CLUSTAL multiple sequence alignment by MUSCLE (3.8) Dictyostelium ----MNENISVSVRARPFNEKEVKDKEHCLWQFGNNNTITSLPPPITQPV -----MAGQGDCCVKVAVRIRPQLSKEKIEGCHI-----Mus Xenopus MSSQNSFMSSKKDDKGKNIQVVVRCRPFNQLERKASSHSVLE-----MASQPSSSSKKKEEKGKNIQVVVRCRPFNLAERKANAHSVVE-----Rat MASQPNSSAKKKEEKGKNIQVVVRCRPFNLAERKASAHSIVE-----Humans ______ Sus Dictyostelium SSLPPISTPIKSSSSSSTSTSAGSLKTPLKTPLKTPLKTPLKTNSTTTNTTVPASPAPTS -----CTSVTPGEPQVLL Mus -----CDAPRKEVCVRTG Xenopus -----CDHARKEVSVRTA Rat -----CDPVRKEVSVRTG Humans Sus Dictyostelium SLTSKFVSNSYTYDHLFPPTCDNYEVYDTVARELVKSAMEGYNASIMAYGITSSGKTFTM G----KDKAFTYDFVFDLDTWQEQIYSTCVSKLIEGCFEGYNATVLAYGQTGAGKTYTM Mus Xenopus GINDKLGKKTYTFDMVFGPAAKQIDVYRSVVCPILDEVIMGYNCTVFAYGQTGTGKTFTM GLTDKTSRKTYTFDMVFGASTKQIDVYRSVVCPILDEVIMGYNCTIFAYGQTGTGKTFTM Rat GLADKSSRKTYTFDMVFGASTKQIDVYRSVVCPILDEVIMGYNCTIFAYGQTGTGKTFTM Humans Sus -----GKTFTM **** TG-----CKEREFLLRVSYLEIYN Dictyostelium GTGF---DTVTSEEEQ--GIIPRAIAHLFRGIDERKRRAQEKGVTGPEFKVSAQFLELYN Mus Xenopus EGERSADEEFTWEQDPLAGIIPRTLHQIFEKLSE----NGTEFSVKVSLLEIYN EGERSPNEVYTWEEDPLAGIIPRTLHQIFEKLTD-----NGTEFSVKVSLLEIYN Rat EGERSPNEEYTWEEDPLAGIIPRTLHQIFEKLTD-----NGTEFSVKVSLLEIYN Humans EGERSPNEEYTWEEDPLAGIIPRTLHQIFEKLTD-----NGTEFSVKVSLLEIYN Sus : ::: **** :: :* :: . ** : .. **:** ETVNDLLGVNQE----NFNLKIHEHPVT--GVYVAGLKEEIVLSVEHVLSLISAGEAH Dictyostelium EEILDLFDSTRDPDARHRRSNIKIHEDANG--GIYTTGVTSRLINSQEELIQCLKQGALS Mus EELFDLLSPSPDV----GERLQMFDDPRNKRGVIIKGLEEVSVHNKDEVYHILERGAAR Xenopus EELFDLLSPSSDV----SERLQMFDDPRNKRGVIIKGLEEITVHNKDEVYQILEKGAAK Rat EELFDLLNPSSDV----SERLQMFDDPRNKRGVIIKGLEEITVHNKDEVYQILEKGAAK Humans EELFDLLNPSSDV----SERLQMFDDPRNKRGVIIKGLEEITVHNKNEVYQILEKGAAK Sus * : **:. . : .:::.: . *: *: . : . : . * Dictyostelium RHVGSTSYNLQSSRSHTIFKMII-----ESKEVLPEGSGSGGLESPVRYSTL RTTASTQMNVQSSRSHAIFTIHLCQMRVCAQPDLVNETVTGLPDGAAPTGTEYETLTAKF Mus Xenopus RKTASTLMNAYSSRSHSVFSVTI-----HMKETTVDG-----EELVKIGKL RTTAATLMNAYSSRSHSVFSVTI-----HMKETTIDG-----EELVKIGKL Rat RTTAATLMNAYSSRSHSVFSVTI-----HMKETTIDG-----EELVKIGKL Humans RTTAATLMNAYSSRSHSVFSVTI-----HMKETTVDG-----EELVKIGKL Sus * ...* * *****... Dictyostelium NLIDLAGSEKASESTISAIRNKEGSYINKSLLTLGTVISKLSEKDTG--YIPYRDSKLTR HFVDLAGSERLKRTGATGERAKEGISINCGLLALGNVISALGDQSKKVVHVPYRDSKLTR Mus NLVDLAGSENIGRSGAVDKRAREAGNINQSLLTLGRVITALVERAP---HIPYRESKLTR Xenopus NLVDLAGSENIGRSGAVDKRAREAGNINQSLLTLGRVITALVERTP---HIPYRESKLTR Rat NLVDLAGSENIGRSGAVDKRAREAGNINQSLLTLGRVITALVERTP---HVPYRESKLTR Humans NLVDLAGSENIGRSGAVDKRAREAGNINQSLLTLGRVITALVERTP---HVPYRESKLTR Sus :::***** * .*. ** .**:** **: * :. ::***:*** VLQNSLSGNSRVAIICTITLASNNFEESHNTLKFASRAKKISNNAKVNEILDDK-----Dictyostelium LLQDSLGGNSQTIMIACVSPSDRDFMETLNTLKYANRARNIKNKVVVNQDKTSQQISALR Mus Xenopus ILQDSLGGRTKTSIIATVSPASINLEETVSTLEYANRAKNIMNKPEVNQKLTKR-----ILQDSLGGRTRTSIIATISPASLNLEETLSTLEYAHRAKNIMNKPEVNQKLTKK-----Rat ILQDSLGGRTRTSIIATISPASLNLEETLSTLEYAHRAKNILNKPEVNQKLTKK-----Humans ILQDSLGGRTRTSIIATISPASLNLEETLSTLEYAHRAKNILNKPEVNQKLTKK-----Sus :**:**.*.:. :*. :: *: .**::* **.:* *: ... Dictyostelium Mus **AEIARLQMELMEYKAGKRVIGEDGTEGYSDLFRENAMLQKENGALRLRVKAMQEAIDAIN** Xenopus Rat Humans Sus Dictyostelium -----ALLKQYRNEI-----AELKSKLSDA NRVTQLMSQEANLLLAKAGDGNEAIGALIQNYIREIEELRTKLLESEAMNESLRRSLSRA Mus -----ERLKRDLATA Xenopus Rat ----ALIKEYTEEI-----ERLKRDLAAA -----ALIKEYTEEI-----ERLKRDLAAA Humans Sus -----ERLKRDLAAA **::* ** *. .*: * Dictyostelium SARNPYSLGASPAGPAFGGSPATSMEDASEVIRKAKQDLERLKKKEVRQRRKSPEKEAFK Mus Xenopus REKNGVYL-SNENYEQLQGKVLSQEEIITEYTEKI------TAMEEEIK Rat REKNGVYI-SEESFRAMNGKVTVQEEQIAELAEKI-----GVLEEELS Humans REKNGVYI-SEENFRVMSGKLTVQEEQIVELIEKI-----GAVEEELN Sus RK-----Dictyostelium -----LSTEKELQETLTE------KRAKLQAENSEETDENEAEEEEEERDESGCEEEEGREDEDEDSGSEESLVDSDSDPEEKE Mus Xenopus RINELFAENKKELEECTTILQCKEK-----Rat KAAELFTDSEKELNQCKSDLQTKTQ-----Humans RVTELFMDNKNELDQCKSDLQNKTQ-----Sus Dictyostelium -----KEKMKITNQELL-----VNFQADLADLTCEIEIKQKLIDELENSQRRLQTLKHQYEEKLILLQNKIRDTQLERDRVL Mus ----ELEETQKNLH----ESKEQLAQEAFVVTALET----Xenopus ----ETKLQLVKEEYVSSALER---Rat ----ETKLQLVKEEYITSALES---Humans Sus

Humans

Dictyostelium Mus Xenopus Rat Sus Dictyostelium Mus Xenopus Rat Sus Dictyostelium Mus Xenopus Rat Humans Sus Dictyostelium Mus Xenopus Rat Humans

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Dictyostelium

QNLSTMECYTEEKANKIKADYEKRLREMNRDLQKLQAAQKEHARLLKNQSRYERELKKLQ -----TEKKLHGTANKLLTTVRETSKDVSGLHA------

-----TEKKLHETASKLLNTVKETTRDVSGLHS------

-----TEEKLHDAASKLLNTVEETTKDVSGLHS------

-----HKLVD-----

AEVAEMKKAKVALMKQMREEQQRRRLVETKRNREIAQLKKEQRRQEFQIRALESQKRQQE

-----QHNTQVHE

-----AHNAEAQE

-----AEKHRSLLESKINNLNKLILVSTSVNNSASKGGSGSGNG-

IVLRRKTQEVSALRRLAKPMSERVAGRVGLKPPNMDSGAEVSASTTSSEAESGARSVSSI

NFAEQMDKRFSVIERSVDEYSVKQQGMLDFYTNSIDNLLGASSAALSVTATAVAKSFTSV

SFGRSLSSLFNNMEELIRDGSEKQKAMLDVHKALFGNLMSSSVSALDTISTTALESLMSI IFGKNLNSLFNNMEELIKDGSSKQKAMLEVHKTLFGNLLSSSVSALDTITTVALGSLTSI

VRQWNRKIDHFLGDRPTATVNGGRPARKKFQKKGASQSFSKAARLKWQSLERRIIDIVMQ

QETVSEKVSH-----SVDEILK PENVLARVSO----ISDMILE

PENVSTHVSQ----IFNMILK

RMTIVNLEADMERLIKKREELFLLQEALRRKREHLQAESPEEEKGLQELAEEIEVLAANI

QETLSSQAKD-----DLQKLMAAHRTGL-----EQALRTDLLPVVTAV EQSLAAQSKT-----VLQGSIDELVTNL----FTSLKTIIAPGVVSI

EQSLAAESKT-----VLQELINVLKTDL-----LSSLEMILSPTVVSI

----NGSRSTFVSPSQNSHHHHGDLGSITP----NSFSNLLLQSPSQNN DYINDSITDCQATIVQLEETKEELDSTDTSVVISSCSLAEARLLLDNFLKASIDKGLQVA

LNLNSHLSHCLQNFQAVADKIDSHKEEMNSFFTEHS-----RSLHRLRLDSGSALS LNINRQLQHIFRASVTMAEKVEDQKREIDSFLSILC----NNLHELRENTVSSLV

LKINSQLKHIFKTSLTVADKIEDQKKELDGFLSILC----NNLHELQENTICSLV

NNNSHISPLSQSTSSLTIGGGSGNGFESNEL-----IQIQSKMAKLELE QKEAQIRLLEGRLRQTDMTGSSQNHLLLDALREKAEAHPELQALIYNVQHENGYASTDEE

SIQSEYESLKVEIETAQSMHSEGVNNLIGSLQNQLNLLAMETQQNF-SGFLAKGGKLQKS

ESQKLCGNLTEDLKTIKETHSQELCQLSSSWAER-----F-CALEKKYANIQKP ESQKQCGNLTEDLKTIKQTHSQELCKLMNLWTER----F-CALEEKCENIQKP

LEEKNKKIDFLTSFNQDSALEKIKQLEGELVQRDMDLGLYQRESTR-----VSEFSEGSFSQSFTMKGSTSHDDFKFKGEPK-LSAQMKAVSAECLGPPLDSSTKNITKSL

VGCLQQDLDSISSDAIEHTSSHHDKFAGQSQDIAVEIRQLAASNMG-TLEESSKQCEKLT LNSIQENTERKSTDIINKTTVHSKKILADSDGLLQELRHFNEEGTQ-LVEDSVGHCGSLS

LSSVQENIQQKSKDIVNKMTFHSQKFCADSDGFSQELRNFNQEGTK-LVEESVKHSDKLN

ASLVEIKEDGVGFSIRDPYYRDKVSRTVSLPTRGSTFPRQSRGATDTSPLTRRKSYDRGQ

GSINAIS-----RESQHWCESASQQIDSLLEE-----SNLETVS-----QEITQRCGTLNTSTVHFSDQ------

GNLEKIS-----QETEQRCESLNTRTVYFSEQ------

PIRSTDMGFTPPSSPPTRPRNDRNVFSRLTSNQSQGSALDKSDDSDSSLSEVLRGIITPI ----QVCYLRTSKKHLQSLQKDVEV----

-----WASCLSKRKEELQNLMEFVNG----

-----WVSSLNEREQELHNLLEVVSQ----

GGAKGARTAPLQCISMAEGHTKPILCLDATDELLFTGSKDRSCKMWNLVTGQEIAALKGH -----GCGASVVEITEHVNAQRQAEEKAL

-----CCEASSSEITEKIRGHRAAIESQH

-----CCEASSSDITEKSDGRKAAHEKQH

PNNVVSIKYCSHSGLVFSVSSSYIKVWDIRDSAKCIRTLTSSGQVISGDA---CIATSTR

-----TSLVEQVRDDKEMLGEQRLELHEQVQSGQNKVNSYLNEEL

----SSFVVQITSDEEKFKAGSLELDKTIKTGLTKLNCFLQQDL

-----NIFLDQMTIDEDKLIAQNLELNETIKIGLTKLNCFLEQDL

-----ILLKFKQI AITSAQGEHQINQMALSPSGSMLYVASGNAVRIWELNRFQPIGKLTGHIGPVMCLTVTQT

RNDVPTGTTPQRRDYVYP--SLLVRTKPRDVLLEQFRQQQQ-----EYLESISSVIS KLDIPTGMTPERKNYLYP--STLVRTEPREQLLDQLQKKQP-----KPLMMLNCSES

KLDIPTGTTPQRKSYLYP--STLVRTEPREHLLDQLKRKQP----ELLMMLNCSEN

DSENTSLKSKIQEYEVMY-----SNQHDLVVTGSKDHYVKMFQLGDCVTGTIGPTHNFEPPHYDGIECLAIQGDILFSGSRDN

EAVEPPVEQDSLEDEPPVAVNDSVMSE-----KSCIDLSMVCQENGGVPFFQQKKAL

SK-ETSQDME-EDREVLEQSTEELVSQ-----EPCVHTSADCSSSGGVPFFQHKKPH

NKEETIPDVD-VEEAVLGQYTEEPLSQ-----EPSVDAGVDCSSIGGVPFFQHKKSH

GIKKWDLDQQELIQQIPNAHKDWVCALAFVPGRPMLLSACRAGFIKVWNVDNFTPIGEIK

RKEKENRANTTLLER------GKDKENRGLNP-VEK------

GKDKENRGINT-LER------

GHDSPINAICTNSKHIFTASSDCRVKLWNYVPGLTPCLPRRVLAIKGRAPPCPDLPPPPL

----SKIMDEAEQ------SLPKSKLPLRMQN----------GKVEEASEH-------SISKSRLPLRASINLC-----

----SKVEETTEH------LVTKSRLPLRAQINL-----

TLPILPFPVFPPPRSELLLHVT

-----LQTLLSHKDEKISSLESKLRD----