Supplementary Information

Protein alignments performed with CLUSTAL O (1.2.4).

* = fully conserved residue

: = conservation between groups of strongly similar properties

. = conservation between groups of weakly similar properties

Alignment MFN1

🟦 Conserved cysteine residues
🟥 GTPase domain
🟪 HR1
🟩 HR2
🟨 TMD

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MFN1 H. sapiens        ------------------------------------------------------------
MFN1 M. musculus       ------------------------------------------------------------
MFN1 G. gallus         ------------------------------------------------------------
MFN1 D. rerio          ------------------------------------------------------------
MARF D. melanogaster   MAAYLNRTISMVTGQTGPADDDRHASSTDTVDKSGPGSPLSRFNSSLQQSGSTMAANLLP 60
FZO1 C. elegans        --------------------------------MSGTAS----LVHTLPASGDSNHRGLHS 24


MFN1 H. sapiens        -----MAEPVSPLKHFVLAKKAITAIFDQLLEFVTEGSHFVEATYKNPELDRIATEDDLV 55
MFN1 M. musculus       -----MAETVSPLKHFVLAKKAITAIFGQLLEFVTEGSHFVEATYRNPELDRIASEDDLV 55
MFN1 G. gallus         ----MAEAAVSPLKHFVLAKKTITAIFEQLLDYVTEGAAFVEATYRNPELEHVATEDELA 56
MFN1 D. rerio          ----MEQLDPSPLKRFVLAKKKISEVFEQLLVYVQEGCEFVKETCANESLENIANKDQLD 56
MARF D. melanogaster   ESRLYQSNDKSPLQIFVRAKKKINDIYGEIEEYVHETTTFINALHAEAEIVD---KAERE 117
FZO1 C. elegans        LKNSRRAADNEPLLRFREAKKVLGDVYGELKDNVAELE----GVYKDIKENDFVSSEQRE 80
                                 .**  *  *** :  :: ::   * *          : .      . :

MFN1 H. sapiens        EMQGYKDKLSIIGEVLSRRHMKVAFFGRTSSGKSSVINAMLWDKVLPSGIGHITNCFLSV 115
MFN1 M. musculus       EIQGYRNKLAVIGEVLSRRHMKVAFFGRTSSGKSSVINAMLWDKVLPSGIGHTTNCFLSV 115
MFN1 G. gallus         EIQAYKKKLAVIGEVLSRRHMKVAFFGRTSSGKSSVINAMLWDKVLPSGIGHTTNCFLSV 116
MFN1 D. rerio          EIESYTSKLSIIQEVLARRHMKVAFFGRTSNGKSTVINAMLRDRVLPSGIGHTTNCFLSV 116
MARF D. melanogaster   LFESYVYKVAAIREVLQRDHMKVAFFGRTSNGKSSVINAMLREKILPSGIGHTTNCFCQV 177
FZO1 C. elegans        EIEAIGDSIKTIMDTFQRDNMKVVFFGRTSNGKSTTINAMLHEKVLPQGMGHTTCCFLQV 140
                        ::.   .:  * :.: * :***.******.***:.***** :::**.*:** * ** .*

MFN1 H. sapiens        EGTDGDKAYLMTEGSDEKKSVKTVNQLAHALHMDK----DLKAGCLVRVFWPKA----KC 167
MFN1 M. musculus       EGTDGDKAYLMTEGSDEKKSVKTVNQLAHALHMDK----DLKAGCLVHVFWPKA----KC 167
MFN1 G. gallus         EGTDGDKAYLMTEGSDEKKSVKTVNQLAHALHMDK----DLKAGCLVHVFWPKS----KC 168
MFN1 D. rerio          EGTDEDKAFLKTEGSEEEKSIKTVNQLAHALHMDE----SLDAGCLVKVFWPKT----KC 168
MARF D. melanogaster   EGSNGGEAYLMTEGSEEKLNVVNIKQLANALCQE-----KLCESSLVRIFWPRE----RC 228
FZO1 C. elegans        EGSEGEVGHLQLDDNPQKIDMKMLGKIGHALSDENSDLPAMGQDSLLKVFHPKKSESGEC 200
                       **::   ..*  :.. ::  .:  : ::.:**  :      :  ..*:::* *:     .*

MFN1 H. sapiens        ALLRDDLVLVDSPGTDVTTELDSWIDKFCLDADVFVLVANSESTLMNTEKHFFHKVNERL 227
MFN1 M. musculus       ALLRDDLVLVDSPGTDVTTELDIWIDKFCLDADVFVLVANSESTLMNTEKHFFHKVNERL 227
MFN1 G. gallus         ALLRDDLVLVDSPGTDVTTELDSWIDKFCLDADVFVLVANSESTLMNTEKHFFHKVNERL 228
MFN1 D. rerio          ALLRDDLVLVDSPGTDVTTELDSWIDKFCLDADVFVLVANSESTLMNTEKHFFHKVNEKL 228
MARF D. melanogaster   SLLRDDVVFVDSPGVDVSANLDDWIDNHCLNADVFVLVLNAESTMTRAEKQFFHTVSQKL 288
FZO1 C. elegans        RLLQNDVVILDSPGVDLSPEFDSWIDKHCLDADVFVLVSNAESTLTQAEKNFFLRVAKKL 260
                        **::*:*::****.*:: ::* ***:.**:******* *:***: .:**:**  * ::*

MFN1 H. sapiens        SKPNIFILNNRWDASASEPEYMEDVRRQHMERCLHFLVEELKVVNALEAQNRIFFVSAKE 287
MFN1 M. musculus       SKPNIFILNNRWDASASEPEYMEDVRRQHMERCLHFLVEELKVVSPSEARNRIFFVSAKE 287
MFN1 G. gallus         SKPNIFILNNRWDASASEPEYMEDVRRQHMERCLTFLVDELKVIDPVEARNRIFFVSAKE 288
MFN1 D. rerio          SKPNIFVLNNRWDASAAEPEYMEDVRKQHTDRCVNFLVEELKVVDRAQAPNRIFFVSAKE 288
MARF D. melanogaster   SKPNIFILNNRWDASANEPECQESVKSQHTERCIDFLTKELKVSNEKEAAERVFFVSARE 348
FZO1 C. elegans        SKPNVFILNNRWDASAAETENIEDVKKQHLTRFRQFLVDELEVCSEREVNDRIFFVSSRE 320
                       ****:*:********* * *  *.*: **  *   **..**:* .  :. :*:****::*

MFN1 H. sapiens        VLSARKQKAQGMPESGVALAEGFHARLQEFQNFEQIFEECISQSAVKTKFEQHTIRAKQI 347
MFN1 M. musculus       VLNSRKHKAQGMPEGGGALAEGFQARLQEFQNFEQTFEECISQSAVKTKFEQHTIRAKQI 347
MFN1 G. gallus         VLSARRQKAQGMPESGGALAEGFQTRFQEFQNFEQIFEECISQSAVKTKFEQHTIRAKQI 348
MFN1 D. rerio          VLNSRMQRAQ-----GGALAEGFQDRLKEFQNFERSFEECISHSAVKTKFEQHTIRAKQI 343
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MARF D. melanogaster   TLQARIEEAKGNPPHMGAIAEGFQIRYFEFQDFERKFEECISQSAVKTKFQQHSSRGKSV 408
FZO1 C. elegans        VLESRLKAR-GLVQ-KAYQAEGHGTRALEFQNFERHFEHCISRSAIHTKFEAHNRRAHEM 378
                       .*.:* .            ***.  *  ***:**: **.***:**::***: *. *.:.:

MFN1 H. sapiens         LATVKNIMDSVNLAAEDKRHYSVEEREDQIDRLDFIRNQMNLLTLDVKKKIKEVTEEVAN 407
MFN1 M. musculus        LDTVKNILDSVNVAAAEKRVYSMEEREDQIDRLDFIRNQMNLLTLDVKKKIKEVTEEVAN 407
MFN1 G. gallus          IDTVKNIMDAINVAAAEKRVLSMEEREDQKDRLDFVRNQLNILTEDTKEKIKRVTEEVEN 408
MFN1 D. rerio           TETVKDIMDQINITAAEKRVVSLEEREYLIDRLDFVRNQLNLLIQDIKKKIKAITEEVEN 403
MARF D. melanogaster   SGDMKSMLDNIYERITIFRNLKQDQKNLLTERIQGTETQMMQVTREMKMKIHNMVEEVEE 468
FZO1 C. elegans        IGKMRLNLNSVLTSAAEQRSKLQNNLNESTRTFNECRVNFTQFEKAYREQTEQLRAEVHL 438
                          ::  :: :       *    :: :     ::  . ::  .    : : . :  **

MFN1 H. sapiens         KVSCAMTDEICRLSVLVDEFCSEFHPNPDVLKIYKSELNKHIEDGMGRNLADRCTDEVNA 467
MFN1 M. musculus        KVSCAMTDEICRLSVLVDEFCSEFHPTPSVLKVYKSELNKHIEDGMGRNLADRCTNEVNA 467
MFN1 G. gallus          KVSSAMTDEICRLSVLVDEFYSDFHPSPQVLKLYKTELNKHIEDGLGKNLADRCSSEVNE 468
MFN1 D. rerio           KVSNAMAEEICRLSVIIDEFRSDFHPSPQMLKMYKSDLLSHIEQGMGKNLAFRCSDAVNA 463
MARF D. melanogaster   KVSKALNEEIWRLGVLIDEFNMPFHPERLVLNIYKKELNAHVESGLGSNLRARLSMALAM 528
FZO1 C. elegans        KVSADFFEEIARLDAIIDRFEQPFDGSSSGMTKYKEDLAIFVDKCLSSDLEARCTGGLMS 498
                       ***  : :** **..::*.*   *.     :. ** :*  .::. :. :*  * :  :

MFN1 H. sapiens         LVLQTQQEIIENLKPLLPAGI--QDKLHTLI-PCKKFDLSYNLNYHKLCSDFQEDIVFRF 524
MFN1 M. musculus        SILQSQQEIIENLKPLLPAGI--QNKLHTLI-PCKKFDLSYDLNCHKLCSDFQEDIVFRF 524
MFN1 G. gallus          SMHQSQQEIIENLKPLLPSGA--QNQLHLLI-PCRKFDLSYDLNCHSLCADFQEDIMFHF 525
MFN1 D. rerio           SVQCSQQDMIECLKPLLPSAA--QTQLHMLI-PSRKFELSYDLNCATLCSDFQENIEFQF 520
MARF D. melanogaster   NVESAQTEMTDRMHALVPNEQLLATSTKMVV-RTQPFEMLYSLNCQNLCADFQEDLEFKF 587
FZO1 C. elegans        RIWNLENDMFQYVTKILAEPY--QNKLEEVWRYRAPFKFSICVDVPALVNDFHEDLEFRF 556
                        :   : :: : :  ::        . . :      *.:   ::   *  **:*:: *:*

MFN1 H. sapiens         SLGWSSLVHRFLGPRNAQRVLLGL--SEPIFQLPRSLASTPTAPTTP---------ATPD 573
MFN1 M. musculus        SLGWSSLVHRFLGSTNAQRVLLGL--SEPIFQVPRSLASTPTAPSNP---------AAPD 573
MFN1 G. gallus          SLGWTSLVNRFLGPKHAQRVLLGL--ADPNLQIPRPLATTPSAASLP--------AATPE 575
MFN1 D. rerio           SLGWSALVHRFLGPVNAKRALMLV---DQNLQLTAPT--TPTAPAVVQSQNSRALGQNQA 575
MARF D. melanogaster   SWGIAAMIQRFTGKVRERSKKGQPALVNRQSSIGHSV-STPTTTPVEATPVCLLPAPVVA 646
FZO1 C. elegans        TFGLHAIIRRIIAYRSGQPVTAI----NTNLLTPLSLKQQ-------SEKNSVRDAEASA 605
                       : *  :::.*: .    :         :

MFN1 H. sapiens         NASQEELMITLVTGLASVTSRTSMGIIIVGGVIWKTIGWKLLSVSLTMYGALYLYERLSW 633
MFN1 M. musculus        NAAQEELMITLITGLASLTSRTSMGIIVVGGVIWKTVGWKLISVTLSMYGALYLYERLTW 633
MFN1 G. gallus          NTSPDDFMVPLVMSLASLTSRTSMSIIVVGGVIWKTVGWKLISLSLSMYGLLYLYERLTW 635
MFN1 D. rerio           SVTQEELMLTMVNNLASVTSRTSMSVIIVGGVVWRTVGWRLIALSMSMYGLLYLYERLTW 635
MARF D. melanogaster   GITPEQLSLISRFAVSSIGSQGTVGGLVVAGVMLKTIGWRVLVGVGALYGCIYLYERLSW 706
FZO1 C. elegans        ASEEQAMMTQMVLTSAAFLANGSLGVLVVGGIVYKAVGWRVIAVGGAAYAGLYAWERMRW 665
                           : :        ::. :. ::. ::*.*:: :::**:::    : *. :* :**: *

MFN1 H. sapiens         TTHAKERAFKQQFVNYATEKLRMIVSSTSANCSHQVKQQIATTFARLCQQVDITQKQLEE 693
MFN1 M. musculus        TTRAKERAFKQQFVNYATEKLQMIVSFTSANCSHQVQQEMATTFARLCQQVDVTQKHLEE 693
MFN1 G. gallus          TTKAKERAFKQQFVNYATEKLQMIVSLTSANCSHQVQQEMATTFARLCQQVDVTQKNLEK 695
MFN1 D. rerio           TTKAKERALKKQFVDYATEKLQMIISFTSSNCSHQVQQEIASTFARLCQQVDITQKDLES 695
MARF D. melanogaster   TNSAKERTFKSQYVRHATKKLKMIVDLTSANCSHQVQQELSSTFARLCRTVDTATTDMND 766
FZO1 C. elegans        NSGAKEQHLKEQFRSHLAARMQQVSTAHTHHCETQAIREMDQVFDGLKATVGGVHREMKN 725
                       .. ***: :*.*:  : : ::: :    : :*. *. :::  .*  *   *. .  .::.

MFN1 H. sapiens         EIARLPKEIDQLEKIQNNSKLLRNKAVQLENELENFTKQFLPSSNEES- 741
MFN1 M. musculus        EIARLSKEIDQLEKIQNNSKLLRNKAVQLESELENFSKQFLHPSSGES- 741
MFN1 G. gallus          EIARLSKEIDQLENIQSHSKQLRNKAIHLENELDHFTKHFLQKSK---- 740
MFN1 D. rerio           DIQRLTDKIQKLETVQNRSKVLRHKATALEMQLEDFSSQYLRLQP---- 740
MARF D. melanogaster   ELKTLDSQLNILEANQKQLKLLRNKANYIQNELDIFEHNYISPQ----- 810
FZO1 C. elegans        DLDVQKTQIDAVDSTIRTLGTIKGKAVFLLRNLEQFASSYLRSDSPPTP 774
                       ::     ::: ::        :: **  :  :*: *   ::  .
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Alignment MFN2

🟦 Conserved cysteine residues
🟥 GTPase domain
🟪 HR1
🟩 HR2
🟨 TMD

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MFN2 H. sapiens         ---------------------------------------MS-----LLFSRCNSIVTVKK 16
MFN2 M. musculus        ---------------------------------------MS-----LLFSRCNSIVTVKK 16
MFN2 G. gallus          -----------------------------VGDEAQPSRQSS-----LL---ILGFFTLKK 23
MFN2 D. rerio           ---------------------------------------MS-----LVFPRPNTSVIGKK 16
MARF D. melanogaster   MAAYLNRTISMVTGQTGPADDDRHASSTDTVDKSGPGSPLSRFNSSLQQSGSTMAANLLP 60
FZO1 C. elegans        --------------------------------MSGTAS----LVHTLPASGDSNHRGLHS 24
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MFN2 H. sapiens        NKRHMAEVNASPLKHFVTAKKKINGIFEQLGAYIQESATFLEDTYRNAELDPVTTEEQVL 76
MFN2 M. musculus       DKRHMAEVNASPLKHFVTAKKKINGIFEQLGAYIQESASFLEDTHRNTELDPVTTEEQVL 76
MFN2 G. gallus         DKRHMAEVNASPLKHFVTAKKKINGIFEQLAAYINESSSFLEETHKNVELDPVTTEEQVL 83
MFN2 D. rerio          DKRLMAEVNASPLKHFVTAKKKINGIFEQLGAYIKESSAFLEETYSNEELDPVTTEEQVA 76
MARF D. melanogaster   ESRLYQSNDKSPLQIFVRAKKKINDIYGEIEEYVHETTTFINALHAEAEIVDKAE---RE 117
FZO1 C. elegans        LKNSRRAADNEPLLRFREAKKVLGDVYGELKDNVAELE----GVYKDIKENDFVSSEQRE 80
                        ..     : .**  *  *** :..:: ::   : *        : : :    .

MFN2 H. sapiens        DVKGYLSKVRGISEVLARRHMKVAFFGRTSNGKSTVINAMLWDKVLPSGIGHTTNCFLRV 136
MFN2 M. musculus       DVKGYLSKVRGISEVLARRHMKVAFFGRTSNGKSTVINAMLWDKVLPSGIGHTTNCFLRV 136
MFN2 G. gallus         EVKGYLSKVSGISEVLARRHMKVAFFGRTSNGKSTVINAMLWDKVLPSGIGHTTNCFLRV 143
MFN2 D. rerio          EVRGYLSKVAGIGEVLSRRHMKVVFFGRTSNGKSSVINAMLWDKVLPSGIGHTTNCFLRV 136
MARF D. melanogaster   LFESYVYKVAAIREVLQRDHMKVAFFGRTSNGKSSVINAMLREKILPSGIGHTTNCFCQV 177
FZO1 C. elegans        EIEAIGDSIKTIMDTFQRDNMKVVFFGRTSNGKSTTINAMLHEKVLPQGMGHTTCCFLQV 140
                        ...   .:  * :.: * :***.**********:.***** :*:**.*:**** ** :*

MFN2 H. sapiens        EGTDGHEAFLLTEGSEEKRSAKTVNQLAHALHQDK----QLHAGSLVSVMWPN----SKC 188
MFN2 M. musculus       GGTDGHEAFLLTEGSEEKKSVKTVNQLAHALHQDE----QLHAGSMVSVMWPN----SKC 188
MFN2 G. gallus         EGTDGHEAFLLTEGSEEKKSVKTVNQLAHALHQDE----LLNAGSLVSVMWPN----SKC 195
MFN2 D. rerio          EGTDGNESFLLTEGSDERKSVKTVNQLAHALHQDE----DLDAGSLVCVMWPK----AKC 188
MARF D. melanogaster   EGSNGGEAYLMTEGSEEKLNVVNIKQLANALCQEK-----LCESSLVRIFWPR----ERC 228
FZO1 C. elegans        EGSEGEVGHLQLDDNPQKIDMKMLGKIGHALSDENSDLPAMGQDSLLKVFHPKKSESGEC 200
                        *::*  ..*  :..  ::  .   : ::.:** :::     :  .*:: :: *.     .*

MFN2 H. sapiens        PLLKDDLVLMDSPGIDVTTELDSWIDKFCLDADVFVLVANSESTLMQTEKHFFHKVSERL 248
MFN2 M. musculus       PLLKDDLVLMDSPGIDVTTELDSWIDKFCLDADVFVLVANSESTLMQTEKQFFHKVSERL 248
MFN2 G. gallus         PLLKDDLVLMDSPGIDVTTELDSWIDKFCLDADVFVLVANSESTLMQTEKQFFHKVNERL 255
MFN2 D. rerio          ALLRDDLVLVDSPGIDVTTELDSWIDKFCLDADVFVLVANSESTLMQTEKSFFHKVNERL 248
MARF D. melanogaster   SLLRDDVVFVDSPGVDVSANLDDWIDNHCLNADVFVLVLNAESTMTRAEKQFFHTVSQKL 288
FZO1 C. elegans        RLLQNDVVILDSPGVDLSPEFDSWIDKHCLDADVFVLVSNAESTLTQAEKNFFLRVAKKL 260
                        **::*:*::****:*:: ::*.***:.**:******* *:***: ::** **  * ::*

MFN2 H. sapiens        SRPNIFILNNRWDASASEPEYMEEVRRQHMERCTSFLVDELGVVDRSQAGDRIFFVSAKE 308
MFN2 M. musculus       SRPNIFILNNRWDASASEPEYMEEVRRQHMERCTSFLVDELGVVDRAQAGDRIFFVSAKE 308
MFN2 G. gallus         SRPNIFILNNRWDASASEPEYMEEVRRQHMERCTSFLVDELGVVDRTQAGDRIFFVSAKE 315
MFN2 D. rerio          SSPNIFILNNRWDASANEPEYMEEVRRQHMDRCTSFLVDELRVVDRSHAGDRIFFVSAKE 308
MARF D. melanogaster   SKPNIFILNNRWDASANEPECQESVKSQHTERCIDFLTKELKVSNEKEAAERVFFVSARE 348
FZO1 C. elegans        SKPNVFILNNRWDASAAETENIEDVKKQHLTRFRQFLVDELEVCSEREVNDRIFFVSSRE 320
                       * **:*********** * *  *.*: **  *  .**..** *  ..  .. :*:****::*

MFN2 H. sapiens        VLNARIQKAQGMPEGGGALAEGFQVRMFEFQNFERRFEECISQSAVKTKFEQHTVRAKQI 368
MFN2 M. musculus       VLSARVQKAQGMPEGGGALAEGFQVRMFEFQNFERQFEECISQSAVKTKFEQHTVRAKQI 368
MFN2 G. gallus         VLNARIQRAQGMPEGGGALADGFQVRMFEFQNFERRFEECISQSAVKTKFEQHTVRAKQI 375
MFN2 D. rerio          VLQARVQKAQGMPEAGGALAEGFQARMFEFQNFERRFEECISQSAVKTKFEQHTTRAKQI 368
MARF D. melanogaster   TLQARIEEAKGNPPHMGAIAEGFQIRYFEFQDFERKFEECISQSAVKTKFQQHSSRGKSV 408
FZO1 C. elegans        VLESRLKARGLVQ--KAYQAEGHGTRALEFQNFERHFEHCISRSAIHTKFEAHNRRAHEM 378
                       .*.:*::         .  *:*.  * :***:***:**.***:**::***: *. *.:.:

MFN2 H. sapiens        AEAVRLIMDSLHMAAREQQVYCEEMREERQDRLKFIDKQLELLAQDYKLRIKQITEEVER 428
MFN2 M. musculus       AEAVRLIMDSLHIAAQEQRVYCLEMREERQDRLRFIDKQLELLAQDYKLRIKQITEEVER 428
MFN2 G. gallus         AEDVRLIMDSVHVAAQEQRVYCLEMREERQERLGFIDKQLELLTQDYKRKIKQITEEVER 435
MFN2 D. rerio          SEALRLIMDSVHIAAQEQRIHCLEMKEEREDRLEFIDKQLDLLTLDCKSKIKKITEEVEK 428
MARF D. melanogaster   SGDMKSMLDNIYERITIFRNLKQDQKNLLTERIQGTETQMMQVTREMKMKIHNMVEEVEE 468
FZO1 C. elegans        IGKMRLNLNSVLTSAAEQRSKLQNNLNESTRTFNECRVNFTQFEKAYREQTEQLRAEVHL 438
                          ::  ::.:       :    :  :     :     ::  .    : : .::  **.

MFN2 H. sapiens        QVSTAMAEEIRRLSVLVDDYQMDFHPSPVVLKVYKNELHRHIEEGLGRNMSDRCSTAITN 488
MFN2 M. musculus       QVSTAMAEEIRRLSVLVDEYQMDFHPSPVVLKVYKNELHRHIEEGLGRNLSDRCSTAIAS 488
MFN2 G. gallus         QVSNAMAEEIRRLSVLVDEYQADFHPSQVVLKVYKNELHKHIEEGLGRNMSDRCSNAITA 495
MFN2 D. rerio          QVSNAMAEEIRRLAVLVDDFHMDFHPSPVVLKVYKNELHRHIEEGLGRNMSERCSSAITV 488
MARF D. melanogaster   KVSKALNEEIWRLGVLIDEFNMPFHPERLVLNIYKKELNAHVESGLGSNLRARLSMALAM 528
FZO1 C. elegans        KVSADFFEEIARLDAIIDRFEQPFDGSSSGMTKYKEDLAIFVDKCLSSDLEARCTGGLMS 498
                       :**  : *** ** .::* :.  *. .   :. **::*  .::. *. ::  * : .:

MFN2 H. sapiens        SLQTMQQDMIDGLKPLLPVS--VRSQIDMLVPRQCFSLNYDLNCDKLCADFQEDIEFHFS 546
MFN2 M. musculus       SLQTMQQDMIDGLKPLLPVS--MRNQIDMLVPRQCFSLSYDLNCDKLCADFQEDIEFHFS 546
MFN2 G. gallus         SLQTMQQEMIDGLKPLLPLS--LRGQIDMLIPRQCFTLSYDLNCDKLCADFQEDIEFHFS 553
MFN2 D. rerio          ALQTTQTDMIDGLKPLLPIT--IREQVDKMVPRQCFALSYDLNCDKLCSDFQEDIGFHFS 546
MARF D. melanogaster   NVESAQTEMTDRMHALVPNEQLLATSTKMVVRTQPFEMLYSLNCQNLCADFQEDLEFKFS 588
FZO1 C. elegans        RIWNLENDMFQYVTKILAEPY-QNKLEEVWRYRAPFKFSICVDVPALVNDFHEDLEFRFT 557
                        : . : :* : :  ::          .       * :   ::   *  **:**: *:*:

MFN2 H. sapiens        LGWTMLVNRFLGPKNSRR-----ALMGYNDQVQR--------PIPLTPAN---PSMPPLP 590
MFN2 M. musculus       LGWTMLVNRFLGPKNSRR-----ALLGYSDQVQR--------PLPLTPAN---PSMPPLP 590
MFN2 G. gallus         LGWTMLVNRFLGPKNGRR-----ALMGYNDQIQR--------P--LTPAN---PSLPPLP 595
MFN2 D. rerio          LGWTMLVNRFLGPKNTRR-----ALMGYNDQVPR--------SLAITPVS---TSMPPFP 590
MARF D. melanogaster   WGIAAMIQRFTGKVRERSKKGQPALVNRQSSIGHSVSTPTTTPVEATPVC---LLPAPV- 644
FZO1 C. elegans        FGLHAIIRRIIAYRSGQPVTA------IN--------TNLLTPLSLKQQSEKNSVRDAEA 603
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                        *   ::.*: .    :           .                 .

MFN2 H. sapiens        QGSLTQEEFMVSMVTGLASLTSRTSMGILVVGGVVWKAVGWRLIALSFGLYGLLYVYERL 650
MFN2 M. musculus       QSSLTQEELMVSMVTGLASLTSRTSMGILVVGGVVWKAVGWRLIALSFGLYGLLYVYERL 650
MFN2 G. gallus         QGSMTQEELMVSMVTGLASLTSRTSMGIIVVGGVVWKAVGWRLIALSFGLYGLLYVYERL 655
MFN2 D. rerio          QGSMTQEELMVSMVTGLASLTSRTSMGIIVVGGVIWKAVGWRLIALSVGLYGLLYVYERL 650
MARF D. melanogaster   VAGITPEQLSLISRFAVSSIGSQGTVGGLVVAGVMLKTIGWRVLVGVGALYGCIYLYERL 704
FZO1 C. elegans        SAASEEQAMMTQMVLTSAAFLANGSLGVLVVGGIVYKAVGWRVIAVGGAAYAGLYAWERM 663
                        ..   : :        ::: :. ::* :**.*:: *::***::.   . *. :* :**:

MFN2 H. sapiens        TWTTKAKERAFKRQFVEHASEKLQLVISYTGSNCSHQVQQELSGTFAHLCQQVDVTRENL 710
MFN2 M. musculus       TWTTKAKERAFKRQFVEYASEKLQLIISYTGSNCSHQVQQELSGTFAHLCQQVDITRDNL 710
MFN2 G. gallus         TWTTKAKERAFKRQFVEYAGEKLQLIVSYTGSNCSHQVQQELAGTFAQLCQQVDVTRENL 715
MFN2 D. rerio          TWTTRAKERTFKRQFVDYASEKLQLIVSYTGSNCSHQVQQELASTFSQLCQQVDVTRQQL 710
MARF D. melanogaster   SWTNSAKERTFKSQYVRHATKKLKMIVDLTSANCSHQVQQELSSTFARLCRTVDTATTDM 764
FZO1 C. elegans        RWNSGAKEQHLKEQFRSHLAARMQQVSTAHTHHCETQAIREMDQVFDGLKATVGGVHREM 723
                        *.. ***: :* *:  :   ::: :      :*. *. :*:  .*   *   *. .  ::

MFN2 H. sapiens        EQEIAAMNKKIEVLDSLQSKAKLLRNKAGWLDSELNMFTHQYLQPSR---- 757
MFN2 M. musculus       EQEIAAMNKKVEALDSLQSRAKLLRNKAGWLDSELNMFTHQYLQPSR---- 757
MFN2 G. gallus         EQEISAMNKKIEVLDSLQSKAKLLRNKAGWLDSELNMFTHQYLQQSR---- 762
MFN2 D. rerio          EDEIGDLNSKIEQLDTLQSKAKLLRNKAGWLDSELNMFIQQYLQQGR---- 757
MARF D. melanogaster   NDELKTLDSQLNILEANQKQLKLLRNKANYIQNELDIFEHNYISPQ----- 810
FZO1 C. elegans        KNDLDVQKTQIDAVDSTIRTLGTIKGKAVFLLRNLEQFASSYLRSDSPPTP 774
                       ::::   ..::: :::       ::.** ::  :*: *  .*:
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Alignment DRP1

🟥 GTPase domain
🟪 Middle domain
🟩 Variable domain
🟦 GED

```
DRP1 H. sapiens        MEALIPVINKLQDVFNTVGA--DIIQLPQIVVVGTQSSGKSSVLESLVGRDLLPRGTGIV 58
DRP1 M. musculus       MEALIPVINKLQDVFNTVGA--DIIQLPQIVVVGTQSSGKSSVLESLVGRDLLPRGTGVV 58
DRP1 G. gallus         MEALIPVINKLQDVFNTVGA--DIIQLPQIVVVGTQSSGKSSVLESLVGRDLLPRGTGVV 58
DRP1 D. rerio          MEALIPVINKLQDVFNTVGA--DIIQLPQIAVVGTQSSGKSSVLESLVGRDLLPRGTGIV 58
DRP1 D. melanogaster  MEALIPVINKLQDVFNTVGS--DSIQLPQIVVLGSQSSGKSSVIESVVGRSFLPRGTGIV 58
DRP1 C. elegans       MENLIPVVNKLQDVFATLGRKEDQIQLPQIVVVGSQSAGKSSVLENLVGRDFLPRGTGIV 60
                       ** ****:******* *:*   * ******.*:*:**:*****:*.:***.:******:*

DRP1 H. sapiens        TRRPLILQLVHVSQEDKRKTTGEENG-------------VEAEEWGKFLHTKNKLYTDFD 105
DRP1 M. musculus       TRRPLILQLVHVSPEDKRKTTGEENGKF-------QSWRVEAEEWGKFLHTKNKLYTDFD 111
DRP1 G. gallus         TRRPLILQLVHVSPEDGRKTAGDENDPATWKNPRHLSKEIDAEEWGKFLHTKNKIYTDFD 118
DRP1 D. rerio          TRRPLILQLVHVDPEDRRKTSEE--------------NGVDGEEWGKFLHTKNKIYTDFD 104
DRP1 D. melanogaster  TRRPLVLQLIYSPLDDRENRSA-EN------------GTSNAEEWGRFLHTK-KCFTDFD 104
DRP1 C. elegans       TRRPLILQLNHVALDDESKRRR-------------SNGTLLTDDWAMFEHTGSKVFTDFD 107
                       *****:*** :   :*  :                       ::*. * **  * :****

DRP1 H. sapiens        EIRQEIENETERISGNNKGVSPEPIHLKIFSPNVVNLTLVDLPGMTKVPVGDQPKDIELQ 165
DRP1 M. musculus       EIRQEIENETERISGNNKGVSPEPIHLKVFSPNVVNLTLVDLPGMTKVPVGDQPKDIELQ 171
DRP1 G. gallus         EIRQEIENETERISGNNKGISPEPIHLKIFSSNVVNLTLVDLPGMTKVPVGDQPKDIELQ 178
DRP1 D. rerio          EIRQEIENETERVSGNNKGISDEPIHLKIFSPHVVNLTLVDLPGITKVPVGDQPKDIELQ 164
DRP1 D. melanogaster  EIRKEIENETERAAGSNKGICPEPINLKIFSTHVVNLTLVDLPGITKVPVGDQPEDIEAQ 164
DRP1 C. elegans       AVRKEIEDETDRVTGVNKGISLLPISLKIYSHRVVSLSLVDLPGITKIPVGDQPVNIEEQ 167
                        :*:***:**:* :* ***:.  ** **::* .**.*:******:**:****** :** *

DRP1 H. sapiens        IRELILRFISNPNSIILAVTAANTDMATSEALKISREVDPDGRRTLAVITKLDLMDAGTD 225
DRP1 M. musculus       IRELILRFISNPNSIILAVTAANTDMATSEALKISREVDPDGRRTLAVITKLDLMDAGTD 231
DRP1 G. gallus         IRELILQFISNPNSIILAVTAANTDMATSEALKIAREVDPDGRRTLAVITKLDLMDAGTD 238
DRP1 D. rerio          IRELILKYISNPNSIILAVTAANTDMATSEALKVAREVDPDGRRTLAVVTKLDLMDAGTD 224
DRP1 D. melanogaster  IKELVLKYIENPNSIILAVTAANTDMATSEALKLAKDVDPDGRRTLAVVTKLDLMDAGTD 224
DRP1 G. gallus         IREMILLYISNPSSIILAVTPANQDFATSEPIKLAREVDAGGQRTLAVLTKLDLMDQGTD 227
                       *:*::* :*.**.******* ** *:**** :*::::** .*:*****:******* ***

DRP1 H. sapiens        AMDVLMGRVIPVKLGIIGVVNRSQLDINNKKSVTDSIRDEYAFLQKKYPSLANRNGTKYL 285
DRP1 M. musculus       AMDVLMGRVIPVKLGIIGVVNRSQLDINNKKSVTDSIRDEYAFLQKKYPSLANRNGTKYL 291
DRP1 G. gallus         AMDVLMGRVIPVKLGIIGVVNRSQLDINNKKSVADSIRDEYGFLQKKYPSLANRNGTKYL 298
DRP1 D. rerio          AMDVLMGRVIPVKLGLIGVVNRSQLDINNKKSVADSIRDEHGFLQKKYPSLANRNGTKYL 284
DRP1 D. melanogaster  AIDILCGRVIPVKLGIIGVMNRSQKDIMDQKHIDDQMKDEAAFLQRKYPTLATRNGTPYL 284
DRP1 C. elegans       AMDVLMGKVIPVKLGIIGVVNRSQQNILDNKLIVDAVKDEQSFMQKKYPTLASRNGTPYL 287
                       *:*:* *:*******:***:**** :* ::* : * ::** .*:*:***:**.**** **

DRP1 H. sapiens        ARTLNRLLMHHIRDCLPELKTRINVLAAQYQSLLNSYGEPVDDKSATLLQLITKFATEYC 345
DRP1 M. musculus       ARTLNRLLMHHIRDCLPELKTRINVLAAQYQSLLNSYGEPVDDKSATLLQLITKFATEYC 351
DRP1 G. gallus         ARTLNRLLMHHIRDCLPELKTRINVLAAQYQSLLNSYGEPVEDKSATLLQLITKFATEYC 358
```

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DRP1 D. rerio          ARTLNRLLMHHIRDCLPELKTRINVLSAQYQSLLSSYGEPVEDMSATLLQLITKFATEYC 344
DRP1 D. melanogaster   AKTLNRLLMHHIRDCLPDLKTRVNIMATQFQSLLNSYGEDVSDKSQTLLQIITKFSSAYC 344
DRP1 C. elegans        AKRLNMLLMHHIRNCLPALKARVSIMNAQCQSDLVAFGEPVEDKNRTLLQIITRFATAYT 347
                       *: ** *******:*** **:*:.:: :* ** * ::** *.* . ****:**:*:: *

DRP1 H. sapiens        NTIEGTAKYIETSELCGGARICYIFHETFGRTLESVDPLGGLNTIDILTAIRNATGPRPA 405
DRP1 M. musculus       NTIEGTAKYIETSELCGGARICYIFHETFGRTLESVDPLGGLNTIDILTAIRNATGPRPA 411
DRP1 G. gallus         NTIEGTAKYIETSELCGGARICYIFHETFGRTLESVDPLGGLNTIDILTAIRNATGPRPA 418
DRP1 D. rerio          NTIEGTAKYIETAELCGGARICYIFHETFGRTLESVDPLGGLTTIDVLTAIRNATGPRPA 404
DRP1 D. melanogaster   CTIEGTARNIETTELCGGARMGYIFHETFGRTLDSIHPLAGLSKMDILTAIRNATGPRPA 404
DRP1 C. elegans        STIEGTARNIETTELCGGARICYIFHDTFGRSLESVNPLENLTQLDILTAIRNATGPRPA 407
                        ******: ***:*******: ****:****:*:*:.** .*. :*:*************

DRP1 H. sapiens        LFVPEVSFELLVKRQIKRLEEPSLRCVELVHEEMQRIIQHCSNYSTQELLRFPKLHDAIV 465
DRP1 M. musculus       LFVPEVSFELLVKRQIKRLEEPSLRCVELVHEEMQRIIQHCSNYSTQELLRFPKLHDAIV 471
DRP1 G. gallus         LFVPEVSFELLVKRQIKRLEEPSLRCVELVHEEMQRIIQHCSNYSTQELLRFPKLHDAIV 478
DRP1 D. rerio          LFVPEVSFELLVKRQVKRLEEPSLRCVELVHEEMQRIIQHCSNYSTQELLRFPKLHDAIV 464
DRP1 D. melanogaster   LFVPEVSFELLVKRQIRRLEEPSLRCVELIHEEMQRIVQHCGNEVQQEMLRFPKLHEKIV 464
DRP1 C. elegans        LFVPEVSFELLVKRQIQRLEEPSLRCVELVHEEMQRMVQHCGFTTQQEMIRFPRLYDKIN 467
                       ***************::************:******::***.    **::***:*:: *

DRP1 H. sapiens        EVVTCLLRKRLPVTNEMVHNLVAIELAYINTKHPDFADACGLMNNNIEEQRRNRLAREL- 524
DRP1 M. musculus       EVVTCLLRKRLPVTNEMVHNLVAIELAYINTKHPDFADACGLMNNNIEEQRRNRLAREL- 530
DRP1 G. gallus         EVVTCLLRRRLPVTNEMVHNLVAIELAYINTKHPDFADACGLMNNNIEEQRRNRLAREL- 537
DRP1 D. rerio          EVVTSLLRKRLPVTNEMVHNLVAIELAYINTKHPDFADACGLMNNNIEEQRRNRM-REL- 522
DRP1 D. melanogaster   DVVTQLLRRRLPHTNVMVENIVAIELAYINTKHPDFHKDAALVPSLLKTDSDPYSQINLG 524
DRP1 C. elegans        EVVSGVLKERLKPTNELVENLVAIELAYINTKHPEFTEANLVTLLKEELLLDDRHGRSRN 527
                       :**: :*:.**  ** :*.*:*************:* .   :     :         .

DRP1 H. sapiens        --PSAVSRDKS-----SKVPSALAPASQEPSPAASAEADGKLIQDSRRETKNVASGGGGV 577
DRP1 M. musculus       --PSAGSRDKS-----SKVPSALAPASQEPPPAASAEADGKLIQDNRRETKNVPSAGGGI 583
DRP1 G. gallus         --PSSVPRDKS-----TKAPGALPPASQETVTAASAEADGKA--------------AAGA 576
DRP1 D. rerio          --PTSVPRDKM----------------------------------------------AGG 534
DRP1 D. melanogaster   QRRANTPRNHMSPQISSHSAGSQQPQQQQPPQPNSSQQQYSQVHEQ-----------NHV 573
DRP1 C. elegans        RHASTGERA-----VSAH-----GEQQLQPVPGVNGVDLNAVLQQQQQQSQNQ------- 570
                          :   *

DRP1 H. sapiens        GDGVQEPTTGNWRGMLKTSKAEELLA-E--EKSKPIPIMPASPQKGHAVNL-LDVPV-PV 632
DRP1 M. musculus       GDGGQEPTTGNWRGMLKTSKAEELLA-E--EKSKPIPIMPASPQKGHAVNL-LDVPV-PV 638
DRP1 G. gallus         GDVTQESGTGNWRGMLKSSKAEEVSA-E--EKSKPAAALPASPQKGHAVNL-LDVPV-PV 631
DRP1 D. rerio          AQAEQEGGTGTWRGMLKKGD--EGQG-E--EKTKLQSSIPASPQKGHAVNL-LDVPV-PV 587
DRP1 D. melanogaster   AENSTPSMASTWLSNILPPAPTRPDSIENSTNNTPVHNNIVSPVK--PVNLLPDVPANHN 631
DRP1 C. elegans        ------RASNGFLGLFGN----------------AAASSKTSPQEKQSANFLPEVPETQL 608
                               :. : . :                        .** :   .*:  :**

DRP1 H. sapiens        ARKLSAREQRDCEVIERLIKSYFLIVRKNIQDSVPKAVMHFLVNHVKDTLQSELVGQLYK 692
DRP1 M. musculus       ARKLSAREQRDCEVIERLIKSYFLIVRKNIQDSVPKAVMHFLVNHVKDTLQSELVGQLYK 698
DRP1 G. gallus         ARKLSAREQRDCEVIERLIKSYFLIVRKNIQDSVPKAVMHFLVNHVKDTLQSELVGQLYK 691
DRP1 D. rerio          ARKLSAREQRDCEVIERLIKSYFLIVRKNIQDSVPKAVMHFLVNHVKDSLQSELVGQLYK 647
DRP1 D. melanogaster   PRRLTDKEQKDCDVIEHLIKSYFYIVRKSIQDSVPKAIMHFLVNYVKDNLQSELVTHLYK 691
DRP1 C. elegans        GRKLTSREQRDVAIIERLIRNYFIIVRKNIQDSVPKAIMALLVNFVRDNLQSELVRQLYK 668
                        *:*: :**:*  :**:**:.** ****.********:* :***.*:*.****** :***

DRP1 H. sapiens        SSLLDDLLTESEDMAQRRKEAADMLKALQGASQIIAEIRETHLW 736
DRP1 M. musculus       SSLLDDLLTESEDMAQRRKEAADMLKALQGASQIIAEIRETHLW 742
DRP1 G. gallus         SLLLDDLLTESEDMAQRRKEAADMLKALQRASQIIAEIRETHLW 735
DRP1 D. rerio          PALLDDLLTESEDMAQRRNEAADMLKALQKASQVIAEIRETHLW 691
DRP1 D. melanogaster   SDKAETLLNESDHIAVRRKEAADMLKALTRANHIISEIRETHMW 735
DRP1 C. elegans        PDEMDDLLAETEDMAQRRRDTLETMKALQQASVIISEVRETQVW 712
                           : ** *::.:* ** .:: : :***  *. :*:*:***::*
```

Alignment Fis1

🟥 TPR motifs
🟨 TMD

```
Fis1 H. sapiens        ----------------------------MEAVLNELVSVEDLLKFEKKFQSEK-AAGSVS 31
Fis1 M. musculus       ----------------------------MEAVLNELVSVEDLKNFERKFQSEQ-AAGSVS 31
Fis1 G. gallus         RPIRARSAPQRPIAPHSTPSCPIAPHSAPQRPISPCRPRFPPQALERRYAEES-HRGAPS 59
Fis1 D. rerio          ----------------------------MEAVVSDIVAPEDLKKFEKKYNAEL-VKGPVS 31
Fis1 D. melanogaster   ----------------------------MEDLLNEVVPQEDLERFEKKYHHELELDGEVT 32
Fis1 C. elegans        --------------------------MDYGTILEERTNPAVLMNAREQYMRQC-ARGDPS 33
                                                       :.           ..::  :    *  :

Fis1 H. sapiens        KSTQFEYAWCLVRSKYNDDIRKGIVLLEELLPKGS-KEEQRDYVFYLAVGNYRLKEYEKA 90
```

```
Fis1 M. musculus       KSTQFEYAWCLVRSKYNEDIRRGIVLLEELLPKGS-KEEQRDYVFYLAVGNYRLKEYEKA 90
Fis1 G. gallus         RRCRFEYAWGLLRSRYNSDVRKGVAMFRELMADGA-PEEQRDCVYYLAVGNYRLKEYEQA 118
Fis1 D. rerio          RDTTFEYAWCLIRSKYTNDIVKGIQLLEELVHTSK-KDDQRDFLFYLAVANYRLKEYERA 90
Fis1 D. melanogaster   TDTKFEYAFCLVRSRYTNDVRKGIMILEELART-H-PDGRRDYIYYLAFGNARIKEYTSG 90
Fis1 C. elegans        AASTFAFAHAMIGSKNKLDVKEGIVCLEKLLRDDEDRTSKRNYVYYLAVAHARIKQYDLA 93
                         * :*  :: *: . *: .*:  :.:*         :*: ::***..: *:*:*  .

Fis1 H. sapiens        LKYVRGLLQTEPQNNQAKELERLIDKAMKKDGLVGMAIVGGMALGVAGLAGLIGLAVSKS 150
Fis1 M. musculus       LKYVRGLLQTEPQNNQAKELERLIDKAMKKDGLVGMAIVGGMALGVAGLAGLIGLAVSKS 150
Fis1 G. gallus         LKYVGALLQAEPGNTQGLRLQQLVRACMHRGEPHCAP----------------------- 155
Fis1 D. rerio          LKYIRTLLKNEPDNKQALELEKLIKDALKKDGLVGMAIVGGIGLGVAGLAGLIGLAVSKG 150
Fis1 D. melanogaster   LKYCRAFLDIES-NDQVRSLEEYIKKEIDKEVAKGMVVAGGAALVLGGILGL-GIAMARN 148
Fis1 C. elegans        LGYIDVLLDAEGDNQQAKTLKESIKSAMTHDGLIGAAIVGGGALALAGLVAIFSMSRK-- 151
                       * *   :*. *  * *   *:. :   : :

Fis1 H. sapiens        KS---- 152
Fis1 M. musculus       KS---- 152
Fis1 G. gallus         ------
Fis1 D. rerio          AKS--- 153
Fis1 D. melanogaster   KQKREK 154
Fis1 C. elegans        ------
```

Alignment MFF

🟥 Repeated domains
🟩 Coiled coil domain
🟨 TMD

```
MFF H. sapiens         MSKGTSSDTSLGRVSRAAFPSPTAAEMAEISRIQYEMEYTEGISQRMRVPEKLKVAPPNA 60
MFF M. musculus        --------------------------MAEISRIQYEMEYTEGISQRMRVPEKLKVAPPNA 34
MFF G. gallus          -------------MSGAAFPSP-AAEMAEINRLQYEMEYTEGISQRMRVPEKLKVAPQNA 46
MFF D. rerio           --------------------------MAEVNRIHYELEYTEGISQQMRIPERLKIASGSS 34
                                                 ***:.*::**:********:**:**:**:*  .:

MFF H. sapiens         DLEQGFQEGVPNASVIMQVPERIVVAGNNEDVSFSRPADLDLIQSTPFKPLALKTPPRVL 120
MFF M. musculus        DLEQEFQDGVPNASVIMQVPERIVVTGNNEDISFSRPADLDLIQSTPFKPLALKTPPRVL 94
MFF G. gallus          DLEKNIPEGFPNASVTMQVPERIVVAGNSEDIPLSRPPDLDLLQSTPFKPLALKTPPRVI 106
MFF D. rerio           EEPPGLLNA--SHSTMMLVPERIVIAGDDNDARFGRPRDLDLIQSTPLETVELKTPPRVL 92
                       :    : :.  . *. * ******::*:.:*  :.** ****:****:: : *******:

MFF H. sapiens         TLSERPLDFLDLERPPT-TPQN-EEIRAVGRLKRERSMSEN-AVRQNGQLVRNDSLWHRS 177
MFF M. musculus        TLSERPLDFLDLERPLP-TPQS-EESRAVGRLKRERSMSEN-AVRQNGQLVRNDSI---- 147
MFF G. gallus          SLSDRPLDFLDLEKPPQQTPQN-EEVRSVGRLKRERSMSEN-ATRQNGQLARNDSM---- 160
MFF D. rerio           TLNDQPLDFLEPEPAANSTAQPREEMKSHFRSRREQCRSENSTMRRNGQINKHDF----- 147
                       :*.::*****: *     * *  ** ::  * :**:. *** : *:***: ::*

MFF H. sapiens         DSAPRNKISRFQAPISAPEYTVTPSPQQARVCPPHMLPEDGANLSSARGILSLIQSSTRR 237
MFF M. musculus        ---------------------VTPSPPQARVCPPHMLPEDGANLSSARGILSLIQSSTRR 186
MFF G. gallus          ------------------------------------------------------------
MFF D. rerio           -------------------ASPSPSRAPVRVCPPLISPEDSQNLNSASGVLNYIKSTTRR 188


MFF H. sapiens         AYQQILDVLDENRRPVLRGGSA-AATSNPHHDNVRYGISNIDTTIEGTSDDLTVVDAASL 296
MFF M. musculus        AYQQILDVLDENRRPVLRGGSA-AATSNPHHDNVRYGISNLDAAIEGASDDMTVVDAASL 245
MFF G. gallus          --------------PVLRGGSAATTSSNPHHDNTRYGLSNMDTTLEGTPDDMTVVDAASL 206
MFF D. rerio           AYQQVLEVLDDSQRG------------------RASLVTFDASVENTPDDAGLTDAASL 229
                                                         * .: .:*:::*.: **  :.*****

MFF H. sapiens         RRQIIKLNRRLQLLEEENKERAKREMVMYSITVAFWLLNSWLWFRR 342
MFF M. musculus        RRQIIKLNRRLQLLEEENKERAKREMVMYSITVAFWLLNSWLWFRR 291
MFF G. gallus          RRQIIKLNRRLQLLEEENKERAKREMIMYSITVAFWLLNSWLWFRR 252
MFF D. rerio           RRQIIKLNRRLQLLEHENKERAKREMVMYSLTVAFWLVNSWIWLRR 275
                       ***************.**********:***:******:***:*:**
```

Alignment GDAP1

🟥 GST domains
🟩 HD
🟨 TMD

```
GDAP1 H. sapiens       -----MA--ERQEEQ-------RGSPPLRAEGKADAEVKLILYHWTHSFSSQKVRLVIAE 46
GDAP1 M. musculus      -----MA--RRQDEA-------RAGVPLRVEGPPDKEVHLILYHWTHSFSSQKVRLVIAE 46
GDAP1 G. gallus        ----------------------------MAGPGGAAAPLVLYHWTQSFSSQKVRLAIAE 31
GDAP1 D. rerio         MAVENIGEGESQDEKEILIKKDAQDSGEIVESTKTKASKLILYHWTQSFSSQKVRLAIAE 60
```

```
GDAP1 D. melanogaster  -----MS--EQTKEIEALP-----PTLQDFKAPDLPANKPVLFFHPYNFHAQKVLMVFYE 48
                                                      .        :*:.   .* :*** :.: *

GDAP1 H. sapiens       KALKCEEHDVSLPLSEHNEPWFMRLNSTGEVPVLIHGENIICEATQIIDYLEQTFLDERT 106
GDAP1 M. musculus      KALKCEEHDVSLPLSEHNEPWFMRLNSAGEVPVLVHGENIICEATQIIDYLEQTFLDERT 106
GDAP1 G. gallus        KALTCEEHDVNLPLSEHNEPWFMRLNASGEVPVLIHGENIICEATQIIDYLEATFVDAEV 91
GDAP1 D. rerio         KGLQCEDYDVSLPLSEHNEPWFMRLNPTGEVPVLVHDNHVICDPTQIMDYLEQNFCDEQT 120
GDAP1 D. melanogaster  KKIDFFPYVVDLCNGEQYSNWFLNLNPKGDVPVLQDGALVIPSSTHIINYVESKFRGDRS 108
                       * :    : *.*  .*: . **:.**  *:**** ..   :* . *:*::*:* .* . .

GDAP1 H. sapiens       PRLMPDKESMYYPRVQHYRELLDSLPMDAYTHGCILHPELTVDSMIPAYATTRIRSQIGN 166
GDAP1 M. musculus      PRLMPDEGSMYYPRVQHYRELLDSLPMDAYTHGCILHPELTVDSMIPAYATTRIRSQIGN 166
GDAP1 G. gallus        PRLMPEEGSMYYPRVQHYRELLDSLPMDAYTHGCILHPELTVDSMIPAYATSRIRSQISN 151
GDAP1 D. rerio         PKLIPEEGSTYYHRVQHYRELLDSLQMDAYTHGCILHPEITVDSHIPAYATTHIRTQIGN 180
GDAP1 D. melanogaster  --LKPAHNSKEFDQMLIFEQAMARLPVGTLSLGSFIHDDLKLVPKAPFIGPVRQ-SCLKN 165
                         * * . *  : ::  :.: :  * :.: : *.::* ::.:    *  .  :  : : *

GDAP1 H. sapiens       TESELKKLAEENPDLQEAYIAKQKRLKSKLLDHDNVKYLKKILDELEKVLDQVETELQRR 226
GDAP1 M. musculus      TESELKKLAEENPDLQEAYIAKQKRLKSKLLDHDNVKYLKKILDELEKVLDQVETELQRR 226
GDAP1 G. gallus        TESELKKLAEENPDLQDAYIAKQKRLKSKLLDHDNIKYLKKILDELEKVLDQVETELQRR 211
GDAP1 D. rerio         TESELKKLAVENPDLKDAYIAKQRRLKSKLFDHDNMKYLKKLLDELENVLDQVETELQRR 240
GDAP1 D. melanogaster  NEKVLDLLRHSVDEQATKKAALQHKLDIQLRRH----ELASSREEFQKVLDAVRHFLLYV 221
                       .*. *. *  .  :      * *::*. :*  *     * .  :*:::*** *.  *

GDAP1 H. sapiens       NEETPEEGQ-QPWLCGESFTLADVSLAVTLHRLKFLGFARRNWGNGKRPNLETYYERVLK 285
GDAP1 M. musculus      NEETPEEGN-QPWLCGESFTLADVSLAVTLHRLKFLGFARRNWGHGKRPNLETYYERVLK 285
GDAP1 G. gallus        NEETPEDGS-QPWLCGEFFSLADVSLAVTLHRLKFLGLARRNWGNGKRPNLEAYYERVLK 270
GDAP1 D. rerio         SEETPEEGSQQAWLCGDFFSIADVSLAVTLHRLKFLGLSRRYWGNGMRVNLETYYERVLD 300
GDAP1 D. melanogaster  EQELTAQAPRVEWLTGDELSVADISLGLLLHRLYQLGFENQFWTFGKLPQVEAYFLRFRQ 281
                       .:*   :.    ** *: :::**:**.: ****  **: .: *  *   ::*:*: *. .

GDAP1 H. sapiens       RKTFNKVLGHVNNILISAVLPTAFRVAKKRAPKVLGTTLVVGLLAGVGYFAFMLFRKRLG 345
GDAP1 M. musculus      RKTFNKVLGHVNNILISAVLPTAFRVAKKRAPKVLGSTLVVGLLVGMGYFAFMLFRRRLG 345
GDAP1 G. gallus        RKAFHKVLGHVNNILISAVLPTAFRVAKKRAPRVLGTTLMVGMLAGMAYFALVCLRKRFA 330
GDAP1 D. rerio         RPTFRRVLGHVNNILISAVLPTAFRVAKKKAPAFVGATLLVGLIGGATYLAFIYFKKRLL 360
GDAP1 D. melanogaster  RESFHRLQPSNFAILREMW---------TRTPGNYK------LGAGAGFLGMAMFAAFAH 326
                       * :*.::      ** .           .::*          :  *  ::.:  :

GDAP1 H. sapiens       SMILAFRPRPNYF 358
GDAP1 M. musculus      SMILALRPRPNYF 358
GDAP1 G. gallus        NMMLSIRTRQNYF 343
GDAP1 D. rerio         VS----------- 362
GDAP1 D. melanogaster  K------------ 327
```

Alignment GDAP1L1

🟦 Conserved cysteine residues
🟥 GST domains

```
GDAP1L1 H. sapiens     MATPNNLTPTNCSWWPISALESDAAKPAEAPDAPE--AASPAHWPRESLVLYHWTQSFSS 58
GDAP1L1 M. musculus    MATPNNLTPTNCSWWPISALESDAAKPVETPDAPE--ASSPAHWPKESLVLYHWTQSFSS 58
GDAP1L1 G. gallus      MATPNNVTPTNCSWWPISALENDAGKSKEGEENQD--PTDPALRSQDRLVLYHWTQSFSS 58
GDAP1L1 D. rerio       MASSNNVTPTNCSWWPISAMEEDGKIPD-GEESHEPTIHEHKPYSKDRLVLYHWTQSFSS 59
                       **: **:************:*.*.       :  :    .     :: ************

GDAP1L1 H. sapiens     QK---VRLVIAEKGLVCEERDVSLPQSEHKEPWFMRLNLGEEVPVIIHRDNIISDYDQII 115
GDAP1L1 M. musculus    QKRLQVRLVIAEKGLACEERDVSLPQSEHKEPWFMRLNLGEEVPVIIHRDNIISDYDQII 118
GDAP1L1 G. gallus      QK---VRLVIAEKGLPCEERDVSMPLLEHKEPWFMRLNLGEEVPVIIHRDNIISDYNQII 115
GDAP1L1 D. rerio       QK---VRLVINEKGLLCEERDVSLPLTEQKEPWFMRLNLGEEVPVFIHGDTIVSDYNQII 116
                       **   ***** **** *******:*  *:****************:** *.*:***:***

GDAP1L1 H. sapiens     DYVERTFTGEHVVALMPEVGSLQHARVLQYRELLDALPMDAYTHGCILHPELTTDSMIPK 175
GDAP1L1 M. musculus    DYVERTFTGEHVVALMPEAGSPQHARVLQYRELLDALPMDAYTHGCILHPELTTDSMIPK 178
GDAP1L1 G. gallus      DYMERNFTGENVPQLIPEPGTLLHSRVLQYRELLDSLPMDAYTHGCILHPELTTDSMIPK 175
GDAP1L1 D. rerio       DYIETNFVGDTVAQLIPDEGTPMYARVQQYRELLDGLPMDAYTHGCILHPELTTDSMIPK 176
                       **:* .*.*: *  *:*: *:  ::** *******.************************

GDAP1L1 H. sapiens     YATAEIRRHLANATTDLMKLDHEEEPQLSEPYLSKQKKLMAKILEHDDVSYLKKILGELA 235
GDAP1L1 M. musculus    YATAEIRRHLANATTDLMKLDHEEEPQLSEPYLSKQKKLMAKILEHDDVSYLKKILGELA 238
GDAP1L1 G. gallus      YATAEIRRHLANASTELMKLDHEEEPPLTEPYLSKQKKLMAKILEHDNVNYLKKILGELG 235
GDAP1L1 D. rerio       YATAEIRRHLANAASELMKLDHE-EPQLTEPYLSKQKKLMAKILDHDNVNYLKKILGELA 235
                       *************:::******* ** *:***************:**:*.*********.

GDAP1L1 H. sapiens     MVLDQIEAELEKRKLENEGQKCELWLCGCAFTLADVLLGATLHRLKFLGLSKKYWEDGSR 295
GDAP1L1 M. musculus    MVLDQIEAELEKRKLENEGQTCELWLCGCAFTLADVLLGATLHRLKFLGLSKKYWEDGSR 298
```

```
GDAP1L1 G. gallus      MVLDQIEAELEKRKLEYQGQKCELWLCGCVFTLADILLGATLHRLKFLGLSKKYWEDGSR 295
GDAP1L1 D. rerio       MVLDQVEAELEKRKLEYQGQKCELWLCGPTFTLADICLGATLHRLKFLGLSRKYWEDGSR 295
                       *****:********** :**.******* .*****: **************:********

GDAP1L1 H. sapiens     PNLQSFFERVQRRFAFRKVLGDIHTTLLSAVIPNAFRLVKRKPPSFFGASFLMGSLGGMG 355
GDAP1L1 M. musculus    PNLQSFFERVQRRFAFRKVLGDIHTTLLSAVIPNAFRLVKRKPPSFFGASFLMGSLGGMG 358
GDAP1L1 G. gallus      PNLQSFFDRIQKRFAFRKVLGDIHTTLLSAVVPNAFRLVKRKPPSFFGASFLMGSLGGMG 355
GDAP1L1 D. rerio       PNLQSFFERVQKRYAFRKVLGDIHTTLLSAVLPNAFRMVKKKPPSFFGASFLMGSLGGMG 355
                       *******:*:*:*:*****************:*****:**:*******************

GDAP1L1 H. sapiens     YFAYWYLKKKYI 367
GDAP1L1 M. musculus    YFAYWYLKKKYI 370
GDAP1L1 G. gallus      YFAYWYLKKKYI 367
GDAP1L1 D. rerio       YFAYWFLKKKYM 367
                       *****:*****:
```

Alignment Mid49

🟨 Transmembrane region
🟩 Disordered region
🟫 Drp1 recruitment domain

```
Mid49 H. sapiens       MAEFSQKRGKRRSDEGLGSMVDFLLANARLVLGVGGAAVLGIATLAVKRFIDRATSPRDE 60
Mid49 M. musculus      MAEFSQKQRKQSGSEGLGSVVDFLLANARLVLGVGGAAVLGIATLAVKRLIDRATSPPDE 60
Mid49 D. rerio         ----MYYSGKRRGEDGIAAVIDFLLSNARLVLGVGGAAVLGIATLAVKRLIERAGRPPDE 56
                                *:  ..:*:.:::****:***********************:*:**  * **

Mid49 H. sapiens       DD--TKADSWKELSLLKATPHLQPRPPPA-------------ALSQPVLPLAPSSSAPEG 105
Mid49 M. musculus      DD--TKGDSWKELSLLRATSPQKPQPPPA-------------AFSQPLATGSPSPSVPVE 105
Mid49 D. rerio         EPDKKMTDSWEELSLVSASPKLLHKGIEGVVMKQIAAATKKAELSQPIP----MPSSEPQ 112
                       :   .  ***:****: *:     :   .              :***:       *

Mid49 H. sapiens N     PAETDPEVTPQLSSPAPLCLTLQERLLAFERDRVTIPAAQVALAKQLAGDIALELQAYFR 165
Mid49 M. musculus      PTPIHSPTTPKFSTIAPLCLTFQERLLAFERKHVITPEAHVTLAKQLAGDIALELQAYLR 165
Mid49 D. rerio         RCDADPPPPQRRKRMDLCVLTFADRLQQYYRTRVCLSAEEVCVAQQRALDIATEIQAFLH 172
                           .     : .      **: :**  : * :*     .* :*:* * *** *:**:::

Mid49 H. sapiens       SKFPELPFGAFVPGGPLYDGLQAGAADHVRLLVPLVLEPGLWSLVPGVDTVARDPRCWAV 225
Mid49 M. musculus      SKFPELPFGALVPGGPLYDGLQAGTAEHVRLLAPLELEPGLWSLVPGVDTVAREPRCWAV 225
Mid49 D. rerio         SKHPDMPLGDMTLAGSLLDDLQVVTADHACLIVPLQLESSLWTPIAGEDTFLGHPQYCMV 232
                       **.*::*:* :. .* * *.**. :*:*. *:.** ** .**: : * **.  .*:   *

Mid49 H. sapiens       RRTQLEFCPRGSSPWDRFLVGGYLSSRVLLELLRKALAASVNWPAIGSLLGCLIRPSMAS 285
Mid49 M. musculus      RRTQLEFHPRGCSPWDRFLVGGYLSSRVLLELLRKALSASVNWPAIGSLLGCLIWPDVAS 285
Mid49 D. rerio         RRENLEYFPRGRSYWDRHLLGAYLSSRLVCEQLSKAVMESMNWPSLTGTLECEVRPVLGS 292
                       ** :**: *** * ***.*:*.*****:: * * **:  *:***:: . * * : * :.*

Mid49 H. sapiens       EELLLEVQHERLELT----VAVLVAVPGVDA-DDRLLLAWPLEGLAGNLWLQDLYPVEAA 340
Mid49 M. musculus      EELLLKVQHECLEFT----LAVLMVVPGAST-DDRLLLAWPLEGLASNLWLQDLYPVETA 340
Mid49 D. rerio         PELKLEIQGLTQSSHDSGERFYITVLPTVRLGQMTLMAQREITGSFDYVWYQSLYSSETA 352
                        ** *::*    .         : .:* .   :  *:    : *  . :* *.**  *:*

Mid49 H. sapiens       RLRALDDHDAGTRRRLLLLLCAVCRGCSALGQLGRGHLTQVVLRLGEDNVDWTEEALGER 400
Mid49 M. musculus      RLRALDDQDAGTRRRLLLLLCGICRGHPALVRLGWSHLTQVVLHLGEEEVAWTEEALGER 400
Mid49 D. rerio         RLAALDQADSGARRKCLKTLKAVCRNCPALRKLNGSHISNVVLHMSEKETDWSESAFSNR 412
                       ** ***: *:*:**: *  * .:**.  ** :*. .*:::***::.*.:. *:*.*:.:*

Mid49 H. sapiens       FLQALELLIGSLEQASLPCHFNPSVNLFSSLREEEIDDIGYALYSGLQEPEGLL- 454
Mid49 M. musculus      FLQALEFLVGSLEQASLPCHFNPSVNLLGNFREEEIDDIGYVLYSGLQVPESLF- 454
Mid49 D. rerio         FLQAITELIGYLETGVLPSYFKANVNLFQGFTEDDIDEMGFMLYCAVTEPEILLI 467
                       ****:  *:* ** . **.:*: .***: .: *::**::*: **..:  ** *:
```

Alignment MiD51

🟨 Transmembrane region
🟩 Disordered region
☒ NT domain (N-terminus)
🟫 Drp1 recruitment domain
🟪 NT domain (C-terminus)

```
Mid51 H. sapiens       -MAGAGERKGKKDDNGIGTAIDFVLSNARLVLGVGGAAMLGIATLAVKRMYDRAISAPTS 59
Mid51 M. musculus      -MAGAGERKGKKDDNGIGTAIDFVLSNARLVLGVGGAAMLGIATLAVKRMYDRAISAPTS 59
Mid51 D. rerio         MAGVNGDRKGKKDDNGLGTAIDFVLSNAKLVLGVGGAAMLGIATLAVKRMYDRALSAPSS 60
                         .  *:*********:***********:*************************:***:*
```

```
Mid51 H. sapiens        PTRLSHSGKRSWEEPNWMGS-PRLLNRDMKTGLSRSLQTLPTDSSTFDTDTFCPPRPKPV 118
Mid51 M. musculus       PTRLSHSGKRSWEEPNWMGS-PRLLNKDMKAGLSRSLQTLPTDSSAFDTDTFCPPRPKPL 118
Mid51 D. rerio          PTKADPSGRRSWEEPSWLGSSPRTLNHDMKQNVSRSLQTLPTSSSSFKPDSLHRGLA-RG 119
                        **: . **:******.*:** ** **:*** .:*********.**:*. *::

MiD51 H. sapiens        ARKGQVDLKKSRLRMSLQEKLLTYYRNRAAIPAGEQARAKQAAVDICAELRSFLRAKLPD 178
MiD51 M. musculus       ARRGQVDLKKSRLRMSLQEKLLSYYRNRAAIPAGEQARAKQAAVDICAELRSFLRAKLPD 178
MiD51 D. rerio          GRPAKAELQRARLRLSLQEHLWAFFHERVTIPSEEQSVARRAALDICAELRVFLHAKLPD 179
                        .* .:.:*:::***:****:* :::::*.:**: **: *::**:******* **:*****

Mid51 H. sapiens        MPLRDMYLSGSLYDDLQVVTADHIQLIVPLVLEQNLWSCIPGEDTIMNVPGFFLVRRENP 238
Mid51 M. musculus       MPLRDMYLSGSLYDDLQVVTADHIQLIVPLVLEQNLWSCIPGEDTIMNVPGFFLVRRENP 238
Mid51 D. rerio          MPLREMYLSGSLYDDLQVVTADHAQLMVPLILEKNLWSSIPGEDTIMNIPGFSLVRRENL 239
                        ****:****************** **:***:**:****.*********:*** ******

Mid51 H. sapiens        EYFPRGSSYWDRCVVGGYLSPKTVADTFEKVVAGSINWPAIGSLLDYVIRPAPPPEALTL 298
Mid51 M. musculus       EYFPRGSSYWDRCVVGGYLSPKTVADTFEKVVAGSINWPAIGSLLDYVIRPAPPPEALTL 298
Mid51 D. rerio          EYFPRGSSYWDRCMVGGYLSPKSVLEVFEKLVAGSINWPAIGSVLDYVIRPVVPSETLTL 299
                        *************:********:* :.***:************:*******. * *:***

Mid51 H. sapiens        EVQYERDKHLFIDFLPSVTLGDTV-LVAKPHRLA--QYDNLWRLSLRPAETARLRALDQA 355
Mid51 M. musculus       EVQYEKDKHLVIDFLPSVTLGDTV-LVARPHRLA--QYDNLWRLSLRPAETARLRALDQA 355
Mid51 D. rerio          EVQYETDRRLYVDFLPLLVMEDGVSLIAKPHRLAAERHENLWRQSFRVAETAKLRALDQE 359
                        ***** *::* :**** :.: * * *:*:*****  :::**** *:* ****:******

Mid51 H. sapiens        DSGCRSLCLKILKAICKSTPALGHLTASQLTNVILHLAQEEADWSPDMLADRFLQALRGL 415
Mid51 M. musculus       DSGCRSLCLKILKAICKSTPALGHLTASQLTNVILHLAQEEADWSPDMLADRFLQALRGL 415
Mid51 D. rerio          DAGCRSVCLKILKAVCKLNPALARLNASQLTNAILLLSEQEGDWTQEALADRFMQLLRAL 419
                        *:*****:*******:** .***.:*.******.** *:::*.**: : *****:* **.*

Mid51 H. sapiens        ISYLEAGVLPSALNPKVNLFAELTPEEIDELGYTLYCSLSEPEVLLQT- 463
Mid51 M. musculus       ISYLEAGVLPSALNPKVNLFAELTPQEIDELGYTLYCSLSEPEVLLQT- 463
Mid51 D. rerio          VGHLEAGRMPCTLNLKVNLLCELTPQEIDELGYTLYCALSDPESLLRTV 468
                        :.:**** :*.:** ****:.****:***********:**:** **:*
```