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Homo_sapiens_(Human) -----CPSDKPAPVQKPPSSGTSSEFEVTPPEEQNS-PESSSH-ANAMALG--PL 150
Mus_musculus_(Mouse) T-TTATATTGNSMEKPEPASKSPNSGASDSEFEVTPPEEQNS-PETGSHPTNMMDLGG--PP 163
Rattus_norvegicus_(Rat) TTTTITTTIGNSMEKSPASVSKPPNSGASDSEFEVTPPEEQNS-PETGSHRNVNMLG--SP 165
Felis_catus_(Cat)_(Felis_silvestris_catus) -----HPSNKAEPVQKPPSSGTSSEFEVTPPEEQNSPPASGGQARTMELG--PL 152
Pan_troglodytes_(Chimpanzee) -----CPSDKPAPVQKPPSSGTSSEFEVTPPEEQNS-PESSSH-ANAMALG--PL 150
Gallus_gallus_(Chicken) -----AQPD---TGTKSPSSGTSSEFEVTPPEEQNS-GCPQDSGRAEL---E--P 143
Anolis_carolinensis_(Green_anole)_(American_chameleon) -----NQDKMEKATPKPPSSGTSSEFEVTPPEEQNS-PPSRRKPIGKI---E--PV 144
Monodelphis_domestica_(Gray_short-tailed opossum) -----RNEQAPTQKTPSSGTSSEFEVTPPEEQNS-GGRNSDMDLT--PL 151
Ictidomys_tridecemlineatus_(Thirteen-lined_ground_squirrel)_(Spermophilus_tridecemlineatus) -----CPSDKSAPKPPSSGTSSEFEVTPPEEQNSPPESRGRHINRPMELG--PL 151
Myotis_lucifugus_(Little_brown_bat) -----PPSDKPEPVQKPPSSGTSSEFEVTPPEEQNSPPESGQTRNRMELG--PL 157
Otolemur_garnettii_(Small-eared_galago)_(Garnett's_greater_bushbaby) -----CPSDKPAPVQKPPSSGTSSEFEVTPPEEQNSPPASGGQARTMELG--PL 151
Mustela_putorius_furo_(European_domestic_ferret)_(Mustela_furo) -----HPSDKPEPVQKPPSSGTSSEFEVTPPEEQNSPPASGGHARTMELG--PL 152
Ficedula_albicollis_(Collared_flycatcher)_(Muscicapa_albicollis) -----AQPD---LEARKSP---SDL---E--QP 118
Chlorocebus_sabaeus_(Green_monkey)_(Cercopithecus_sabaeus) -----CPSDKPAPVQKPPSSGTSSEFEVTPPEEQNSPPESSSH-ANETVLG--PL 151
Taeniopygia_guttata_(Zebra_finch)_(Poephila_guttata) -----LSP---HSPRKSPPSSGTSSEFEVTPPEEQNS-GFPQEGRAEA---MGTP 145
Pongo_abelii_(Sumatran_orangutan)_(Pongo_pygmaeus_abelii) -----CPSDKPAPVQKPPSSGTSSEFEVTPPEEQNS-PESSSH-ANAMALG--PL 150
Macaca_fascicularis_(Crab-eating_macaque)_(Cynomolgus_monkey) -----CPSDKPAPVQKPPSSGTSSEFEVTPPEEQNSPPESSSH-ANETVLG--PL 151
Pelodiscus_sinensis_(Chinese_softshell_turtle)_(Trionyx_sinensis) -----TEKQDQTAQKPPSSGTSSEFEVTPPEEQNS-RFQESRKSDDMLTAPVEL 148
Bos_taurus_(Bovine) -----HPSDKPEPVQKPPSSNTSSEFEVTPPEEQNS-PESSSH-ANAMALG--PL 150
Pan_paniscus_(Pygmy_chimpanzee)_(Bonobo) -----CPSDKPAPVQKPPSSGTSSEFEVTPPEEQNS-PESSSH-ANAMALG--PL 150
Capra_hircus_(Goat) -----HPSNKAEPVQKPPSSNTSSEFEVTPPEEQNS-SSPSSGHTRNRMELG--PL 151
Danio_rerio_(Zebrafish)_(Brachydanio_rerio) -----TERQESRDLTGNLTQQEATEGSEFEVTPPEEQNS-PESSSH-ANAMALG--PL 155
Xenopus_tropicalis_(Western_clawed_frog) --SPKM-TDLSDVHPKSNQKTPSSGTSSEFEVTPPEEQNS-PESSSH-ANAMALG--PL 157
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Homo_sapiens_(Human) PREDGNLMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 210
Mus_musculus_(Mouse) PPEDSNLKLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 223
Rattus_norvegicus_(Rat) PPEDGNLMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 225
Felis_catus_(Cat)_(Felis_silvestris_catus) PHEDTNLMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 212
Pan_troglodytes_(Chimpanzee) PHEDGNLMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 210
Gallus_gallus_(Chicken) PHEDANLPLQQLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 203
Anolis_carolinensis_(Green_anole)_(American_chameleon) PNEDANLMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 204
Monodelphis_domestica_(Gray_short-tailed opossum) PKEDSNLMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 211
Ictidomys_tridecemlineatus_(Thirteen-lined_ground_squirrel)_(Spermophilus_tridecemlineatus) PHEDSNLMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 211
Myotis_lucifugus_(Little_brown_bat) PHEDSNLMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 217
Otolemur_garnettii_(Small-eared_galago)_(Garnett's_greater_bushbaby) PHEDSNLMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 211
Mustela_putorius_furo_(European_domestic_ferret)_(Mustela_furo) PHEDSNLMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 212
Ficedula_albicollis_(Collared_flycatcher)_(Muscicapa_albicollis) PNEDANLPLQQLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 178
Chlorocebus_sabaeus_(Green_monkey)_(Cercopithecus_sabaeus) PHEDANLMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 211
Taeniopygia_guttata_(Zebra_finch)_(Poephila_guttata) LNEANLPLQQLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 205
Pongo_abelii_(Sumatran_orangutan)_(Pongo_pygmaeus_abelii) PHEDGNLMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 210
Macaca_fascicularis_(Crab-eating_macaque)_(Cynomolgus_monkey) PHEDGNLMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 211
Pelodiscus_sinensis_(Chinese_softshell_turtle)_(Trionyx_sinensis) QNEDTNLMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 208
Bos_taurus_(Bovine) PQEDSTMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 210
Pan_paniscus_(Pygmy_chimpanzee)_(Bonobo) PHEDGNLMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 210
Capra_hircus_(Goat) PQEDSTMLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 211
Danio_rerio_(Zebrafish)_(Brachydanio_rerio) PQENLELASQLRRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 215
Xenopus_tropicalis_(Western_clawed_frog) PQEDDNVQLHLQRLLETTLSVCAEPEPHQQLFTHLGRMALEFNRLASKVHKNEQRTSILQT 217
*:***:***** *:*** *: :*:: :*:****:
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Homo_sapiens_(Human) 590
Mus_musculus_(Mouse) 591
Rattus_norvegicus_(Rat) 592
Felis_catus_(Cat)_(Felis_silvestris_catus) 593
Pan_troglodytes_(Chimpanzee) 594
Gallus_gallus_(Chicken) 595
Anolis_carolinensis_(Green_anole)_(American_chameleon) 596
Monodelphis_domestica_(Gray_short-tailed opossum) 597
Ictidomys_tridecemlineatus_(Thirteen-lined_ground_squirrel)_(Spermophilus_tridecemlineatus) 598
Myotis_lucifugus_(Little_brown_bat) 599
Otolemur_garnettii_(Small-eared_galago)_(Garnett's_greater_bushbaby) 600
Mustela_putorius_furo_(European_domestic_ferret)_(Mustela_furo) 601
Ficedula_albicollis_(Collared_flycatcher)_(Muscicapa_albicollis) 602
Chlorocebus_sabaeus_(Green_monkey)_(Cercopithecus_sabaeus) 603
Taeniopygia_guttata_(Zebra_finch)_(Poephila_guttata) 604
Pongo_abelii_(Sumatran_orangutan)_(Pongo_pygmaeus_abelii) 605
Macaca_fascicularis_(Crab-eating_macaque)_(Cynomolgus_monkey) 606
Pelodiscus_sinensis_(Chinese_softshell_turtle)_(Trionyx_sinensis) 607
Bos_taurus_(Bovine) 608
Pan_paniscus_(Pygmy_chimpanzee)_(Bonobo) 609
Capra_hircus_(Goat) 610
Danio_rerio_(Zebrafish)_(Brachydanio_rerio) 611
Xenopus_tropicalis_(Western_clawed_frog) 612

GSPEGAGALLRKQELVTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 590
GSPEGAGALLRKQELVTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 591
GSPEGAGALLRKQELVTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 592
GGPEGAGALLRKQELVTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 593
GSPEGAGALLRKQELVTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 594
AGTLEPAGKVPQQELTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 595
NSSADPSVNIHQEVMTQNDLLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 596
-----VKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 597
GSPEGAAGLLRKQELVTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 598
GNPEGAGLLRKQELVTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 599
GSPEGAGLLRKQELVTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 600
GGPEGAGLLRKQELVTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 601
A--MEPAGKLQQEQLTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 602
GSPEGAGLLRKQELVTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 603
A--MEPAGKLQQEQLTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 604
GSPEGAGLLRKQELVTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 605
GSPEGAGLLRKQELVTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 606
GSPEGAGLLRKQELVTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 607
CSAKDAGMVQ--AAVRAGE----- 608
GSPEGAGLLRKQELVTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 609
GSPEGAGLLRKQELVTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 610
GSPEGAGLLRKQELVTQNELLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 611
--LGEVANLRQQLHTQIAVLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ 612
ASLEDDR--LPQREELQMNDLLKQVQKIFEEDEFQFRSDRERMNEEKEELKKQVEKLLQAQ

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Danio_rerio_(Zebrafish)_(Brachydanio_rerio)
Xenopus_tropicalis_(Western_clawed_frog)

VTLSNAQLKAFKDEE-----KAREALRQQR-----K 527
VTLTNAQLKTLKEE-----KAKEALKQQR-----K 540
VLTLLTAQLRTLKEE-----KAKEALKQQR-----K 542
VTLTNAQLKAFKDEE-----KTKAELKQQR-----K 528
VTLTNAQLKAFKDEE-----KAREALRQQR-----K 527
LAVSNQLRASKDCQREKEEKKLKKLKKHQQ-----K 511
LMLTNNQLRTFKDQYQKQKQKQKQKQKQKQ-----K 516
VTLTNAQLKAFKDEE-----KAKEALRQQR-----K 528
VTLTNAQLKAFKDEE-----KAKEALRQQR-----K 529
VTLTNAQLKAFKDEE-----KAKEALKQQR-----K 528
VTLTNAQLKAFKDEE-----KTKAELKQQR-----K 528
VTLTNAQLKAFKDEE-----KTKAELKQQR-----K 528
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VTLTNAQLKAFKDEE-----KAREANRQQR-----K 528
LVLSSMQVST-----GEKEEKKLKKLKKHQQ-----K 518
VTLTNAQLKAFKDEE-----KAREALRQQR-----K 485
VTLTNAQLKAFKDEE-----KAREANRQQR-----K 428
--RAAGDLRVFDDYQREKQKQKQKQKQKQVAVRGSWSWEGCEPQAQQ-----K 498
VTLTNAQLKAFKDEE-----KAKDALRQQR-----K 528
VTLTNAQLKAFKDEE-----KAREALRQQR-----K 527
VTLTNAQLKAFKDEE-----KAKDALRQQR-----K 510
MTNLTNQLHQAQNECQREARERCKLERLQMHQKQEGQQERR----- 549
LGQVNTLRSQCDLRRESSRD--AV-----R 537
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Danio_rerio_(Zebrafish)_(Brachydanio_rerio)
Xenopus_tropicalis_(Western_clawed_frog)

AKASGERYHV-EPHPEH--L--LGGVYAYPPMPMPVHHGFDWQSIYPPPPMAMEHPP 583
AKASGERYHM-EPHPEH--V--VGGVYAYPPMPMPVHHGFDWQSIYPPPPMAMEHPP 596
AKASGERYHV-EPHPEH--L--LGGVYAYPPMPMPVHHGFDWQSIYPPPPMAMEHPP 598
AKASADRYHM-EPHPEH--L--LGGVYAYPPMPMPVHHGFDWQSIYPPPPMAMEHPP 584
AKASGERYHV-EPHPEH--L--LGGVYAYPPMPMPVHHGFDWQSIYPPPPMAMEHPP 583
--ASGERLHP-DPVPGLGPACPMYQYSPVPPMPVHHGFDWQSIYPPPAL-OGEHAP 567
--HSGDRLHQENPQPAPVAVPCMVQYQVSPPAQHLRSGEDWQSIYPPSALASIEQP 574
MKASGERYHM-DPPEH--L--LGGVYAYPPMPMPVHHGFDWQSIYPPPPMAMEHPP 540
AKASGERYHV-DPPEH--L--LGGVYAYPPMPMPVHHGFDWQSIYPPPPMAMEHPP 585
AKASGERYHV-EPHPEH--L--LGGVYAYPPMPMPVHHGFDWQSIYPPPPMAMEHPP 580
AKASGERYHV-EPHPEH--L--LGGVYAYPPMPMPVHHGFDWQSIYPPPPMAMEHPP 584
AKASAEHYRM-EPHPEH--L--LGGVYAYPPMPMPVHHGFDWQSIYPPPPMAMEHPP 584
--ASGERLHP-EPGPGPLGPACPMYQYSPVPPMPVHHGFDWQSIYPPPAL-OGEHAP 539
AKASGERYHV-EPHPEH--L--LGGVYAYPPMPMPVHHGFDWQSIYPPPPMAMEHPP 584
--ASGERLHA-EPGPGPLGPACPMYQYSPVPPMPVHHGFDWQSIYPPPAL-OGEHAP 566
AKASGERYHV-EPHPEH--L--LGGVYAYPPMPMPVHHGFDWQSIYPPPPMAMEHPP 541
AKASGERYHV-EPHPEH--L--LGGVYAYPPMPMPVHHGFDWQSIYPPPPMAMEHPP 584
AGTSGERLHP-EPLQGLGPACPMYQYSPVPPMPVHHGFDWQSIYPPSAMPGEHPP 557
AKASADRYHL-EPHPEH--L--LGGVYAYPPMPMPVHHGFDWQSIYPPPPMAMEHPP 581
AKASGERYHV-EPHPEH--L--LGGVYAYPPMPMPVHHGFDWQSIYPPPPMAMEHPP 583
AKTSADRYHL-EPHPEH--L--LGGVYAYPPMPMPVHHGFDWQSIYPPPPMAMEHPP 566
-----TSDPTSNA PNGMSPYCG-----PQVQGHQGLEG-P-IHPPPMKNISTAP 596
KQALGERYIV-DPHMGH--V--VCPYQYPPSPG--LVYPAFEDW-QIYPPPPVHPEHSQ 590
. . * * : * *

Homo_sapiens_(Human)
Mus_musculus_(Mouse)
Rattus_norvegicus_(Rat)
Felis_catus_(Cat)_(Felis_silvestris_catus)
Pan_troglodytes_(Chimpanzee)
Gallus_gallus_(Chicken)
Anolis_carolinensis_(Green_anole)_(American_chameleon)
Monodelphis_domestica_(Gray_short-tailed opossum)
Ictidomys_tridecemlineatus_(Thirteen-lined_ground_squirrel)_(Spermophilus_tridecemlineatus)
Myotis_lucifugus_(Little_brown_bat)
Otolemur_garnettii_(Small-eared_galago)_(Garnett's_greater_bushbaby)
Mustela_putorius_furo_(European_domestic_ferret)_(Mustela_furo)
Ficedula_albicollis_(Collared_flycatcher)_(Muscicapa_albicollis)
Chlorocebus_sabaeus_(Green_monkey)_(Cercopithecus_sabaeus)
Taeniopygia_guttata_(Zebra_finch)_(Poephila_guttata)
Pongo_abelii_(Sumatran_orangutan)_(Pongo_pygmaeus_abelii)
Macaca_fascicularis_(Crab-eating_macaque)_(Cynomolgus_monkey)
Pelodiscus_sinensis_(Chinese_softshell_turtle)_(Trionyx_sinensis)
Bos_taurus_(Bovine)
Pan_paniscus_(Pygmy_chimpanzee)_(Bonobo)
Capra_hircus_(Goat)
Danio_rerio_(Zebrafish)_(Brachydanio_rerio)
Xenopus_tropicalis_(Western_clawed_frog)

PLPNSRLFHL- EYTWR- P-----CGVVRNPQSSQVMDP--PTARPTESPKNDRG 634
PHPNSRLFHL- PEYWRP- PCAGIR-----NQSSQVMDP--PPDRPAEPESADNDCDG 645
PHPNSRLFHL- PEYWRP- PCAGIR-----NQSSQVMDP--PPDRPAEPESADNDCDG 647
PLPNSRLFHL- EYTWR- PC-----GGMR--NQSSQVMDS--PTARPAEPESKNDREG 633
PLPNSLCPSLAPGHTQLR- PQTPSREGEVVRNPQSSQVMDP--PTARPTEPGELLILSLG 640
GQ--NFHYP- PPEYWRP- PCAMTR-----QNAATVP- VPKVPKDLQA--GPAL 613
GQ--NYHRFP- PPEYWRP- PCAMTR-----QNSQAVDG--VKQFSDSDPT--GLG 621
PVPNSRLFHL- PEYAWRS- PCGMVVRNPQSSQVMDA--LVQP--SDPEPTDHGLPN-- 589
PLPNSRLFHL- PEYWRP- PCGTRM-----NQSAQVDP--PSTRTPDPESAKNDHEG 634
PLPNSHLVPM- PGYWRP- PY-----GGMR--NQTSQVMDS--PTARPAEPESAKNDKRG 629
PLPNSRLFHL- EYTWR- PY-----GGIR--NQSSQVMDP--SPARVPEPESTKNDREG 633
PLPNSRLFHL- EYTWR- PC-----GGMR--NQSSQVMDP--PPARVPEPESTKNDREG 633
GQ--NFHFP- PPEYWRP- PCAMHS-----QNSQAVAG--LKPVPKDLQA--GPAL 585
PLPNSRLFHL- EYTWR- P-----CGVVRNPQSSQVMDS--PTARPTESPKNDRG 635
----- 566
PLPNSRLFHL- EYTWR- P-----CGVVRNPQSSQVMDP--PTARPTESPKNDRG 633
PLPNSRLFHL- EYTWR- P-----CGVVRNPQSSQVMDS--PTARPTESPKNDRG 585
VQ--NFHFP- PPEYWRP- PCAVSRT-----QNSQAVDG--VKLPKPAEPAGGREG 605
PLPNSRLFHL- NTPGGC--PVEYQ-----VIRA--PK----- 608
PLPNSLCPSLAPGHTQLR- PQTPSREGEVVRNPQSSQVMDP--PTARPTEPGELLILSLG 640
PLPNSRLFHL- PEYWRP- PFGVVR-----NQSSQVMDL--PTARPTESPKNDRG 614
--GRDQPNVPGFYQV--SFPQGR--SRQAD--TAR-----APPETAGMATGFKRE 645
IQ--DLNNVP- PPAYWRMATL--PRMQNSKNKK--EQDIAGSQTQAPRQT----- 637

Homo_sapiens_(Human)	PQ-----	636
Mus_musculus_(Mouse)	PQ-----	647
Rattus_norvegicus_(Rat)	PQ-----	649
Felis_catus_(Cat)_(Felis_silvestris_catus)	PQ-----	635
Pan_troglodytes_(Chimpanzee)	PPWGR----	645
Gallus_gallus_(Chicken)	P-----	614
Anolis_carolinensis_(Green_anole)_(American_chameleon)	PKNQRPT--	628
Monodelphis_domestica_(Gray_short-tailed_opossum)	-----	589
Ictidomys_tridecemlineatus_(Thirteen-lined_ground_squirrel)_(Spermophilus_tridecemlineatus)	PQ-----	636
Myotis_lucifugus_(Little_brown_bat)	PQ-----	631
Otolemur_garnettii_(Small-eared_galago)_(Garnett's_greater_bushbaby)	PQ-----	635
Mustela_putorius_furo_(European_domestic_ferret)_(Mustela_furo)	PQ-----	635
Ficedula_albicollis_(Collared_flycatcher)_(Muscicapa_albicollis)	P-----	586
Chlorocebus_sabaeus_(Green_monkey)_(Cercopithecus_sabaeus)	PQ-----	637
Taeniopygia_guttata_(Zebra_finch)_(Poephila_guttata)	-----	566
Pongo_abelii_(Sumatran_orangutan)_(Pongo_pygmaeus_abelii)	-----	583
Macaca_fascicularis_(Crab-eating_macaque)_(Cynomolgus_monkey)	PQ-----	637
Pelodiscus_sinensis_(Chinese_softshell_turtle)_(Trionyx_sinensis)	PV-----	607
Bos_taurus_(Bovine)	-----	608
Pan_paniscus_(Pygmy_chimpanzee)_(Bonobo)	PPWGR----	645
Capra_hircus_(Goat)	PQ-----	617
Danio_rerio_(Zebrafish)_(Brachydanio_rerio)	RQNIDPGKH	653
Xenopus_tropicalis_(Western_clawed_frog)	-----	637

Figure S1. Clustal Omega alignment of TNIP1. Multiple sequence alignments of TNIP1 homologs. * (asterisk) denotes positions featuring a single, fully conserved residue, : (colon) denotes conservation of residues featuring extremely similar properties, . (period) denotes conservation of residues featuring weakly similar properties.

Common Name	Species name	Uniprot identifier
Bonobo	<i>Pan paniscus</i>	A0A2R8ZVM7
Bovine	<i>Bos taurus</i>	A0A3S5ZPJ2
Brown bat	<i>Myotis lucifugus</i>	G1PDF5
Bushbaby	<i>Otolemur garnettii</i>	H0WG84
Cat	<i>Felis silvestris catus</i>	M3WHS7
Chimpanzee	<i>Pan_troglodytes</i>	A0A2I3SHK0
Chicken	<i>Gallus gallus</i>	F1NQ66
Chinese softshell turtle	<i>Pelodiscus sinensis</i>	K7FF90
Collared flycatcher	<i>Ficedula albicollis</i>	U3K078
Ferret	<i>Mustela putorius furo</i>	M3YQJ3
Goat	<i>Capra hircus</i>	A0A452G1D6
Green anole	<i>Anolis carolinensis</i>	G1KKH7
Green monkey	<i>Chlorocebus sabaeus</i>	A0A0D9RFW6
Human	<i>Homo Sapiens</i>	Q15025
Mouse	<i>Mus musculus</i>	Q9WUU8
Opossum	<i>Monodelphis domestica</i>	F7GJZ2
Rat	<i>Rattus norvegicus</i>	D3ZHV1
Squirrel	<i>Citidomys tridecemlineatus</i>	I3M719
Sumatran orangutan	<i>Pongo abelii</i>	H2PH42
Western clawed frog	<i>Xenopus tropicalis</i>	Q08CX3
Zebra finch	<i>Taeniopygia guttata</i>	H0YRE9
Zebrafish	<i>Danio rerio</i>	A1L1N2

Table S1. Species listed which were used for *in silico* assessments in Figure 1, Supplemental table S2 and Supplemental figure S2.

A

Percent Identity (%)	Human	Green Monkey	Crab-eating Macaque	Chimpanzee	Orangutan	Bonobo
Human	100	97.48	97.48	96.70	98.80	96.86
Green Monkey	97.48	100	98.90	94.81	97.43	94.65
Crab-eating Macaque	97.48	98.90	100	94.81	97.94	94.65
Chimpanzee	96.70	94.81	92.11	100	96.91	99.84
Orangutan	98.80	97.43	97.94	96.91	100	97.08
Bonobo	96.86	94.65	94.65	99.84	97.08	100

B

Percent Identity (%)	Human	Zebrafish	Collared Flycatcher	Zebra Finch	Western Clawed Frog
Human	100	46.48	56.99	54.07	50.59
Zebrafish	46.48	100	47.03	44.76	40.47
Collared Flycatcher	56.99	47.03	100	85.33	49.94
Zebra Finch	54.07	44.76	85.33	100	47.50
Western Clawed Frog	50.59	40.47	49.91	47.50	100

Table S2. Percent identity matrix derived from alignment of TNIP1 in 23 species. (a) Tables showing calculated similarity in amino acid identity with the 5 highest scorers and **(b)** 4 lowest scorers (less than 60% identity match) as compared to human. Percent identity scores were calculated using standard settings within the Clustal Omega sequence alignment algorithm.

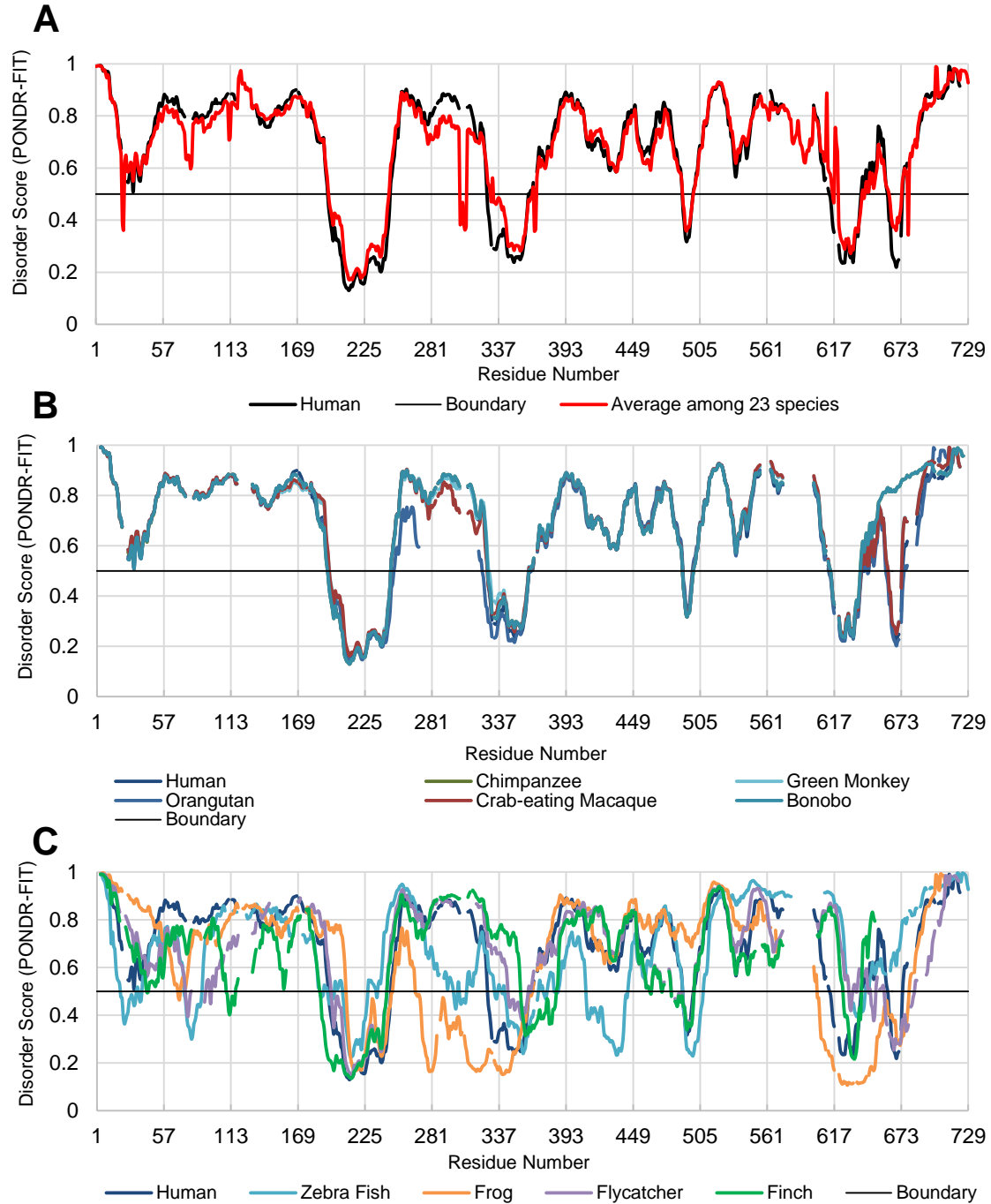


Figure S2. Species comparison of TNIP1 homologs by percent identity similarity. (a) POND-R-FIT scores for human TNIP1 versus average POND-R-FIT of all 23 species used in the Clustal Omega alignment. (b) Top five and (c) bottom four species in amino acid sequence homology, compared with human, as determined by the percent identity similarity post alignment with Clustal Omega (sequence identity less than 60%). Boundary line (0.5) delineates prediction of disorder (any residue score above 0.5 predicts disorder in region). Gaps were introduced based on alignment data generated using Clustal Omega with default parameters.

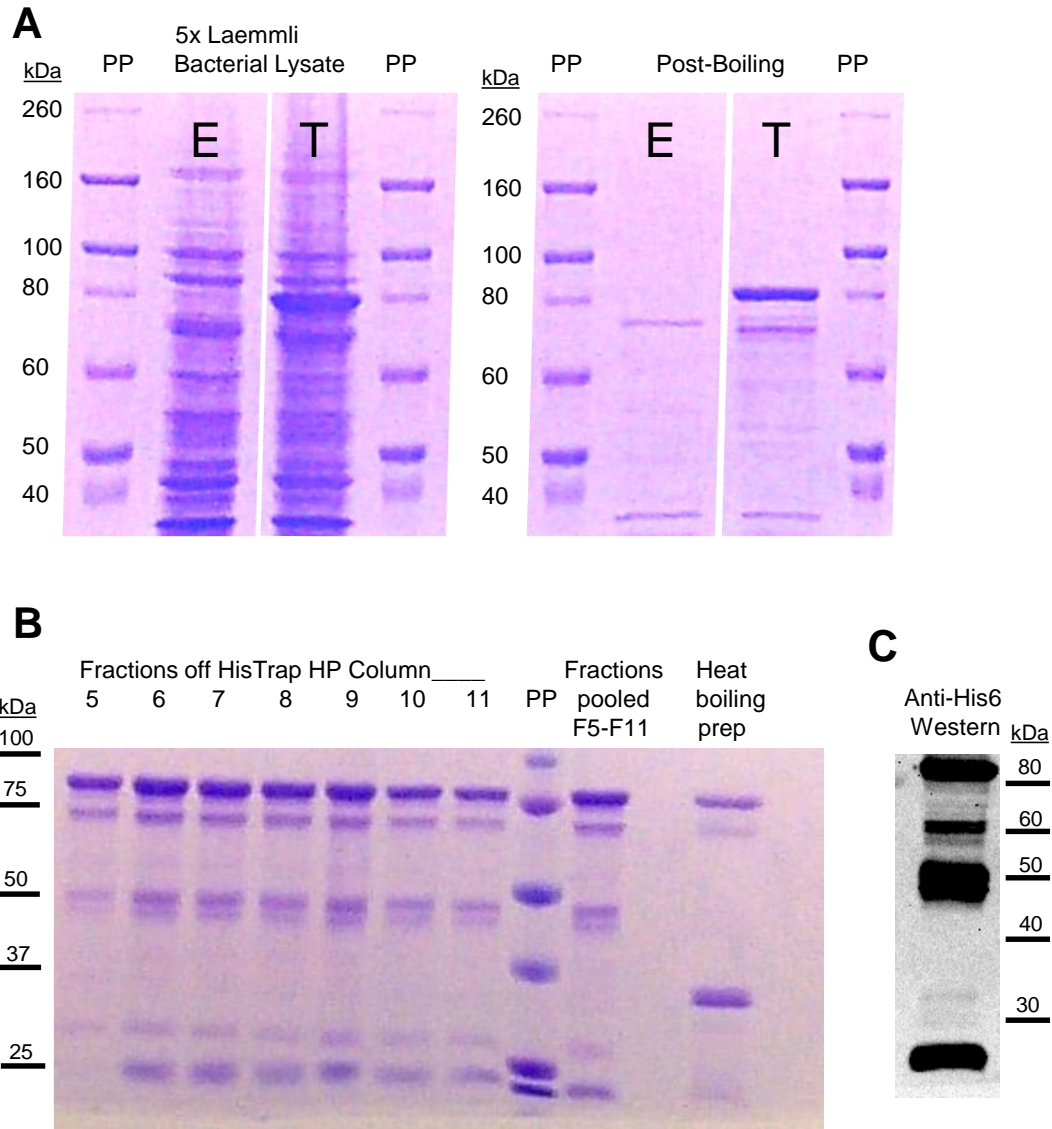


Figure S3. Expression and purification of full-length TNIP1. pET28a empty vector (E) and pET28a – TNIP1 (T) were induced with 0.1 mM IPTG and expression was allowed to go for 4 hours at 30 °C before bacterial pellets were collected. Lysis occurred with direct addition of **(a)** 5X Laemmli buffer or resuspension at 1/20 (w/v) in 20 mM sodium phosphate buffer (pH 8.0), 500 mM NaCl, 20 mM imidazole before heating in 99 °C water bath for 20 minutes followed by immediate cooling on ice for 10 minutes. **(b)** Pellets were clarified at 28,000x *g* for 35 minutes before injection onto pre-calibrated 5 mL HisTrap HP column at 1 mL/minute and eluted with 20 mM sodium phosphate buffer (pH 8.0), 500 mM NaCl, 300 mM imidazole, and 10% glycerol over seven fractions (sample post clarification immediately prior to injection onto column loaded in last lane labeled as “heat boiling prep”). **(c)** Identification of pooled elution from panel b was performed using western blot analysis with anti-His6 antibody. PP – pre-stained SDS-PAGE protein standards.

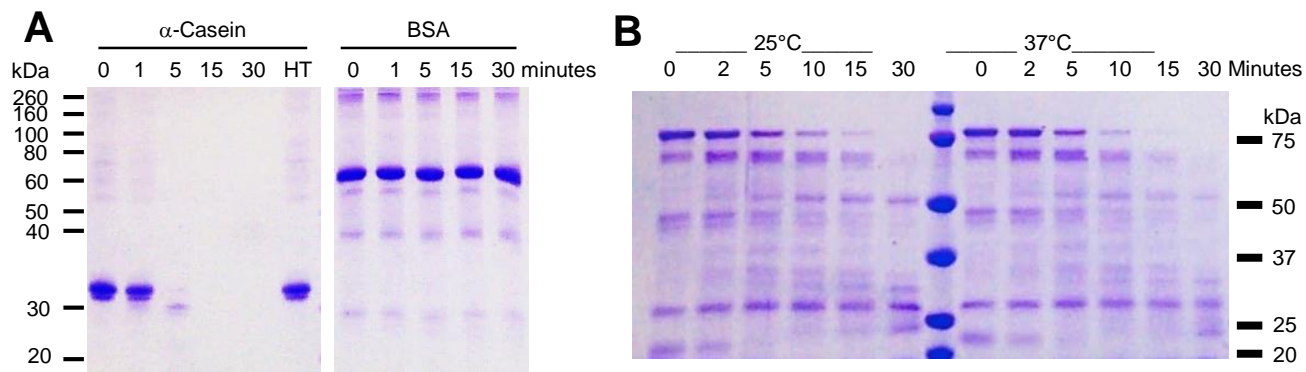


Figure S4. Limited proteolysis of full-length TNIP1 and control proteins. (a) Limited proteolysis of positive and negative controls α -casein and BSA, respectively. Proteolysis was performed with 500:1 w/w ratio of protein substrate to trypsin. Experiments were performed at 37°C. (b) Limited proteolysis performed with full-length TNIP1 with 250:1 TNIP1 to chymotrypsin ratio (w/w) at 25 °C and 37 °C. Samples collected over 30 minutes with reactions quenched with addition of 5X Laemmli buffer and heating at 95 °C for 5 minutes prior to loading 6 μ g on a acrylamide gel for analysis by SDS-PAGE. HT – heat control with no enzyme present.

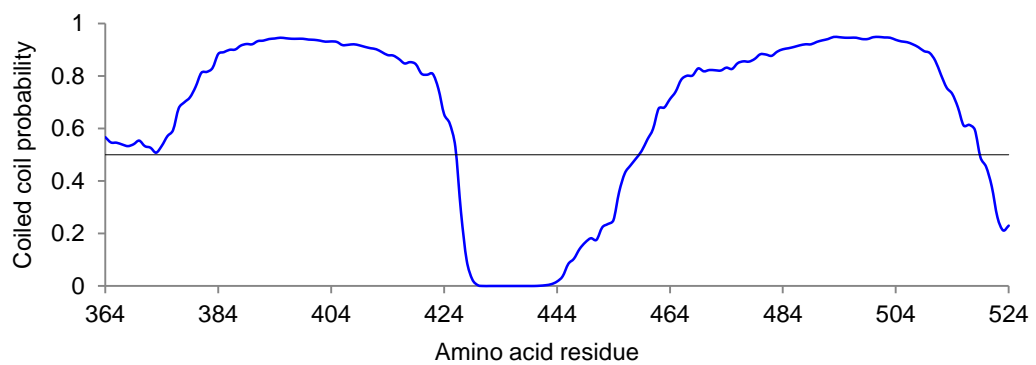


Figure S5. *In silico* prediction of coiled-coil domain across A20 and ubiquitin binding domains of TNIP1. DeepCoil prediction scores represented as coiled-coil probability across AA364-524 of TNIP1.

ENSP00000430760, ENSP00000428187, ENSP00000317891

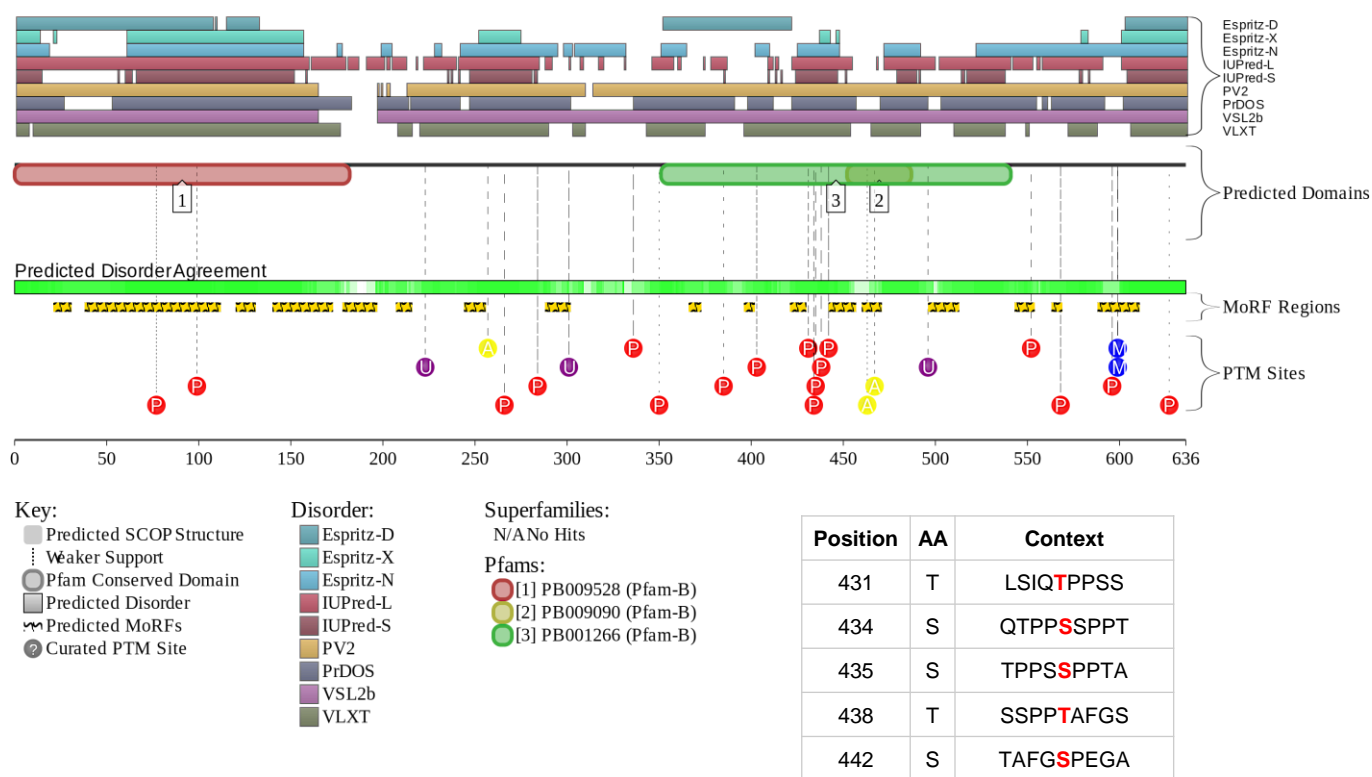


Figure S6. D2P2 analysis of human TNIP1 amino acid sequence. The UniProt sequence Q15025 for human TNIP1 was submitted to D2P2 (<http://d2p2.pro/>). Aligned results are presented for the nine disorder predictors it examines with extent of disorder agreement among them indicated by the intensity of green in the Predicted Disorder Agreement bar representing the entire length of the protein. Predicted molecular recognition features (MoRF) regions and post-translational modification (PTM) sites are also reported. The inset table summarizes predicted phosphorylation sites within the AHD1-UBAN region of TNIP1 AA417-509.

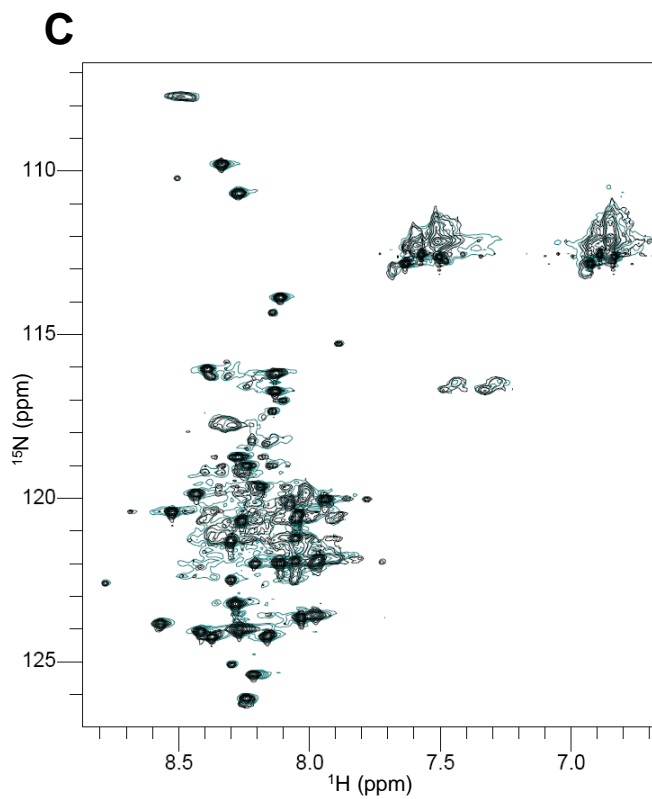
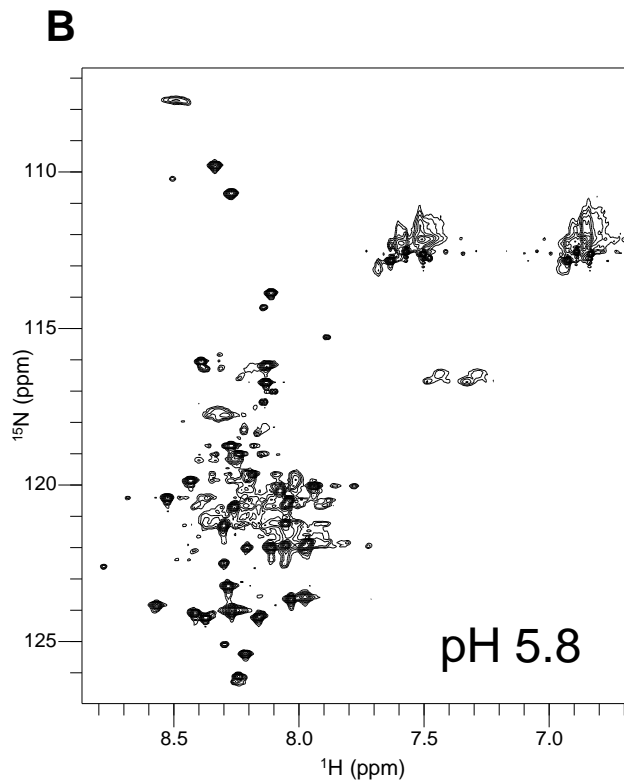
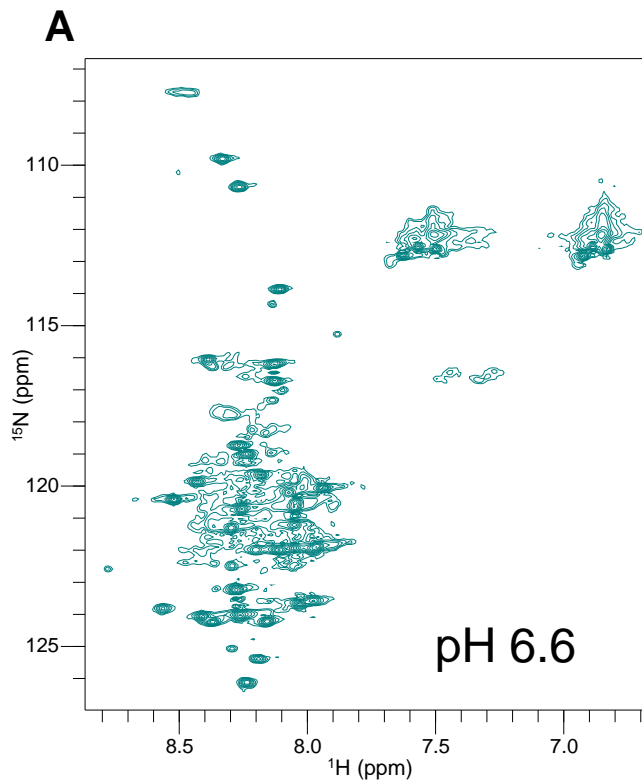


Figure S7. ^1H – ^{15}N HSQC spectra of AHD1-UBAN. Spectra of TNIP1⁴¹⁷⁻⁵⁰⁹ collected at (a) pH 6.6 and (b) pH 5.8 in 20 mM sodium phosphate buffer and 50 mM NaCl. (c) Overlay of spectra from panel (a) and (b).