Zebrafish\_VclB MPVFHTKTIESILEPVAQQISHLVIMHEEGEVDGKAIPDLSAPVLAVQAAVSNLVRVGKE 60

Zebrafish\_VclA MPVFHTKTIESILEPVAQQISHLVIMHEEGEVDGKAIPDLTSPVAAVQAAVSNLVRVGKE 60

Xenopus\_Vcl MPVFHTKTIESILEPVAQQISHLVIMHEEGEVDGKAIPELTAPVAAVQAAVSNLVRVGKE 60

Human\_Vcl MPVFHTRTIESILEPVAQQISHLVIMHEEGEVDGKAIPDLTAPVAAVQAAVSNLVRVGKE 60

Mouse\_Vcl MPVFHTRTIESILEPVAQQISHLVIMHEEGEVDGKAIPDLTAPVAAVQAAVSNLVRVGKE 60

Chicken\_Vcl MPVFHTRTIESILEPVAQQISHLVIMHEEGEVDGKAIPDLTAPVSAVQAAVSNLVRVGKE 60

Drosophila\_Vcl MPVFHTKTIESILDPVAQQVSRLVILHEEAE-DGNAMPDLSRPVQVVSAAVANLVKVGRD 59

CElegans\_Vcl MPVFHTKTIENILEPVAQQVSRLVILHEEAN-DGNAMPDLTGPVGMVSRAVGNLIQVGYD 59

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Zebrafish\_VclB TVQTTEDAIMRRDMPPAFIKVENACTKLVQAAQMLKADPYSVPARDYLIDGSRGILSGTS 120

Zebrafish\_VclA TVQTTEDKIMKRDMPSAFIKVENACAKLVEAAQMLRTDPYSVPARDYLIDGSRGILSGTS 120

Xenopus\_Vcl TVQTTEDQIMKRDMPPAFIKVENACAKLVQAAQMLHADPYSVPARDYLIDGSRGILSGTS 120

Human\_Vcl TVQTTEDQILKRDMPPAFIKVENACTKLVQAAQMLQSDPYSVPARDYLIDGSRGILSGTS 120

Mouse\_Vcl TVQTTEDQILKRDMPPAFIKVENACTKLVQAAQMLQSDPYSVPARDYLIDGSRGILSGTS 120

Chicken\_Vcl TVQTTEDQILKRDMPPAFIKVENACTKLVRAAQMLQADPYSVPARDYLIDGSRGILSGTS 120

Drosophila\_Vcl TINSSDDKILRQDMPSALHRVEGASQLLEEASDMLRSDPYSGPARKKLIEGSRGILQGTS 119

CElegans\_Vcl TCDHSDDRILQQDMPPALQRVEGSSKLLEESSYSLKHDPYSVPARKKLIDGARGILQGTS 119

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Zebrafish\_VclB DLLLTFDEAEVRKIIRVCKGILEYLTVAEVVESMEDLITYTKNLGPGMTKMAKMIDERQQ 180

Zebrafish\_VclA DLLLTFDEAEVRKIIRVCKGILEYLTVAEVVETMEDLITYTKNLGPGMTKMAKMIDERQQ 180

Xenopus\_Vcl DLLLTFDEAEVRKIIRVCKGILEYLTVAEVVESMEDLVTYTKNLGPGMTKMAKMIDERQQ 180

Human\_Vcl DLLLTFDEAEVRKIIRVCKGILEYLTVAEVVETMEDLVTYTKNLGPGMTKMAKMIDERQQ 180

Mouse\_Vcl DLLLTFDEAEVRKIIRVCKGILEYLTVAEVVETMEDLVTYTKNLGPGMTKMAKMIDERQQ 180

Chicken\_Vcl DLLLTFDEAEVRKIIRVCKGILEYLTVAEVVETMEDLVTYTKNLGPGMTKMAKMIDERQQ 180

Drosophila\_Vcl SLLLCFDESEVRKIIQECKRVLDYLAVAEVINTMEQLVQFLKDLSPCLSKVHREVGAREK 179

CElegans\_Vcl ALLLCFDESEVRKIIRVCRKANDYVAVSEVIESMADLQQFVKDISPVLHDVTNDVNLRQQ 179

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Zebrafish\_VclB ELTHQEHRVMLVNSMNTVKELLPVLISGIKIFVTTRTSQ-GKGVEEALKNRNFTVEKMNT 239

Zebrafish\_VclA ELTHQEHRVMLVTSMNTVKELLPVLISAIKIFVTTKCTK-SHGVEEALKNRNYTFDKMTA 239

Xenopus\_Vcl ELTHQEHRVMLVNSMNTVKDLLPVLISAMKIFVTTKNSR-SQGIEEALKNRNFTVEKMSA 239

Human\_Vcl ELTHQEHRVMLVNSMNTVKELLPVLISAMKIFVTTKNSK-NQGIEEALKNRNFTVEKMSA 239

Mouse\_Vcl ELTHQEHRVMLVNSMNTVKELLPVLISAMKIFVTTKNSK-NQGIEEALKNRNFTVEKMSA 239

Chicken\_Vcl ELTHQEHRVMLVNSMNTVKELLPVLISAMKIFVTTKNTK-SQGIEEALKNRNFTVEKMSA 239

Drosophila\_Vcl ELTHQVHSEILVRCLEQVKTLAPILICSMKVYIHIVEQQ-GRGAEEAAENRNYLAARMSD 238

CElegans\_Vcl ELTHQVHREILIRCMDSIKVIAPILICSMKTSIELGTPHPRQGHAEAIANRNFMSQRMTE 239

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Zebrafish\_VclB EINEIIRVLQLTSWDEDAWAN-KDTEAMKRALALIDSKMAQAKNWLRDPQGQPGGPGEQA 298

Zebrafish\_VclA EINEIIRVLQLTSWDEDAWANKKDTEAMKRALALIESKMGQAKGWLRDPNALPGDPGEHA 299

Xenopus\_Vcl EINEIIRVLQLTSWDEDAWAS-KDTEAMKRALALIDSKINQAKGWLRDPNAPPGDVGEQA 298

Human\_Vcl EINEIIRVLQLTSWDEDAWAS-KDTEAMKRALASIDSKLNQAKGWLRDPSASPGDAGEQA 298

Mouse\_Vcl EINEIIRVLQLTSWDEDAWAS-KDTEAMKRALASIDSKLNQAKGWLRDPNASPGDAGEQA 298

Chicken\_Vcl EINEIIRVLQLTSWDEDAWAS-KDTEAMKRALALIDSKMNQAKGWLRDPNAPPGDAGEQA 298

Drosophila\_Vcl ELQEIIRVLQLTTYDEDTSEL-DNLTVLKKLSNAISNKMEQANEWLSNPYALRGGVGEKA 297

CElegans\_Vcl EMNEIIRVLQLTTYDEDEWDA-DNVTVMRKALSAAKSLLTAALDWLADPHARSGAVGEKA 298

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Zebrafish\_VclB IRQILDEAEKVGELCAGKERRDIVGTAKTLGQLTEQVSDLRARGQGANPVAMQKAQQVSQ 358

Zebrafish\_VclA LRQILDEAGKVGELCAGKERREILGTAKTLGQMTDQVSDVRARGQGATPMGMQKAQQVAQ 359

Xenopus\_Vcl VRQILDEAGKVGELCAGTERKDILGICRTLGQMTDQVSDLRARGQGATPIAMQKAQQVSQ 358

Human\_Vcl IRQILDEAGKVGELCAGKERREILGTCKMLGQMTDQVADLRARGQGSSPVAMQKAQQVSQ 358

Mouse\_Vcl IRQILDEAGKVGELCAGKERREILGTCKMLGQMTDQVADLRARGQGASPVAMQKAQQVSQ 358

Chicken\_Vcl IRQILDEAGKAGELCAGKERREILGTCKTLGQMTDQLADLRARGQGATPMAMQKAQQVSQ 358

Drosophila\_Vcl LRQVIDNATEISERCLPQDSYPIRKLADEVTAMANTLCELRQEGKGQSPQAE----SLVR 353

CElegans\_Vcl IRRICEYADRISARALPEDAQSIKRSIFEITSFTDELCNLRNNGQPDRENLAA---QTAR 355

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Zebrafish\_VclB GLDVLTGKVENAARKLEAMTGSKQAIAKRIDAAQSWLADPHSGPEGEENIRALLGEARKI 418

Zebrafish\_VclA GLDILVGKVENAARKLEALTNAKQAIAKRIDNAQSWLADPNGGPEGEENIRALLAEAKRI 419

Xenopus\_Vcl GLDVLTSKVKNAAHKLEALTNSKQAIGKKIDAAQSWLADPNGGPEGEENIRTILAEAKKI 418

Human\_Vcl GLDVLTAKVENAARKLEAMTNSKQSIAKKIDAAQNWLADPNGGPEGEEQIRGALAEARKI 418

Mouse\_Vcl GLDVLTAKVENAARKLEAMTNSKQSIAKKIDAAQNWLADPNGGPEGEEQIRGALAEARKI 418

Chicken\_Vcl GLDLLTAKVENAARKLEAMTNSKQAIAKKIDAAQNWLADPNGGSEGEEHIRGIMSEARKV 418

Drosophila\_Vcl GIRDRMGE---------------------------------------L--KSL------- 365

CElegans\_Vcl RLKDLVGS---------------------------------------QNSSGL------- 369

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Zebrafish\_VclB ADLCEDPKEREDILRSMSEIAALSGKLAELKRAGKGDTPEARALAKQIATALQNLQSKTS 478

Zebrafish\_VclA ADLCEDPKERDDILRSIGEIAGLTARLVELRRIGKGDTPEARALAKQIGTALQNLQAKTN 479

Xenopus\_Vcl ADLCEDPKDKEDILRSLGEIAALTAKLTDLRRQGKGDSHEARALAKQIATSLQNLQTKVN 478

Human\_Vcl AELCDDPKERDDILRSLGEISALTSKLADLRRQGKGDSPEARALAKQVATALQNLQTKTN 478

Mouse\_Vcl AELCDDPKERDDILRSLGEIAALTSKLGDLRRQGKGDSPEARALAKQVATALQNLQTKTN 478

Chicken\_Vcl AELCEEPKERDDILRSLGEISALTAKLSDLRRHGKGDSPEARALAKQIATSLQNLQSKTN 478

Drosophila\_Vcl -----------------------------------------------VHQAVLGVD---- 374

CElegans\_Vcl -----------------------------------------------MGDALQNAQ---- 378

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Zebrafish\_VclB KAVANTRPAKAAVHLAGKMEQAGRWIDNPTLDDSGVGQAAIRGLLAEGRRLANALPAAQR 538

Zebrafish\_VclA RAVANMRPAKAAVTLEGKMEQALRWINNPGVDDHGVGQAAIRGLIAEGRRLASSLPGPYR 539

Xenopus\_Vcl RAVANSRPVKAAVNMEGKVEQAQRWIDNPSVDDKGVGQAAIRGLVAEGRRLANSMIGPFR 538

Human\_Vcl RAVANSRPAKAAVHLEGKIEQAQRWIDNPTVDDRGVGQAAIRGLVAEGHRLANVMMGPYR 538

Mouse\_Vcl RAVANSRPAKAAVHLEGKIEQAQRWIDNPTVDDRGVGQAAIRGLVAEGHRLANVMMGPYR 538

Chicken\_Vcl RAVANTRPVKAAVHLEGKIEQAQRWIDNPTVDDRGVGQAAIRGLVAEGRRLANVMMGPYR 538

Drosophila\_Vcl ----KAGVQQTAHTIQGRLEQAVKWLQHPEINDGGLGERAINLIVEEGRKVAEGCPGHQK 430

CElegans\_Vcl ----RHGGANPAHTAAGRLEQALRWLDNPGLDDGGLGLQALRLLTADARKLADRLNPQDR 434

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Zebrafish\_VclB QELLGKCEQVEHLMAQLAELAARGEGDSPQARAIAQQLQHTLKELEGKMQDAMTQEVSDI 598

Zebrafish\_VclA QELLAKCEQVEQLMMQLADLAARGEGESPQARAVAAHLLEAIKDLKAKMQEAMTQEVSDV 599

Xenopus\_Vcl QDMMAKCDRVEQLAGQLAELALRGEGDTPLAQAVAAQLQEALKDLKGKMQEAMTQEVSDV 598

Human\_Vcl QDLLAKCDRVDQLTAQLADLAARGEGESPQARALASQLQDSLKDLKARMQEAMTQEVSDV 598

Mouse\_Vcl QDLLAKCDRVDQLTAQLADLAARGEGESPQARALASQLQDSLKDLKAQMQEAMTQEVSDV 598

Chicken\_Vcl QDLLAKCDRVDQLAAQLADLAARGEGESPQARAIAAQLQDSLKDLKARMQEAMTQEVSDV 598

Drosophila\_Vcl AEIQQLCDEVERLK-------RQAAGSGPAAKQAAKQLTQKLYELKAAIQNALVNRIVQD 483

CElegans\_Vcl NRLLGLCSDIDRLAAQLADLERRGLGNSPEAHQIRNQLKNALRDLGDFMRRVLTDRVVDD 494

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Zebrafish\_VclB FSDTTTPIKLLAVAATAPSDSPNREEVFKERASNFENHASRLGATAEKAAAVGT-ANKST 657

Zebrafish\_VclA FSDTTTPIKLLAVAATAPLEAPNREEVFEERASNFENHASRLGATAEKAAAVGT-ANKST 658

Xenopus\_Vcl FSDTTTPIKLLAVAATSPSDTPNRDEVFEERATNFESHSARLGATAEKAAAVGS-ANKAT 657

Human\_Vcl FSDTTTPIKLLAVAATAPPDAPNREEVFDERAANFENHSGKLGATAEKAAAVGT-ANKST 657

Mouse\_Vcl FSDTTTPIKLLAVAATAPPDAPNREEVFDERAANFENHSGRLGATAEKAAAVGT-ANKST 657

Chicken\_Vcl FSDTTTPIKLLAVAATAPSDTPNREEVFEERAANFENHAARLGATAEKAAAVGT-ANKTT 657

Drosophila\_Vcl FMDVSTPLKQFTEAVLQPEGTPGREQNFNQKSNNLQAFSDRASKTSRMVAAGGACGNKKI 543

CElegans\_Vcl FADITTPLKQFVEAVHADPYDPNREQNFVDKSQRLTDHSQSMTTTARLVASCGPSKSKKT 554

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Zebrafish\_VclB VEGIQAAVKSARDLTPQVVSAARILLKNPGNQAAFEHFETMKNQWIDNVEKMTGLVDEAI 717

Zebrafish\_VclA VEGIQAAVKSARDLTPQVTSAARILLKNPGNQAAYEHFDTMKNQWIDNIEKMTSLVDEAI 718

Xenopus\_Vcl VEGIQAAVKSARELTPQVVSAARILLRNPGNQAAYEHFETMKNQWIDNVEKMTGLVDEAI 717

Human\_Vcl VEGIQASVKTARELTPQVVSAARILLRNPGNQAAYEHFETMKNQWIDNVEKMTGLVDEAI 717

Mouse\_Vcl VEGIQASVKTARELTPQVISAARILLRNPGNQAAYEHFETMKNQWIDNVEKMTGLVDEAI 717

Chicken\_Vcl VEGIQATVKSARELTPQVVSAARILLRNPGNQAAYEHFETMKNQWIDNVEKMTGLVDEAI 717

Drosophila\_Vcl AEILLSSAAQVDSLTPQLISAGRIRMNYPGSKAADEHLQNLKQQYADTVLRMRTLCDQAT 603

CElegans\_Vcl VEAILDTAEKVEQLTPQLVNAGRVRLHNPGSE---QHFENIHKQYADALHRLRSHVDDAI 611

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Zebrafish\_VclB DTRSLLAASEDAIKKDLDKCQVAMANHQPQMLVAGATSIARRANRILLVAKREIENSEDP 777

Zebrafish\_VclA DTKSLLDASEEAIKKDIDKCRVAMANVQPQMLVAGATSIARRANRVLLVAKREVENSEDP 778

Xenopus\_Vcl DTRSLLDASEEAIKKDIDKCKVAMANMQPQMLVAGATSIARRANRILLVAKREMENSEDP 777

Human\_Vcl DTKSLLDASEEAIKKDLDKCKVAMANIQPQMLVAGATSIARRANRILLVAKREVENSEDP 777

Mouse\_Vcl DTKSLLDASEEAIKKDLDKCKVAMANIQPQMLVAGATSIARRANRILLVAKREVENSEDP 777

Chicken\_Vcl DTKSLLDASEEAIKKDLDKCKVAMANMQPQMLVAGATSIARRANRILLVAKREVENSEDP 777

Drosophila\_Vcl DPADFIKTSEEHMQVYAKLCEDAIHARQPQKMVDNTSNIARLINRVLLVAKQEADNSEDP 663

CElegans\_Vcl DTGEFVRASETAMRRYTNHCEGAINGADAHGLVNNSSQIARLGNRVLMTAQNEADNSEEP 671

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Zebrafish\_VclB KFRETVKAASDELSRTISPMVMDAKAVAANIKDQGLQRGFLDSGFKILGAVANVRDAFQP 837

Zebrafish\_VclA KFRELVKAASDELGRTISPMVMAAKGVAGNIQDPGLQKGFLDSGYRILAAVGKVREAFQP 838

Xenopus\_Vcl KFRDAVKNASDELSKTISPMVMEAKAVAGNISNPALQKGFLDSGYRILGAVAKVREAFQP 837

Human\_Vcl KFREAVKAASDELSKTISPMVMDAKAVAGNISDPGLQKSFLDSGYRILGAVAKVREAFQP 837

Mouse\_Vcl KFREAVKAASDELSKTISPMVMDAKAVAGNISDPGLQKSFLDSGYRILGAVAKVREAFQP 837

Chicken\_Vcl KFREAVKAASDELSKTISPMVMDAKAVAGNISDPGLQKSFLDSGYRILGAVAKVREAFQP 837

Drosophila\_Vcl VFTERLNAAANRLERSLPAMVGDAKLVATNIADPAAAAAWKNSFQRLLGDVREVRDAIAP 723

CElegans\_Vcl SFVSRVRNAADQLHNAIPPMVNNAKQIAQNPHDQYAAQNWRGTNDHLLNSVRAVGDAITG 731

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Zebrafish\_VclB QEP-----------------E--------------FPPPPPDLESL---QISDTAAPPKP 863

Zebrafish\_VclA QEL-----------------D--------------FPPPPPDLDQL---HVNDDQAPPKP 864

Xenopus\_Vcl PEP-----------------E--------------FPP-PPDLDQL---RLSDEAAPPKP 862

Human\_Vcl QEP-----------------D--------------FPPPPPDLEQL---RLTDELAPPKP 863

Mouse\_Vcl QEP-----------------D--------------FPPPPPDLEQL---RLTDELAPPKP 863

Chicken\_Vcl QEP-----------------D--------------FPPPPPDLEHL---HLTDELAPPKP 863

Drosophila\_Vcl P--------------------QPPPLPTS------LPPPIPELSALHLSNQNAERAPPRP 757

CElegans\_Vcl VPMSNGRHSSYQESISRASPYNPPPPSSQVIRSVNASPPTAPIIHNKMIIREDIPAPPRP 791

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Zebrafish\_VclB PLPEGEVPPPRPPPPEEKDEEFPE------QQAGEMVSEPMMVAARQLHDEARKWSSKGN 917

Zebrafish\_VclA PLPEGEVPPPRPPPPEEKDEEFPE------QKAGEMVSEPMMVAARSLHDEARKWSSKGN 918

Xenopus\_Vcl PLPEGEVPPPRPPPPEEKDEEFPE------QKVGEVVNQPMMVAARQLHDEARKWSSKGN 916

Human\_Vcl PLPEGEVPPPRPPPPEEKDEEFPE------QKAGEVINQPMMMAARQLHDEARKWSSKGN 917

Mouse\_Vcl PLPEGEVPPPRPPPPEEKDEEFPE------QKAGEVINQPMMMAARQLHDEARKWSSKGN 917

Chicken\_Vcl PLPEGEVPPPRPPPPEEKDEEFPE------QKAGEAINQPMMMAARQLHDEARKWSSKGN 917

Drosophila\_Vcl PLPREGLAPVRPPPPETDDEDEG---VFRT---MPHANQPILIAARGLHQEVRQWSSKDN 811

CElegans\_Vcl PPPVELSPPPRPPPPPEYDEEEETRAFWERYPLPQASHQPMLAAAHNLHNELKQWSSQEN 851

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Zebrafish\_VclB DIIGAAKRMALLMAEMSRLVRG-SGGNKRALIQCAKDIAKASDEVTRLAKEVAKQCTDKR 976

Zebrafish\_VclA DIIGAAKRMALLMAEMSRLVRG-GSGNKRALIQCAKDIAKASDEVTRLAKEVAKQCTDKR 977

Xenopus\_Vcl DIIAAAKRMALLMAEMSRLVRG-GSGNKRALIQCAKDIAKASDEVTKLAKEVAKQCTDKR 975

Human\_Vcl DIIAAAKRMALLMAEMSRLVRG-GSGTKRALIQCAKDIAKASDEVTRLAKEVAKQCTDKR 976

Mouse\_Vcl DIIAAAKRMALLMAEMSRLVRG-GSGTKRALIQCAKDIAKASDEVTRLAKEVAKQCTDKR 976

Chicken\_Vcl DIIAAAKRMALLMAEMSRLVRG-GSGNKRALIQCAKDIAKASDEVTRLAKEVAKQCTDKR 976

Drosophila\_Vcl EIIAAAKRMAILMARLSELVLSDSRGSKRELIATAKKIAEASEDVTRLAKELARQCTDRR 871

CElegans\_Vcl DIVAAAKRMAILMARLSQLVRG-EGGTKKDLINCSKAIADSSEEVTRLAVQLARLCTDIK 910

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Zebrafish\_VclB IRTNLLQVCERIPTISTQLKILSTVKATMLGRTNI---------SEEESEQATEMLVHNA 1027

Zebrafish\_VclA IRTNLLQVCERIPTISTQLKILSTVKATMLGRTNI---------SEEESEQATEMLVHNA 1028

Xenopus\_Vcl IRTNLLQVCERIPTISTQLKILSTVKATMLGRTNI---------SDEESEQATEMLVHNA 1026

Human\_Vcl IRTNLLQVCERIPTISTQLKILSTVKATMLGRTNI---------SDEESEQATEMLVHNA 1027

Mouse\_Vcl IRTNLLQVCERIPTISTQLKILSTVKATMLGRTNI---------SDEESEQATEMLVHNA 1027

Chicken\_Vcl IRTNLLQVCERIPTISTQLKILSTVKATMLGRTNI---------SDEESEQATEMLVHNA 1027

Drosophila\_Vcl IRTNLLQVCERIPTIGTQLKILSTVKATMLGA-----------QGSDEDREATEMLVGNA 920

CElegans\_Vcl MRTALLQVSERIPTIATQLKVLSTVKATMLGSANVIGPYGQPVEGSEEDDEAMQQLVHNA 970

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Zebrafish\_VclB QNLMQSVKETVREAEAASIKIRTD-AGFTLHWVRKTPWYQ- 1066

Zebrafish\_VclA QNLMQSVKETVREAEAASIKIRTD-AGFTLRWVRKTPWYQ- 1067

Xenopus\_Vcl QNLMQSVKETVREAEAASIKIRTD-AGCTLRWARKTPWYQ- 1065

Human\_Vcl QNLMQSVKETVREAEAASIKIRTD-AGFTLRWVRKTPWYQ- 1066

Mouse\_Vcl QNLMQSVKETVREAEAASIKIRTD-AGFTLRWVRKTPWYQ- 1066

Chicken\_Vcl QNLMQSVKETVREAEAASIKIRTD-AGFTLRWVRKTPWYQ- 1066

Drosophila\_Vcl QNLMQSVKETVRAAEGASIKIRSDQTSNRLQWVRRQPWYQY 961

CElegans\_Vcl QNLMQSVKDVVRAAEAASIKIRTN-SGLRLRWLRKPMWSNF 1010

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**S1 Text. Multiple sequence alignment of vinculin proteins**

Multiple sequence alignment of vinculin protein sequences from common model organisms using Clustal Omega. Stars represent complete conservation of the amino acid residue across all sequences. Dots and colons represent almost complete conservation, with differences in one or two residues respectively. The Used NCBI reference sequences: *Drosophila* (NP\_476820.1), *C. elegans* (NP\_501104.2), Human (NP\_003364.1), Mouse (NP\_033528.3), Chicken (NP\_990772.1), *Xenopus* (NP\_001090722.1). Zebrafish vinculin sequences were determined from our own cDNA clones.