**ZPn Cysteine 1 2**

**Class I**

CUTL-17          1 ECRMSGISVSLKFATPTSGTI------------YIKDHFSSCRQSFSNTSF-------   39   
CUTL-18          1 QCTFGFISVKVSPGNPDNHNL-------VGGEIYVRNGHSNCSKTIGTDGE-------   44   
CUTL-20a         1 ACDKTDFLLKIKFDENFRGTI------------QSRAGHPKCIYANGTLQSDTK----   42   
CUTL-20b         1 ----------------------------------------------------------    0   
CUTL-25          1 SCRSDAISLVAETEDFFEGQI----------YVKGSRGTPSCSKSYQITQNS------   42   
CUTL-27          1 QCLPQGINITFDLTQNTKYTG----------VVYASERFDQCRVFVKNSSA-------   41   
CUTL-29          1 TCTSSNIEVALTFAKSFSGGV----------LTENPRKYEQCRWKGNGSNS-------   41   
DYF-7            1 DCIADSFTVVLNKSDPEVMRMISNPKSQPVVYVYGHKTRHPCGTSMKDEKGLTN----   54   
NOAH-1a-c        1 ICNYEGIKVQINNGEPFSGVI------------FVKNKFDTCRVEVANSNAATLVL--   44   
NOAH-2           1 LCTNEGIRFIVNTKEPYTGAI------------YAAERFSTCSQVVENAKQ-------   39   
T23F1.5          1 LCLEDGISFEVKTILPLTGEV----------FANDRKRVLECHKSFTEEAK-------   41 

**Class II**

CUTL-24a         1 MCSSDGITASIDFDKPFTGKI----------YSLNYANSNDCLYYNNIDRDT------   42   
CUTL-24b         1 MCSSDGITASIDFDKPFTGKI----------YSLNYANSNDCLYYNNIDRDT------   42   
CUTL-28          1 KCREDNLEVKASSMRMFIGKM-----------MTKKSKKIMCQEDYEGNYD-------   40   
R52.6            1 ----------------------------------------------------------    0   
T01D1.8a         1 ----------------------------------------------------------    0 

**Class IIIa**

CUT-1            1 ECGPNSITVNFNTRNPFEGHV----------YVKGLYDQAGCRSDEGGRQV-------   41   
CUT-3            1 ECGPTSITVNFNTRNAFEGHV----------YVKGLFDQQECRNDEGGRQV-------   41   
CUT-4            1 VCETASISLLFKTRNSFNGKV----------FVKGYVSEPSCMTVGDGKTG-------   41   
CUT-5a           1 SCVGNFIIKVKFDTRTFHGLA----------FVQNHLDNPDCRSFASKTDSAKN----   45   
CUT-5b           1 ECGDDFFEVKFDTRTTFHGLA----------FVQNHLDNPDCRSFASKTDSAKN----   44   
CUTL-1           1 ECDSRTISVQIKTEKPFVGVI----------FVKDFASEEVCTSRGTGRLS-------   41   
CUTL-2           1 RCAPTGITIMLETDSPFKGAL----------FLRGSADKKSCKANFSAQPSQN-----   43   
CUTL-3           1 RCGSESLSINFKTQGAFEGHV----------YVKGHYSMKHCRTDATLESQ-------   41   
CUTL-4           1 ICDIKQIRITMRTSQSFIGNL----------YSKGFFHKSECRVRGNSTANSI-----   43   
F46G11.6         0 ----------------------------------------------------------    0   
T01D1.8b         1 MSLNY-----------------------------------------------------    5 

**Class IIIb**

CUT-6            1 ICGPDRIGVKASTKQPFEGNV----------FVMDHYHDEECRAGPEKFPDSRS----   44   
CUTL-5           1 ICEEDKIIIKIKTSMSNPSNI----------YVDGRENDMECVSRNQN----------   38   
CUTL-6           1 ICAENDLALDIVTSKPFRGNI----------FVKGRAKDKSCRQSYANNGT-------   41   
CUTL-7           1 FCGIDTIRVKVNTEHPFNGRI----------YVDGESDKQHCVQHSADAHSSP-----   43   
CUTL-8a          1 ECLEDEIRIWVKTRKIFAGRI----------YAKGRAELEDCYKDDFGNQKTRK----   44   
CUTL-9           1 ELRVFGKSVTSSSTRSRPGST----------LPLSTSSSPDCPPLTTCAPCACEERRT   48   
CUTL-10          1 DCMEDRVKLSFKTQRPFHGRI----------FVKGMVDKQACVRDFVTSQAKD-----   43   
CUTL-11          1 QCNADTIDMQFRTRKQFNGKV----------YVKGSYNRPECRVDYSTKDQFGR----   44   
CUTL-12a         1 ECGSEGIRLHINPTGTFGGHV----------YVRGFFPQTVCHLNYCTRLTNRP----   44   
CUTL-12b         0 ----------------------------------------------------------    0   
CUTL-13          1 QCNPESITFSFNTRNPFIGNV----------YIRGFYRTPGCRRQFLAPNQAG-----   43   
CUTL-14          1 ECTDTTIEAVFLTETNFLGRV----------FVLGHSQDKDCVSRETGRRT-------   41   
CUTL-15          1 SCAADAIYVKLRTKSTFLGHV-----------DVKYSPDKACFQSLVTNNQ-------   40   
CUTL-16          1 SCHSGFMSLKVNTEKSPPSHV----------FVKGHFRKDGCSFSNTAN---------   39   
CUTL-22a         1 ICDSDQIGLALNENFADIRMF-----------SADHSHHPDCIRRFSLELD-------   40   
CUTL-23a,b       1 KCTEHSMSIVVRTQRALQGVM----------YAHMYHDEPECMIRKTDNSRE------   42   
CUTL-26a,b       1 SCSEDVVSVFIRTSKPFEGLV-----------QTRSSESEACRVQGFGTNV-------   40   
FBN-1a-k         1 YCEADGMTLVLGNETADFEGKI---------FVKGQAENPYCSKSFSSLLNSRKP---   46   
LET-653a         1 ECRDNGISVSVKSRLPYTGAI------------YGLYDFFTCRTEPKEATE-------   39   
LET-653b         1 ECRDNGISVSVKSRLPYTGAI------------YGLYDFFTCRTEPKEATE-------   39   
LET-653c         1 ECRDNGISVSVKSRLPYTGAI------------YGLYDFFTCRTEPKEATE-------   39   
M01E10.2a,b      1 ECVGDGFKVQVNPPAGFRGVA----------VVKGYQDDARCKATASSSLP-------   41   
RAM-5            1 TCSAKLITVSFNTNIPFQGRI----------SVFDKLFIPACNHDYSTNIQKN-----   43 

**ZPn Cysteine 3**

**Class I**

CUTL-17         40 --------------------------------------AELHIPFPTEDDSKCGGIESEP   61   
CUTL-18         45 -----------------------------------------AILKIRHNDTTCITKNGDI   63   
CUTL-20a        43 -------------------------------------------YQLKIPLTGCSTKENGE   59   
CUTL-20b         1 ------------------------------------------------------------    0   
CUTL-25         43 --------------------------------------TALELKINAQELEKCGFRAWPK   64   
CUTL-27         42 ---------------------------------------FSIFIPRPKHNSWCNAVELNN   62   
CUTL-29         42 ----------------------------------------MSINIPLFNSTKCAVVANET   61   
DYF-7           55 ------------------------------------------FNLTIPYGSECDVTLTDL   72   
NOAH-1a-c       45 GLPKDFGMRPISLDNIDDNETGKNKTKKGEETPLKDEIEEFRQKRQAAEFRDCGLVDLLN   110   
NOAH-2          40 ---------------------------------------ISITFPPPTVSSDCGTVIRD-   59   
T23F1.5         42 -------------------------------------------PKMFLPFSTCGVKNVGE   58 

**Class II**

CUTL-24a        43 -------------------------------------------VLFSIPSQLCGTKLQRT   59   
CUTL-24b        43 -------------------------------------------VLFSIPSQLCGTKLQRT   59   
CUTL-28         41 -------------------------------------------FSSKFDFKKCGLDPNKS   57   
R52.6            0 ------------------------------------------------------------   0   
T01D1.8a         0 ------------------------------------------------------------   0 

**Class IIIa**

CUT-1           42 -------------------------------------------AGIELPFDSCNTARTRS   58   
CUT-3           42 -------------------------------------------AGIELPFDTCNVARTRS   58   
CUT-4           42 -------------------------------------------HRFEVRHDSCGVRRQRE   58   
CUT-5a          46 -------------------------------------------SSLRLTFDQCAIEKRHS   62   
CUT-5b          45 -------------------------------------------SSLRLTFDQCAIEKRHS   61   
CUTL-1          42 -------------------------------------------AFLEIEIGLCGALRQRV  58   
CUTL-2          44 -------------------------------------------ISFEFGFDDCPSRRKRQ   60   
CUTL-3          42 -------------------------------------------VNLTVSYSACDVIRQRS  58   
CUTL-4          44 -------------------------------------------EIVLPVDSDCGIRRKRM   60   
CUTL-14         42 -------------------------------------------TSITVPRDKCGVETVQH   58   
CUTL-15         41 -------------------------------------------IEILIPHEECMVPRRRS   57   
F46G11.6         0 ------------------------------------------------------------    0   
T01D1.8b         6 --------------------------------------------------------FEVP   4 

**Class IIIb**

CUT-6           45 -------------------------------------------IGLTVPFSACNVHRYRS   61   
CUTL-5          39 --------------------------------------------KIEVAHDKCGVVNEKT   54   
CUTL-6          42 -------------------------------------------NSYSLPLGKCGMQRLRS   58   
CUTL-7          44 -------------------------------------------QEFTIPIGACNMRRQRT   60   
CUTL-8a         45 -------------------------------------------PHFDLQFGACGMKSLRS   61   
CUTL-9          49 -------------------------------------RRATNSIRLEVPLNSCNTKRDRK   71   
CUTL-10         44 -------------------------------------------VTFELENGACNMRRQRM   60   
CUTL-11         45 -----------------------------------------PVGGIKLNHGACNMDRQRM   63   
CUTL-12a        45 ------------------------------------------IVMDLPFRGPCNVRRRRN   62   
CUTL-12b         1 --------------------------------------------MDLPFRGPCNVRRRRN   16   
CUTL-13         44 -------------------------------------------GSFTVRLGDCGMRRSRQ   60   
CUTL-16         40 ---------------------------------------------ATFEFSKCDVMRQRE   54   
CUTL-22a        41 ------------------------------------------PQFVTRIDGPCGVRRAYK   58   
CUTL-23a,b      43 -------------------------------------------IQMTFTEGKCGLVKTPT   59   
CUTL-26a,b      41 -----------------------------------------AVLKLNLKSDECGIKYDVA   59   
FBN-1a-k        47 -------------------------------------------YVFKVVFQHCDVQLLDN   63   
LET-653a        40 ---------------------------------------FDHFFPYQTVSKNCSDSIKYK   60   
LET-653b        40 ---------------------------------------FDHFFPYQTVSKNCSDSIKYK   60   
LET-653c        40 ---------------------------------------FDHFFPYQTVSKNCSDSIKYK   60   
M01E10.2a,b     42 -------------------------------------------LNLFISNNECGVTQVKS   58   
RAM-5           44 -------------------------------------------ATFQMDILKCANPMFLK   60 

**ZPn Cysteine 4**

**Class I**

CUTL-17         62 ----HKWDYNVVVERNDMKTPSLVTTKDKTFQVSCDFSKIA-----   98   
CUTL-18         64 ----YETVVVVTQNVESVGNATVITIDDQLFKVRCDYSNQK-----  100   
CUTL-20a        60 -------GNLENEIEVVMANNEFNAETDKRFLLTCIPAAPVPKESQ   98   
CUTL-20b         0 ----------------------------------------------    0   
CUTL-25         65 ---PNSKMWLLSGQVIVAFHPTLVTPSDRAFRAHCEFEDFK-----  102   
CUTL-27         63 -----EMSTIIIMSNDRILPHDVTTKDDLFYQVSCQYNPND-----   98   
CUTL-29         62 -------SGTYSIKLLVSPVDGLIVDGFSAINVKCIYATQD-----   95   
DYF-7           73 ----PKHRYAETTVVLEDNADLSFGKTTRLNHVFCLYTRNV-----  109   
NOAH-1a-c      105 ----GTYKSTVVIQTNNLGIPGLVTSMDQLYEVSCDYSSML-----  141   
NOAH-2          60 ----GKMEALVVVSLDGVLPHQVTTEWDRFYRVSCDVSMDK-----   96   
T23F1.5         59 ---QVDSRAQYHMQVVLIIDQGNGTNTLQSFMAQCVHQKVNYNKQV  101 

**Class II**

CUTL-24a        60 ---TRNMIDQMENRVYVQMDKDTQTSADKQFSFVCRLTDPM-----   97   
CUTL-24b        60 -TRNVSMIDQMENRVYVQMDKDTQTSADKQFSFVCRLTDPM-----   99   
CUTL-28         58 -----KDSTYRGMVHVKEGSTSLVTIRDKVLQVNCRLHKSM-----   93   
R52.6            0 ----------------------------------------------    0   
T01D1.8a         0 ----------------------------------------------    0 

**Class IIIa**

CUT-1           59 ---LNPKGVFVSTTVVISFHPQFVTKVDRAYRIQCFYMESD-----   96   
CUT-3           59 ---LNPKGVFVTTTVVVSFHPQFVTKVDRAYRVQCFYMEAD-----   96   
CUT-4           59 -----INGVVISATVIISFHSIFITKIDRAYRVSCFYVEGT-----   94   
CUT-5a          63 ---TSPRGLFLSTNVVVAFNPEFLTKNDRVFKVQCFYMEME-----  100   
CUT-5b          62 ---TSPRGLFLSTNVVVAFNPEFLTKNDRVFKVQCFYMEME-----   99   
CUTL-1          59 ---LNPKGLAVRTTITISFHPYFITKVDRTYNLLCLYRESQ-----   96   
CUTL-2          61 --IVAPRGMTMSSVLVVSYHGSIITHRDVAYQIDCFYREEN-----   99   
CUTL-3          59 ---SNPKGIMMTATIIISFHPMFITKIDKSYKVQCFYAEAQ-----   96   
CUTL-4          61 ---MNPRGILLDTIVILMFHPVFLTQTDRSYHVQCQYTESE-----   98   
CUTL-14         59 ---GKGAGYTSSVNIVISFHDKFLTKVDRAYNITCLYAPTG-----   96   
CUTL-15         58 ---LHPTGVILEVSLSVSFHPEFTTVDDRIFNMQCFHQKKI-----   95   
F46G11.6         1 ---------MSNQLLVFILFLSVLAPTLSIYKSKQKPN--------   29   
T01D1.8b        10 MKYYILLLAFIPHVHGQTQISD------------------------   31 

**Class IIIb**

CUT-6           62 ---LNPKGIFVEVSIVFMFHSLFMTKTDQTVKVQCFYMEAD-----   99   
CUTL-5          55 ---EQPNGSIRRLCIFVQLHPLFVTESDRSYCAQCVYADSHVM---   94   
CUTL-6          59 ---ANPRGVNFMVTVIVSFHPAFITKNDRAFHVKCFYMEPD-----   97   
CUTL-7          61 ---LHPRGISFSFTMITSFHPFFVTGMDRAFSIRCFFLESI-----   98   
CUTL-8a         62 ---VDPRGMYYGITVVVSFHPLFITKVDQAYHVKCFFEEAN-----   99   
CUTL-9          72 ---LNPPSVVVSLIAVVSFHDSFITKLDKAYHIQCAYAEAE-----  109   
CUTL-10         61 -LGPEKRGMEMSMTVIISFHSTFITKVDRAYRCTCFYMEAD-----  100   
CUTL-11         64 ---IAPEGMMFSTVLIISFHPLFLTRMDKAYHIRCMYKEAA-----  101   
CUTL-12a        63 ---VAPPSISYDVTVIIQHHPLFVTSFDKAYRLNCIYRQQE-----  100   
CUTL-12b        17 ---VAPPSISYDVTVIIQHHPLFVTSFDKAYRLNCIYRQQE-----   54   
CUTL-13         61 ISGHSPRGVNQHITFVANFHPNLATKEERSFNIRCFYAHSE-----  101   
CUTL-16         55 --EANPKGMAYTATVVVQLHPLFTTKVDRAYKLRCFYKEAE-----   92   
CUTL-22a        59 --GVPSSFVTYSIRLIVSHNSDELTEFDKIYDVTCSLHLKT-----   97   
CUTL-23a,b      60 ---ADGHGYHFNITVILQFHPLIITRADQGLDMSCFVSSAV-----   97   
CUTL-26a,b      60 -------SKTYSVTVDVHSHPVLIVEGDKSVNVTCREIANG-----   93   
FBN-1a-k        64 --------HTMASTVVVQKHAMFLTNKADSYDLRCQYPIGS-----   96   
LET-653a        61 ---GNEMVLEVVLSTDGIEPLYFITPEDLTYQAKCPISGVK-----   98   
LET-653b        61 ---GNEMVLEVVLSTDGIEPLYFITPEDLTYQAKCPISGVK-----   98   
LET-653c        61 ---GNEMVLEVVLSTDGIEPLYFITPEDLTYQAKCPISGVK-----   98   
M01E10.2a,b     59 ---SDPNGLNSSLVLHLLHDDELNTAEDRAYLLQCFIGAQNQD---   98   
RAM-5           61 -----NGSRLLRAYVEIGFHPLVMTNSDRTFLVECMVKEGS-----   96 

**Class I**

CUTL-17          99 DK-----N--------QL---------------------------------------------------  103   
CUTL-18         101 NA----VAVA-KT--MNL---------------------------------------------------  111   
CUTL-20a         99 VTV------S-FG-GITI---------------------------------------------------  108   
CUTL-20b          0 ---------------------------------------------------------------------    0   
CUTL-25         103 RK------TE-IG--IEN---------------------------------------------------  111   
CUTL-27          99 D-----AKVS-KG--IVV---------------------------------------------------  108   
CUTL-29          96 IT------LTLPPI-FNG-T------------------NAL----------------------------  110   
DYF-7           110 KTI------R-FS---DV---------------------------------------------------  117   
NOAH-1a-c       142 GG-----RVQ-AGYNMTV---------------------------------------------------  153   
NOAH-2           97 MVKEGSVVVT-TI--YEA---------------------------------------------------  111   
T23F1.5         102 LPKRI----E-EA--LEE---------------------------------------------------  112 

**Class II**

CUTL-24a         98 KMAAAKDDGF-GT--KDSYQQAPIKPVASSVSTKMHSSLMPIKPSEVRQVSAFSRDSHLGNWPIPGAKP  163   
CUTL-24b        100 KMAAAKDDGF-GT--KDSYQQAPIKPVASSVSTKMHSSLMPIKPSEVRQVSAFSRDSHLGNWPIPGAKP  165   
CUTL-28          94 PSEE--QFLS-VQ--MNV---------------------------------------------------  106   
R52.6             0 ---------------------------------------------------------------------    0   
T01D1.8a          0 ---------------------------------------------------------------------    0 

**Class IIIa**

CUT-1            97 KTV------S-TQ--IEV---------------------------------------------------  105   
CUT-3            97 KTV------S-TQ--IEV---------------------------------------------------  105   
CUT-4            95 KKV------H-NH--VDI---------------------------------------------------  103   
CUT-5a          101 RRI------Q-KV--IQI---------------------------------------------------  109   
CUT-5b          100 RRI------Q-KV--IQI---------------------------------------------------  108   
CUTL-1           97 VTV------A-NN--ISV---------------------------------------------------  105   
CUTL-2          100 SR------VE-TM--LSV---------------------------------------------------  108   
CUTL-3           97 KTV------T-QQ--LNV---------------------------------------------------  105   
CUTL-4           99 RTV------T-NA--LDV---------------------------------------------------  107   
CUTL-14          97 DV------VS-YA--LTV---------------------------------------------------  105   
CUTL-15          96 NG------TS-TS--L-----------------------------------------------------  102   
F46G11.6         30 -L------LS-KT--VDN---------------------------------------------------   37   
T01D1.8b         32 ------------N--FPA---------------------------------------------------   35 

**Class IIIb**

CUT-6           100 KHV------T-VP--LSV---------------------------------------------------  108   
CUTL-5           95 KDI------E-ST--LDI---------------------------------------------------  103   
CUTL-6           98 EIV------T-QN--IDV---------------------------------------------------  106   
CUTL-7           99 KGL------N-AE--IDV---------------------------------------------------  107   
CUTL-8a         100 KGL------T-AE--LGV---------------------------------------------------  108   
CUTL-9          110 KTV------S-TD--LDV---------------------------------------------------  118   
CUTL-10         101 KVV------T-NK--FDV---------------------------------------------------  109   
CUTL-11         102 RTV------T-AA--IDV---------------------------------------------------  110   
CUTL-12a        101 STL------Q-QR--INV---------------------------------------------------  109   
CUTL-12b         55 STL------Q-QR--INV---------------------------------------------------   63   
CUTL-13         102 SV------VK-AD--LDV---------------------------------------------------  110   
CUTL-16          93 KAV------G-AE--VSV---------------------------------------------------  101   
CUTL-22a         98 MA------VE-TS--YDI---------------------------------------------------  106   
CUTL-23a\_b       98 PRQ------E-LD--RAV---------------------------------------------------  106   
CUTL-26a\_b       89 -EI------A-NG--TQH---------------------------------------------------   96   
FBN-1a-k         97 RAV------E-SH--VNV---------------------------------------------------  105   
LET-653a         99 AKDPANTKSS-AH--LDNRNKAMEASAHALFELLSKTGDDE---------------ALQNTFPLPLTTT  149   
LET-653b         99 AKDPANTKSS-AH--LDN---------------------------------------------------  113   
LET-653c         99 AKDPANTKSS-AH--LDNRNKAMEASAHALFELLSKTGDDE---------------ALQNTFPLPLTTT  149   
M01E10.2a,b      99 AVV------S-TN--LNV---------------------------------------------------  107   
RAM-5            91 ------------L--D-N---------------------------------------------------   93 

**Class I**

CUTL-17         104 ---------------------------------------------------------------------  103   
CUTL-18         112 ---------------------------------------------------------------------  111   
CUTL-20a        109 ---------------------------------------------------------------------  108   
CUTL-20b          0 ---------------------------------------------------------------------    0   
CUTL-25         112 ---------------------------------------------------------------------  111   
CUTL-27         109 ---------------------------------------------------------------------  108   
CUTL-29         111 ---------------------------------------------------------------------  110   
DYF-7           118 ---------------------------------------------------------------------  117   
NOAH-1a-c       154 ---------------------------------------------------------------------  153   
NOAH-2          112 ---------------------------------------------------------------------  111   
T23F1.5         113 ---------------------------------------------------------------------  112 

**Class II**

CUTL-24a        164 -YE-----------------------------PSMKPVSTYPMAPIFAETIPTSPAKDPSEGYVTRPIS  202   
CUTL-24b        166 -YE-----------------------------PSMKPVSTYPMAPIFAETIPTSPAKDPSEGYVTRPIS  204   
CUTL-28         107 ---------------------------------------------------------------------  106   
R52.6             0 ---------------------------------------------------------------------    0   
T01D1.8a          0 ---------------------------------------------------------------------    0 

**Class IIIa**

CUT-1           106 ---------------------------------------------------------------------  105   
CUT-3           106 ---------------------------------------------------------------------  105   
CUT-4           104 ---------------------------------------------------------------------  103   
CUT-5a          110 ---------------------------------------------------------------------  109   
CUT-5b          109 ---------------------------------------------------------------------  108   
CUTL-1          106 ---------------------------------------------------------------------  105   
CUTL-2          109 ---------------------------------------------------------------------  108   
CUTL-3          106 ---------------------------------------------------------------------  105   
CUTL-4          108 ---------------------------------------------------------------------  107   
CUTL-14         106 ---------------------------------------------------------------------  105   
CUTL-15         103 ---------------------------------------------------------------------  102   
F46G11.6         38 ---------------------------------------------------------------------   37   
T01D1.8b         36 ---------------------------------------------------------------------   35 

**Class IIIb**

CUT-6           109 ---------------------------------------------------------------------  108   
CUTL-5          104 ---------------------------------------------------------------------  103   
CUTL-6          107 ---------------------------------------------------------------------  106   
CUTL-7          108 ---------------------------------------------------------------------  107   
CUTL-8a         109 ---------------------------------------------------------------------  108   
CUTL-9          119 ---------------------------------------------------------------------  118   
CUTL-10         110 ---------------------------------------------------------------------  109   
CUTL-11         111 ---------------------------------------------------------------------  110   
CUTL-12a        110 ---------------------------------------------------------------------  109   
CUTL-12b         64 ---------------------------------------------------------------------   63   
CUTL-13         111 ---------------------------------------------------------------------  110   
CUTL-16         102 ---------------------------------------------------------------------  101   
CUTL-22a        107 ---------------------------------------------------------------------  106   
CUTL-23a\_b      107 ---------------------------------------------------------------------  106   
CUTL-26a\_b       97 ---------------------------------------------------------------------   96   
FBN-1a-k        106 ---------------------------------------------------------------------  105   
LET-653a        150 TEVIRQVTTTTKKPSTTTSTKKLTTTTTTTPKPSQKPTTTTTKSPVVITTTTKTSPKPTTSPSTTTSTT  218   
LET-653b        114 ---------------------------------------------------------------------  113   
LET-653c        150 TEVI-----------------------------------------------------------------  153   
M01E10.2a,b     108 ---------------------------------------------------------------------  107   
RAM-5            94 ---------------------------------------------------------------------   93 

**Class I**

CUTL-17         104 -------------------------------------------------------AA-------LK---  107   
CUTL-18         112 -------------------------------------------------------RT-------TQ---  115   
CUTL-20a        109 -------------------------------------------------------NS--------DA--  112   
CUTL-20b          0 ---------------------------------------------------------------------    0   
CUTL-25         112 -------------------------------------------------------LI-------QE---  115   
CUTL-27         109 -------------------------------------------------------GG-------PS---  112   
CUTL-29         111 -----------------------------------------------------QITA-------MN---  116   
DYF-7           118 -------------------------------------------------------SN-------GH---  121   
NOAH-1a-c       154 -------------------------------------------------------TG-------PE---  157   
NOAH-2          112 -------------------------------------------------------SS-------QN---  115 

**Class II**

CUTL-24a        203 TVGHPSPPPLFPNIPVPQRSPP-------------------------VVARVFTTSTMAPVMFTFPTTT  246   
CUTL-24b        205 TVGHPSPPPLFPNIPVPQRSPP-------------------------VVARVFTTSTMAPVMFTFPTTT  248   
CUTL-28         107 -------------------------------------------------------RE-------NN---  110   
R52.6             0 ---------------------------------------------------------------------    0   
T01D1.8a          0 ---------------------------------------------------------------------    0 

**Class IIIa**

CUT-1           106 -------------------------------------------------------SD-------LT---  109   
CUT-3           106 -------------------------------------------------------SD-------LT---  109   
CUT-4           104 -------------------------------------------------------SA-------LT---  107   
CUT-5a          110 -------------------------------------------------------SM-------PP---  113   
CUT-5b          109 -------------------------------------------------------SM-------PP---  112   
CUTL-1          106 -------------------------------------------------------DE-------IS---  109   
CUTL-2          109 -------------------------------------------------------NA-------PQ---  112   
CUTL-3          106 -------------------------------------------------------DI-------AKE--  110   
CUTL-4          108 -------------------------------------------------------SM-------QP---  111   
CUTL-14         106 -------------------------------------------------------QP-------SL---  109   
CUTL-15         103 ---------------------------------------------------------------------  102   
F46G11.6         38 ---------------------------------------------------------------------   37   
T01D1.8b         36 -------------------------------------------------------SD-------II---   39 

**Class IIIb**

CUT-6           109 -------------------------------------------------------SM-------IT---  112   
CUTL-5          104 -------------------------------------------------------SE-------AP---  107   
CUTL-6          107 -------------------------------------------------------SM-------IP---  110   
CUTL-7          108 -------------------------------------------------------GT-------LA---  111   
CUTL-8a         109 -------------------------------------------------------SM-------IP---  112   
CUTL-9          119 -------------------------------------------------------NM-------TD---  122   
CUTL-10         110 -------------------------------------------------------SM-------LP---  113   
CUTL-11         111 -------------------------------------------------------SN-------LP---  114   
CUTL-12a        110 -------------------------------------------------------SD-------IP---  113   
CUTL-12b         64 -------------------------------------------------------SD-------IP---   67   
CUTL-13         111 -------------------------------------------------------SS-------MP---  114   
CUTL-16         102 -------------------------------------------------------SD-------PT---  105   
CUTL-22a        107 -------------------------------------------------------IS-------PQ---  110   
CUTL-23a\_b      107 ----------------------------------------------------------------LK---  108   
CUTL-26a\_b       97 -------------------------------------------------------YA-------SQ---  100   
FBN-1a-k        106 -------------------------------------------------------SE-------LA---  109   
LET-653a        219 TSTTI-PPSTTTRKPANPRRSTIMSATSKVAIIVGKDSSFARARLFTTKHPSTQKID-------VPTTT  279   
LET-653b        114 -------------------------------------------------------SD-------VPTTT  120   
LET-653c        154 -------------------------------------------------------SD-------VPTTT  160   
M01E10.2a,b     108 -------------------------------------------------------VR-------SEL--  112   
RAM-5            94 -------------------------------------------------------TI-------MP---   97   
T23F1.5         113 -------------------------------------------------------LR-------LV---  116 

**Class I**

CUTL-17         108 -----------------------------------------------P--KV-----------------  110   
CUTL-18         116 -----------------------------------------------F--------------N---KLD  120   
CUTL-20a        113 ------------T----------------------------------T---A----------S------  116   
CUTL-20b          0 ---------------------------------------------------------------------    0   
CUTL-25         116 -----------------------------------------------H--EL----------I------  119   
CUTL-27         113 -----------------------------------------------P--VM-----------------  115   
CUTL-29         117 ---------------------------------------------DDN--SV-----------------  121   
DYF-7           122 -----------------------------------------------E--VI----------A------  125   
NOAH-1a-c       158 -----------------------------------------------A--NL-----------------  160   
NOAH-2          116 -----------------------------------------------T--TV-----------------  118   
T23F1.5         117 -----------------------------------------------P--SK-------------L---  120 

**Class II**

CUTL-24a        247 TPLMPLFPIIPNVHFKQGVGVP----------FAPGTLPTTKVDASKW--NDPSAYATAPSTVDSTTPK  303   
CUTL-24b        249 TPLMPLFPIIPNVHFKQGVGVP----------FAPGTLPTTKVDASKW--NDPSAYATAPSTVDSTTPK  305   
CUTL-28         111 -----------------------------------------------KTNQV----------M---S-D  118   
R52.6             0 ---------------------------------------------------------------------    0   
T01D1.8a          0 ---------------------------------------------------------------------    0 

**Class IIIa**

CUT-1           110 -----------------------------------------------T--AF----------Q------  113   
CUT-3           110 -----------------------------------------------T--AF----------Q------  113   
CUT-4           108 -----------------------------------------------T--QL----------L------  111   
CUT-5a          114 -----------------------------------------------P--TM----------H------  117   
CUT-5b          113 -----------------------------------------------P--TM----------H------  116   
CUTL-1          110 -----------------------------------------------T--IS----------Y------  113   
CUTL-2          113 -----------------------------------------------P--RI-----------------  115   
CUTL-3          111 ------------QEKKIFVMVGDEEGGTVSHTTGDQKKLHKLNDPSTE--ER----------I------  149   
CUTL-4          112 -------------------------------------------------ASE----------L------  115   
CUTL-14         110 -----------------------------------------------L--KD----------I------  113   
CUTL-15         103 -----------------------------------------AIGS--P--KP-----------------  109   
F46G11.6         38 ---------------------------------------------------------------------   37   
T01D1.8b         40 -----------------------------------------------E---L----------P------   42 

**Class IIIb**

CUT-6           113 -----------------------------------------------T--VF----------R------  116   
CUTL-5          108 -----------------------------------------------P--LQ----------L------  111   
CUTL-6          111 -----------------------------------------------T--TE----------L------  114   
CUTL-7          112 -----------------------------------------------P--QH----------V------  115   
CUTL-8a         113 -----------------------------------------------T--TE----------L------  116   
CUTL-9          123 -------------------------------------------------EQE----------I------  126   
CUTL-10         114 -----------------------------------------------T--TD----------L------  117   
CUTL-11         115 -----------------------------------------------T--ES----------V------  118   
CUTL-12a        114 -----------------------------------------------S--TA----------L------  117   
CUTL-12b         68 -----------------------------------------------S--TA----------L------   71   
CUTL-13         115 -----------------------------------------------E--ES-----------------  117   
CUTL-16         106 -----------------------------------------------P--VQ----------L------  109   
CUTL-22a        111 -----------------------------------------------T--TT-----------------  113   
CUTL-23a\_b      109 ---------------------------------------------------------------------  108   
CUTL-26a\_b      101 ---------------------------------------------------------------------  100   
FBN-1a-k        110 -----------------------------------------------T--TS----------T------  113   
LET-653a        280 VQTSTTVPTTPS----KTTATTTTTPKPTTTETATTSSSTTTVTTQKP--TTVTSTTTLPSTTASTTTK  342   
LET-653b        121 VQTSTTVPTTPS----KTTATTTTTPKPTTTETATTSSSTTTVTTQKP--TTVTSTTTLPSTTASTTTK  183   
LET-653c        161 VQTSTTVPTTPS----KTTATTTTTPKPTTTETATTSSSTTTVTTQKP--TTVTSTTTLPSTTASTTTK  223   
M01E10.2a,b     113 ------------A----------------------------------I-AET----------I------  118   
RAM-5            98 -----------------------------------------------I--------------V------   99 

**Class I**

CUTL-17         118 ---------------------------------------------------------------------  118   
CUTL-18         129 ---------------------------------------------------------------------  129   
CUTL-20a        123 ---------------------------------------------------------------------  123   
CUTL-20b          0 ---------------------------------------------------------------------    0   
CUTL-25         127 ---------------------------------------------------------------------  127   
CUTL-27         125 ---------------------------------------------------------------------  125   
CUTL-29         130 ---------------------------------------------------------------------  130   
DYF-7           134 --------------------------------------------------------------------- 134   
NOAH-1a-c       172 --------------------------------------------------------------------- 172   
NOAH-2          126 ---------------------------------------------------------------------  126   
T23F1.5         128 ---------------------------------------------------------------------  128 

**Class II**

CUTL-24a        304 TYREQPPTADAPF------SSDNSKEIHETSTI--VASPGVPRPQADQPKDITSVLKTTQEQQI-E-PE  362   
CUTL-24b        306 TYREQPPTADAPF------SSDNSKEIHETSTI--VASPGVPRPQADQPKDITSVLKTTQEQQI-E-PE  364   
CUTL-28         132 --------------------------------------------------------------------- 132   
R52.6             0 ---------------------------------------------------------------------    0   
T01D1.8a          0 ---------------------------------------------------------------------    0 

**Class IIIa**

CUT-1           121 ---------------------------------------------------------------------  121   
CUT-3           121 ---------------------------------------------------------------------  121   
CUT-4           119 ---------------------------------------------------------------------  119   
CUT-5a          125 ---------------------------------------------------------------------  125   
CUT-5b          124 ---------------------------------------------------------------------  124   
CUTL-1          121 ---------------------------------------------------------------------  121   
CUTL-2          124 ---------------------------------------------------------------------  124   
CUTL-3          157 --------------------------------------------------------------------- 157   
CUTL-4          129 --------------------------------------------------------------------- 129   
CUTL-14         121 --------------------------------------------------------------------- 121   
CUTL-15         118 ---------------------------------------------------------------------  118   
F46G11.6         40 ---------------------------------------------------------------------   40   
T01D1.8b         50 --------------------------------------------------------------------- 50 

**Class IIIb**

CUT-6           124 ---------------------------------------------------------------------  124   
CUTL-5          122 ---------------------------------------------------------------------  122   
CUTL-6          122 ---------------------------------------------------------------------  122   
CUTL-7          123 ---------------------------------------------------------------------  123   
CUTL-8a         124 --------------------------------------------------------------------- 124   
CUTL-9          134 ---------------------------------------------------------------------  134   
CUTL-10         125 ---------------------------------------------------------------------  125   
CUTL-11         126 --------------------------------------------------------------------- 126   
CUTL-12a        124 ---------------------------------------------------------------------  124   
CUTL-12b         78 ---------------------------------------------------------------------   78   
CUTL-13         127 --------------------------------------------------------------------- 127   
CUTL-16         117 ---------------------------------------------------------------------  117   
CUTL-22a        114 ---------------------------------------------------------------------  128   
CUTL-23a\_b      114 ---------------------------------------------------------------------  114   
CUTL-26a\_b      105 ---------------------------------------------------------------------  105   
FBN-1a-k        124 --------------------------------------------------------------------- 124   
LET-653a        343 TTTSTPTSPQTTTTHVGAPASSVASVAHDGSTL--AG------------------------KPK-V-P-  382   
LET-653b        184 TTTSTPTSPQTTTTHVGAPASSVASVAHDGSTL--AG------------------------KPK-V-P-  223   
LET-653c        224 TTTSTPTSPQTTTTHVGAPASSVASVAHDGSTL--AG------------------------KPK-V-P-  263   
M01E10.2a,b     126 ---------------------------------------------------------------------  126   
RAM-5           107 --------------------------------------------------------------------- 107 

**ZPc Cysteine d e**

**Class I**

CUTL-17        111 ------EGDVKSEKVLMEIVRNGQAVT---------=------TVPLGAEVSLRWTVID------  147   
CUTL-18        121 -----IYGKVNVKPMSMELRGKREIIKA--------------RTVKLGQSLDLVFTVDN------  160   
CUTL-20a       117 --------SLSDNKTVDYRVRVLDGDSLDSKQLQRPLAVGDRVTYTVEMSD--------------  159   
CUTL-20b         1 MSD--------------------------------------------------------------    3   
CUTL-25        120 -------LGNFQLPKISMHILPAGEESLTTKTQNF--EANEQKVLNVGDPIMFEWKLEQE-----  170   
CUTL-27        116 ITKKSHIHEKISLE--------------------------ITKDGQMVESVFVGESLLATVKSNV  154   
CUTL-29        122 ------VTGSGGSPALTMQILEGHGISGSPVVKAAVGQRITLDIALQN-----------------  163   
DYF-7          126 ------STGGKPKPKVEMLFRSTDSGKTLQAARENEFVEFFIALSPDS-----------------  167   
NOAH-1a-c      161 --IQPRGKIELGNPVLMQLLNGDGTEQPLVQ---------------AKLGDILELRWEIMAMDDE  208   
NOAH-2         119 LDVATPPPVSAELQILNQLEEPLHKASIGDPLLLVITSEQ-------------------------  158   
T23F1.5        121 -----EQKASMPSVQMQIVVDEGHHKLGAE-----------VSAADIGMPLALKWSMVP------  163 

**Class II**

CUTL-24a       363 VTLEIQRGEGPFAPPVTTPIKI---------------------GDNISLVVKAKSYL--------  398   
CUTL-24b       365 VTLEIQRGEGPFAPPVTTPIKI---------------------GDNISLVVKAKSYL--------  400   
CUTL-28        119 -VVVVTAPPAQTNPKFSLKILGLDSTEA-----------------DTVHIGDYGWIMLAVKN---  162   
R52.6            0 -----------------------------------------------------------------    0   
T01D1.8a         0 -----------------------------------------------------------------    0 

**Class IIIa**

CUT-1          114 -------TQVVPMPVCKYEILDGGPSGQ------------PIQFATIGQQVYHKWTCDS------  153   
CUT-3          114 -------TQVVPMPICKYEILNGGPTGE------------PVQFATIGQQVYHKWTCDS------  153   
CUT-4          112 -------ESETQLPVCRYEILNEAGGSP-------------IKYARIGDQVYHKWTCVA------  150   
CUT-5a         118 -------SKQLNMPVCKYEVLDGSPTGP------------PVYFATVGQMVYHKWTCDT------  157   
CUT-5b         117 -------SKQLNMPVCKYEVLDGSPTGP------------PVYFATVGQMVYHKWTCDT------  156   
CUTL-1         114 -------NVNLTMPTCTYQILSGGPFGE------------PVEFGLIGQQVYHQWKCDN------  153   
CUTL-2         116 ------LSDEPKLPTCDYRVEVTGGKAVAGGIVTSSLSETASQIANVGDSVIHIWTCSGDA----  170   
CUTL-3         150 -------SYNVPLPDCKYRVLTESKTEE-------------VAFATVGQIVYHEWSCEA------  188   
CUTL-4         116 -PQSIQQLNDDSAPVCKYEVLMENAQGP------------PLSHATVGDLVYHKWSCDGN-----  162   
CUTL-14        114 -------QVLAEQPSCEYEVFDVRTRRP-------------AEIVHVNAPLEHVWTCDGT-----  153   
CUTL-15        110 ------PPSDTKGPSCSYEVLTSPGGLP-------------AGRLALGQDVYHSWQCQN------  149   
F46G11.6        38 ------------SITCDFSIHKKGPYGQV------------VSGASLDDEIYYKIKCKP------   72

T01D1.8b        43 -------VGRFPEPECKYSVHHGSDKLGRI----------VTSKVNIGDEIYHSWNCNYSGD---   87 

**Class IIIb**

CUT-6          117 -------EQIYQMPQCAYTLRKGAPDGP------------IVRFATLGESVYHRWECIEVEG---  159   
CUTL-5         112 ----SPQFDAPVMPKCNYSIRKQGKDGP------------PVQYASIGDSVFHVWSCDG------  154   
CUTL-6         115 -------SDSMVMPKCEYSVRRDGPNGP------------TLTYANVGDIVFHVWECTP------  154   
CUTL-7         116 -------DQEYSLPVCAYHLKDGIEGHV-------------LRFAQVGQKVTHVWRCDQ------  154   
CUTL-8a        117 -------EARHGIPGCTYSIHRSTIDEL----DAGRPAGNVIQFARVGERVLHQWHCND------  164   
CUTL-9         127 -------NGTVEPPSCDYLISDQNGNSV--------------QNSLVGELVRHQWVCKGG-----  165   
CUTL-10        118 -------IDTARMPLCTYSVRRDSITGP------------IVEFAKVGETVYHVWNCES------  157   
CUTL-11        119 -------QSDLPMPTCSYTIRRDQLDGP------------ILKYAKVGDQVVHRWQCDS------  158   
CUTL-12a       118 --------QSKNAPKCRYDVLSGSLNGP------------VVRFANVGDVVVHKWTCDS------  156   
CUTL-12b        72 --------QSKNAPKCRYDVLSGSLNGP------------VVRFANVGDVVVHKWTCDS------  110   
CUTL-13        118 -----FEQGVTIVPQCTYSLREGTFEGP------------KVSNTRVGMTIVHRWDCDT------  159   
CUTL-16        110 -------EDESPQPVCSYTIHKESPNGP------------IAKFAQLGDVLYHVWECPS------  149   
CUTL-22a       114 ISSSTVHSRAGPGPKCKYSLHHTRVGGP------------RTVSAHVGEVVYHRWKCAAPLYENN  166   
CUTL-23a,b     109 ---------NAADTQCVYRLHRYSPGQC------------VALDAKVGETLYHRWACDSP-----  147   
CUTL-26a,b     101 --------MTSQSPKSDYQLRVLSSRLPVDTVKYSQPYTLQIRPLPS------------------  137   
FBN-1a-k       114 ----LTEKNSTLAPICRLSVSNDQHSSISSAM----------VGDTLKLALEVTPS---------  155   
LET-653a       383 ---VIFDIFHNGQPVEAVVVGTKISLSFRPHY---------------------------------  411   
LET-653b       224 ---VIFDIFHNGQPVEAVVVGTKISLSFRPHY---------------------------------  252   
LET-653c       264 ---VIFDIFHNGQPVEAVVVGTKISLSFRPHY---------------------------------  292   
M01E10.2a,b    119 -------SLSTLPPTCTYSIRKEGPEGPIV------------SRAVVGQTVWHRWECDGTN----  160   
RAM-5          100 -------NRAQSFADCTHLVRMASEWSSMS-------------EFQVGDAIVHEWSCKLPNP---  141 

**ZPc Cysteine f 5 6**

**Class I**

CUTL-17        148 ----ETDKLGFFINECIAERVGGQ--PPYPEPLKIIYQGCPEEKVRNRLLHDPVV---  196   
CUTL-18        161 ----STSARHVFVKKCTAYDQNGD------EKIILIKNGCATQHAKEYVLRDEIK---  205   
CUTL-20a       160 -------DQNGRIGRCWANDGISE-------LPLSDSHGCSLQTSGEVWGDFEVT---  200   
CUTL-20b         4 -------DQNGRIGRCWANDGISE-------LPLSDSHGCSLQTSGEVWGDFEVT---   44   
CUTL-25        171 -----HGIFGIQLERCSAESENGK-------GMKILENGCSLDEELISDTTY------  210   
CUTL-27        155 ------SAELLRIVDCTAHRVGGT---GPPASVNLIADGCALLPAIMSPMRL------  197   
CUTL-29        164 -----TAIYDFYVHSCYAHDGSNS---PDASINIIDSNGCGVRLSRAIDVPAMSAQPT  213   
DYF-7          168 ------AYHGISPKECTFSDREDI-SAPDAKKITFVQGGCPVNGMNDIIDPLAN----  214   
NOAH-1a-c      209 --------LDFFVKNCHAEPGVAGGKAGAGEKLRLIDGGCPTPAVAQKLIPGAIE---  255   
NOAH-2         159 -----AGPHNMMVTECTATRVGGF---GDTVPFTLIENGCPRYPALVGPVEQ------  202   
T23F1.5        164 ----ESDAYGMHIRNCKVVDAVGK-----IDHTLIDEQGCSADLQIIDHPHY------  206 

**Class II**

CUTL-24a       399 ---NETDQFDMFVHSCFATDGKGD-----TKVQMIDENGCVIRLEFASPLHR------  442   
CUTL-24b       401 ---NETDQFDMFVHSCFATDGKGD-----TKVQMIDENGCVIRLEFASPLHR------  444   
CUTL-28        163 ------SAEDFTVTNLVAKDVQTG-----RVLRIIDEDGCVLRRDIVKEIRK------  203   
R52.6            0 ----------------------------------------------------------    0   
T01D1.8a         1 -----------MVNNCTISDSGEE-EIGTRKIQIIDENGCSVFPNILPDISY------   40 

**Class IIIa**

CUT-1          154 ---ETTDTFCAVVHSCTVDDGNGD------TVQILNEEGCALDKFLLNNLEY------  196   
CUT-3          154 ---ETVDTFCAVVHSCTVDDGNGD------TVQILDENGCALDKFLLNNLEY------  196   
CUT-4          151 ---ELENVYCMKVHSCTVYDGQGG-----PPVTVIDANGCSVDGVILQNLEY------  194   
CUT-5a         158 ---EHENTFCMLVHSCFVDDGNGQ------RVQLLNDKGCALDKYLLTNLEY------  200   
CUT-5b         157 ---EHENTFCMLVHSCFVDDGNGQ------RVQLLNDKGCALDKYLLTNLEY------  199   
CUTL-1         154 ---DKEDSFCMVVHTCSVDDGRGE------TSFLIDSNGCSIDKFLLSNLEY------  196   
CUTL-2         171 ----PSDVYCIQVYSCTAEDGGSD------TVQVVDENGCTTDGELLSPIKY------  212   
CUTL-3         189 PGQNQTSPFCVTVHSCNVKDETGK------EVQIFDENGCAVDKYLINNLEY------  234   
CUTL-4         163 ----NKEMYCMTVHSCVVDDGQGF------GQKLVDEHGCTLDAFILKELEY------  204   
CUTL-14        154 ----NLDLFCMTVHDCVINEGKSK-----RRSKIIDSEGCSLDTTRLPNLRY------  196   
CUTL-15        150 -----VYESCIMIENCELVGGEET-------HEVIDSSGCSKHESIMPQLEY------  189   
F46G11.6        73 -----ITGNCLQVVNCTLSSDEPG----FQPYPIIDDMGCSLEESLFKNVQY------  115   
T01D1.8b        88 ---HKNYLFCVMVNNCTISDSGEE-EIGTRKIQIIDENGCSVFPNILPDISY------  135 

**Class IIIb**

CUT-6          160 ---ADKDTFGMLVHSCYVDNGYGD------RVDILDSNGCGLDAVLLSTPDY------  202   
CUTL-5         155 ------NHNGILVQNCHVEDGQGN------KILIIDQNGCGIDHYVMDTPIY------  194   
CUTL-6         155 ------ADMGMLVKKCFVTDGDGE------DHAVVDFDGCATDPFLLSELSY------  194   
CUTL-7         155 ---DASHVYGILIHSCYADDGHGN------KFELVDDRGCSTDPFLLPQIEY------  197   
CUTL-8a        165 ------QMYGVLINNCYVTDGFGK------KADVIDDKGCPIDPILITGIRY------  204   
CUTL-9         166 ----LTNKLKMLVHQCYVKDGAGQ------QFEVIDQHGCTLDQLMLQTPTY------  207   
CUTL-10        158 ------DMFSMLVHSCFVDDGNGD-----ERKPLLDEHGCAIDPLILPDLTY------  198   
CUTL-11        159 ------EDYGLLVHSCYVEDGQGE------KQMIIDERGCHTDRLLLGDPTY------  198   
CUTL-12a       157 ------DRFGFVVHSCVVRDESGK------DFQFIDERGCVTDFSLFPEVSY------  196   
CUTL-12b       111 ------DRFGFVVHSCVVRDESGK------DFQFIDERGCVTDFSLFPEVSY------  150   
CUTL-13        160 -----SGNYGILLRGCTILDSRGV-----ESFPLLDENGCSVSRDFPQVVY-------  200   
CUTL-16        150 ------EAYQMEVYNCDVVGGEEY------SKKVIGENGCSEDIYIMPNLIY------  189   
CUTL-22a       167 ---RQMPMLIFKVYACVVHDENNR------TYAIIDDNGCSLDEEIIPTPEY------  209   
CUTL-23a,b     148 ------PEYNYLVHDCFVQSEKHT-------QQILDSNGCEVDQHFLETPNY------  186   
CUTL-26a,b     138 ---TQQNSYSFFVGQCIAQPVGGN-----VTVQLTDPVGCALFKSIMGHFAR------  181   
FBN-1a-k       156 ------ENFGILPRNCFAINIESG-----ERYTLTDDMGCAIDESLFPQWSA------  196   
LET-653a       412 ----PIPPEYVDVRGCQVEPIDPK-YEWEHEPLFIIRDGCPADGVGLVCPPTH-----  459   
LET-653b       253 ----PIPPEYVDVRGCQVEPIDPK-YEWEHEPLFIIRDGCPADGVGLVCPPTH-----  300   
LET-653c       293 ----PIPPEYVDVRGCQVEPIDPK-YEWEHEPLFIIRDGCPADGVGLVCPPTH-----  340   
M01E10.2a,b    161 ---DTNQAYGIQVHSCYASDDVER------KFAFVDPRGCSSDLALLTDLTY------  203   
RAM-5          142 ------AKTQTFLTNCNALSQNGQ------IIHLIDENGCVIDSELMGDIVY------  181 

**ZPc Cysteine 7 a b**

**Class I**

CUTL-17        197 ------KNGEVYSTKMKVFRFDGSRRVRIKCSIDVCVE--------------KCPP--  232   
CUTL-18        206 ------ETATGFVLPFRAFRFKQGEAVKIECEVKYCEK---------------CK---  239   
CUTL-20a       201 ----RRNGKTIFYNHIKAWAFPTSNEVNIFCNLHVCVT---------------CT---  236   
CUTL-20b        45 ----RRNGKTIFYNHIKAWAFPTSNEVNIFCNLHVCVT---------------CT---   80   
CUTL-25        211 -----SQDFSKIYATSLAFKFPEEYEVFIRCAVRTCVKKTEHLEIINGEEEDLCS---  260   
CUTL-27        198 -------TPSGWQSSLSAFRIDGSEQIDVVCIISICDEN------------KKCPL--  234   
CUTL-29        214 -----PNGPKHVYLHMYGFQFTSNNFVHFECQVKPCIK--------------SCHR--  250   
DYF-7          215 ------VNDQIYFSKFRTFRFGNQSTVFVHCQVQVCLKK------------DECS---  251   
NOAH-1a-c      256 -----IKSSAVKTTKMQAFRFDSSASIRVTCEVEICKG--------------DCEP--  292   
NOAH-2         203 -----DFDKNRLKSDLRAFRLDGSYDVQIVCSIMFCAGP------------NGCPV--  241   
T23F1.5        207 -----DTYHDTASSHMWAFKVPDMSSLQIKCDILICSNI-----KSSVTNTTSCEDIP  254 

**Class II**

CUTL-24a       443 --AKDSENTMFYYLLIKAFKFPGPDDVYFSCTIEFTPKTKAP----------------  482   
CUTL-24b       445 --AKDSENTMFYYLLIKAFKFPGPDDVYFSCTIEFTPKTKAP----------------  484   
CUTL-28        204 --TDNYVKLKISFSGFRRQTEVVYHAMMETCTV-GCMP--------------KCNQDM  244   
R52.6            1 ------------METIFSFFSKHLFDMNIFCSIVLCFVITI---------TECCMRT-   36   
T01D1.8a        41 -----QGDLSAGIKVHAFALDVDTTAVHFTCNIKMLFKD-----------HEQCQ---   79 

**Class IIIa**

CUT-1          197 ------PTDLMAGQEAHVYKYADRSQLFYQCQISITIKDP----------GSECA---  235   
CUT-3          197 ------PTDLMAGQEAHVYKYADRSQLFYQCQISITVKEP----------NEECA---  235   
CUT-4          195 ------TSDLTAGKLAPVFKFADKAGLYFNCQIQLTIKDV----------NYGCSN--  234   
CUT-5a         201 ------PTDLMAGREAHVYKYADRDNMYFDCQISITVKEP---------GLDYCD---  240   
CUT-5b         200 ------PTDLMAGREAHVYKYADRDNMYFDCQISITVKEP---------GLDYCD---  239   
CUTL-1         197 ------PGNLLAGQEAHVYKFADRDALFFQCQISITVKEP----------DQECV---  235   
CUTL-2         213 -----KEGSMRAAASSHAFKFVDNHIVYFKCNIRITVKNP----------SGECPV--  253   
CUTL-3         235 ------SSDLTGGQLSQVFKFADQPSVFFQCKIRLGLKEE----------DGSCIR--  274   
CUTL-4         205 -----NEKELEAGQMSSVFKFADKPTVFFSCMIRVEMKES---------AEMPCV---  245   
CUTL-14        197 -----ENNKLSARVMSKAFRFGDDVAVEFECNVRLDLRNG-----------TSCPR--  236   
CUTL-15        190 ------HNRTHVGTSVKVFGVSHTSIVYFACQVRLHPQLP----------TGECPK--  229   
F46G11.6       116 ----PNHFEAGIFNPFPIRFRASSAAVVLFCVTTVVPIEH-----------GQCT---  155   
T01D1.8b       136 -----QGDLSAGIKVHAFALDVDTTAVHFTCNIKMLFKD-----------HEQCQ---  174 

**Class IIIb**

CUT-6          203 -----DTSLRLATKPYHVFKYADRPVLQFQCQITLCLKYD-----------GGCEGI-  243   
CUTL-5         195 -----NGEQSIAFQETHVFKFAQRTVTRFICQIKICMKGD------------DCKRL-  234   
CUTL-6         195 -----DASLMRAHASSQVFKYADSNQLYFTCQIRLCQKQM-----------GMCQEV-  235   
CUTL-7         198 -----EHGAISAYTNAHVFKYADKVQLYFTCTVQLCYKHD-----------GGCEGI-  238   
CUTL-8a        205 -----SSDLQRAYAESSVFKFADKPGVWFFCQVQMCMKKH-----------GMCDGI-  245   
CUTL-9         208 -----SEDGMSAQVDAYIFKFPDRSTVDFRCTITFCSVDD-----------AECLDM-  248   
CUTL-10        199 -----NKDNNVAYAQVNTFKFADKVSTYFQCAVSTCMNTE-----------GMCDGK-  239   
CUTL-11        199 -----VEALNMAYRESFVFKFADRIAVRFQCEIRLCLKDD-----------GGCDGI-  239   
CUTL-12a       197 -----SDDLKSAFTAVRAFRYADQVMVHFSCQITTCQKQE-----------NGCEGI-  237   
CUTL-12b       151 -----SDDLKSAFTAVRAFRYADQVMVHFSCQITTCQKQE-----------NGCEGI-  191   
CUTL-13        201 -----LPSLTSAYMAIEAISFPDQPSISFSCQIKLCDKGS-----------DECRGM-  241   
CUTL-16        190 -----NENRTKAFVNSNAFNFPDQNNVRISCKISVCPTLS-----------GTCH---  228   
CUTL-22a       210 -----DIENGVIYTPSKAFRFANSNHVHFKCMISVCSAVD-----------PSCRNS-  250   
CUTL-23a,b     187 SRFKDYPEDSYVFQEMSVFKFPGDGDLLFHCKISLCNMND---------PNAPCNQS-  234   
CUTL-26a,b     182 ------RESVEEAEIPSMFRFPNAKQLKISCIVTECDG--------------SCEA--  218   
FBN-1a-k       197 ------ATSSKVQAVFRTFKWPDSSMIRFQCDCNPCVG--------------QCS---  231   
LET-653a       460 -------SEFGAKVSVEAFRYQTTGQVQYSCLVRICPF-------------APCPK--  495   
LET-653b       301 -------SEFGAKVSVEAFRYQTTGQVQYSCLVRICPF-------------APCPK--  336   
LET-653c       341 -------SEFGAKVSVEAFRYQTTGQVQYSCLVRICPF-------------APCPK--  376   
M01E10.2a,b    204 -----ADDSLTAWAASHVFNVHDAESLKFVCKLSLCTRD-------------------  237   
RAM-5          182 -----SDHVPKLYARARIFKFLTDDKYRIECTLEFCNNG------------SPCKDRV  222 

**ZPc Cysteine 8**

**Class I**

CUTL-17       233 ---VICDDLEIRNVDSFG-----------------------------------------------------RKKR  251  
CUTL-18       240 --KANCPS---------------------------------------------------------------RNRR  249  
CUTL-20a      237 --QAACRG---------------------------------------------------------------RERR  246  
CUTL-20b       81 --QAACRG---------------------------------------------------------------RERR   90   
CUTL-25       261 -ASNNCGFVSFESSQ--------------------------------------------------------RSRR  278  
CUTL-27       235 ---MACTSPANRE----------------------------------------------------------REVR  248  
CUTL-29       251 ---EQCIREPDTKIPVIPAH---------------------------------------------------RRRR  271  
DYF-7         252 ---KTCYKKVSDSNLTAERLRF-------------------------------------------------RHKR  274   
NOAH-1a-c     293 ---VECALTGGVKKSFG------------------------------------------------------RKKR  310

NOAH-2        242 ---SNCLDSGTNELFMSHG----------------------------------------------------RKKR  261  
T23F1.5       255 -SPPFCADVVTSPPNSILSDASSFI----------------------------------------------KHRR  282

**Class II**

CUTL-24a      483 ---NICSKL--------------------------------------------------------------RRRR  492  
CUTL-24b      485 ---NICSKL--------------------------------------------------------------RRRR  494  
CUTL-28       245 -MLPEEETNVHSLPLSLDLPRH-------------------------------------------------RMVR  260   
R52.6          37 -IPPD----------------------------------------------------------------------   40   
T01D1.8a       80 --RPRCGNQR-------------------------------------------------------------RFSR   91 

**Class IIIa**

CUT-1         236 --RPTCSEPQGFGAVKQAGAGGAHAAAAPQAGVEEVQAAPVAAAAPVAAPVAAAAAAPAVPRATLAQLRLLRKKR  308   
CUT-3         236 --RPTCSEPQGFGAVKQANQTAQFFRV--------------------------------------------LKKR  264   
CUT-4         235 -TQPQCPTSQYVVEPAQKTTETAEPYPYDSHESGYPTRPANYPVASSRYPIPTT---------------------  287   
CUT-5a        241 --VPSCPDPP-------------------------------------------------------------RRRR  252   
CUT-5b        240 --VPSCPDPP-------------------------------------------------------------RRRR  251   
CUTL-1        236 --RPICEDVEGGGAPVVGPPPYGFSQKTQVSFNQ-------------------------------------RAKR  271   
CUTL-2        254 ---NNCSPNGSTGLIS-------------------------------------------------------RKAR  270   
CUTL-3        275 -SSDHCPATL-------------------------------------------------------------RGKR  290   
CUTL-4        246 IPTEVCKNLPSSKMQNLDVMTDRKVSDDIPPGFPRPQNNTKLQ----------------------------KSQK  292   
CUTL-14       237 ---PRC---------------------------------------------------------------------  238   
CUTL-15       230 ---PKCDLM--------------------------------------------------------------RRKR  239   
F46G11.6      156 --RRKCQ--------------------------------------------------------------------  160   
T01D1.8b      175 --RPRCGNQR-------------------------------------------------------------RFSR  186 

**Class IIIb**

CUT-6         244 TPPQNCKKLPGEDGHHHHHHPE-------------------------------------------------KRRK  269   
CUTL-5        235 SPPEACPSLEERFNEDPDKGKVFADEIHPPASMPSDLTGPNGDTSVEFVRRAPAKGSIYYGVGYNPK----RHRR  305   
CUTL-6        236 -TPPNCGVKKLLSEASGDGN---------------------------------------------------RTKR  258  
CUTL-7        239 -TPPQCSGHSHGI----------------------------------------------------------RGSK  253   
CUTL-8a       246 -TPPSCGSMSRVISVGGEDNGGFEEEEKAPSSRRKTTPKPSGSDYDYENEKPQQ---------------------  298   
CUTL-9        249 -TPPKCGANNNLLR---------------------------------------------------------RKKR  265  
CUTL-10       240 -TPPRCGPAGSFRSSSSSNDNGFNR----------------------------------------------RSRR  267  
CUTL-11       240 -TPPMCSFKDANSNEKQIVK---------------------------------------------------RNAR  262  
CUTL-12a      238 -SPPICRPMDLGPIKVHYV----------------------------------------------------KHEK  259  
CUTL-12b      192 -SPPICRPMDLGPIKVHYV----------------------------------------------------KHEK  213   
CUTL-13       242 -SPPACTPLTQVPITGQVPMPFDNTIGNTFDGIPLEPWMKEPSPPTDDVAN------------------------  291   
CUTL-16       229 --QPKCDASASSIDDASEPIGRELARDELITTPMPTSSTEIPSTTTTSTTTTTS---------------------  280   
CUTL-22a      251 -VPPKCKNGLAKKKRRQLPEEMTIEQ---------------------------------------------RLLR  279   
CUTL-23a,b    235 -IPPKCPKKVPVLPV--------------------------------------------------------RQKR  252  
CUTL-26a,b    219 ---RTCDQDSSASSLLERTTASAESEEFQRVSIIVNLEEADLPVLAEAVDEPVM---------------------  268   
FBN-1a-k      232 --TPTCISSA-------------------------------------------------------------RFRR  243  
LET-653a      496 ---NTCDDVEGCDSSYMH-----------------------------------------------------RYRR  514  
LET-653b      337 ---NTCDDVEGCDSSYMH-----------------------------------------------------RYRR  355   
LET-653c      377 ---NTCDDVEGCDSSYMH-----------------------------------------------------RYRR  395   
M01E10.2a,b   238 --GDGCEGVTPPA--------------------------------------------------------------  248  
RAM-5         223 -FPPKCAFTKEEITS--------------------------------------------------------RSTK  240 

**Class I**

CUTL-17        251 ----------------------------------------------------------------------  251

CUTL-18        249 ---------------------------------------------------------------------- 249   
CUTL-20a       246 ---------------------------------------------------------------------- 246      
CUTL-20b        90 ---------------------------------------------------------------------- 90      
CUTL-25        278 ---------------------------------------------------------------------- 278     
CUTL-27        248 ---------------------------------------------------------------------- 248

CUTL-29        271 ---------------------------------------------------------------------- 271

DYF-7          267 ---------------------------------------------------------------------- 267

NOAH-1a-c      310 ---------------------------------------------------------------------- 310   
NOAH-2         261 ---------------------------------------------------------------------- 261

T23F1.5        282 ---------------------------------------------------------------------- 282   
  
**Class II**

CUTL-24a       492 ----------------------------------------------------------------------  492    
CUTL-24b       494 ---------------------------------------------------------------------- 494

CUTL-28        269 ---------------------------------------------------------------------- 269

R52.6           41 ----------------------------------------------------------------------   41   
T01D1.8a        91 ----------------------------------------------------------------------   91 

**Class IIIa**

CUT-1          308 ----------------------------------------------------------------------  308   
CUT-3          264 ----------------------------------------------------------------------  264

CUT-4          288 QAPASYPSSPAPPPPGADIDNGYPEPQPIYIAETPENAYDGIVGFNDTEQPFTTSAAYTEDGVYSRLIKR  357   
CUT-5a         252 ---------------------------------------------------------------------- 252  
CUT-5b         251 ----------------------------------------------------------------------  251   
CUTL-1         271 ---------------------------------------------------------------------- 271   
CUTL-2         270 ---------------------------------------------------------------------- 270   
CUTL-3         292 ----------------------------------------------------------------------  292   
CUTL-4         293 FSTDAMTSNSDYSADFLDDELEDEVDKMSRIPSVTMNR----------------------------LIRR  334   
F46G11.6       160 ----------------------------------------------------------------------  160

T01D1.8b       186 ---------------------------------------------------------------------- 186

**Class IIIb**

CUT-6          269 ---------------------------------------------------------------------- 269   
CUTL-5         305 ---------------------------------------------------------------------- 305   
CUTL-6         258 ----------------------------------------------------------------------  258     
CUTL-7         254 ---------------------------------------------------------------------- 254   
CUTL-8a        299 KTTNAPRRSTTVSRDYDYDNESPKLHSPNSHSYNSVTPPLDYESVTLTAFSPPINPATV-----------  357   
CUTL-9         265 ---------------------------------------------------------------------- 265    
CUTL-10        267 ---------------------------------------------------------------------- 267

CUTL-11        262 ---------------------------------------------------------------------- 262

CUTL-12a       259 ----------------------------------------------------------------------  259   
CUTL-12b       213 ---------------------------------------------------------------------- 213   
CUTL-13        292 ITSEGEPMPRLITEEEQYQIESNHVEA---------------------------------------REKR  322    
CUTL-14        239 ----------------------------------------------------------------------  239   
CUTL-15        239 ----------------------------------------------------------------------  239   
CUTL-16        281 TTTATETPTTTTERPTTTVTQVLDPTTTVTLPTDFPTPDSIF------------------------RLLK  326   
CUTL-22a       279 ---------------------------------------------------------------------- 279   
CUTL-23a,b     252 ---------------------------------------------------------------------- 252

CUTL-26a,b     269 VHHVARDAETPPPNLIVQKSRDEIYQTECVSVNEFNLLYYLCIFLAVCSIVGFTMNIVLALML---KRRS  335     
FBN-1a-k       243 ----------------------------------------------------------------------  243     
LET-653a       514 ----------------------------------------------------------------------  514    
LET-653b       355 ----------------------------------------------------------------------  355

LET-653c       395 ----------------------------------------------------------------------  395   
M01E10.2a,b    248 ---------------------------------------------------------------------- 248

RAM-5          240 ----------------------------------------------------------------------  240

**Class I**

CUTL-17        251 ----------------------------  251   
CUTL-18        249 ----------------------------  249   
CUTL-20a       246 ----------------------------  246   
CUTL-20b        90 ----------------------------   90   
CUTL-25        278 ----------------------------  278   
CUTL-27        248 ----------------------------  248   
CUTL-29        271 ----------------------------  271   
DYF-7          274 ----------------------------  274   
NOAH-1a-c      310 ----------------------------  310   
NOAH-2         261 ----------------------------  261   
T23F1.5        282 ----------------------------  282

**Class II**

CUTL-24a       492 ----------------------------  492   
CUTL-24b       494 ----------------------------  494   
CUTL-28        269 ----------------------------  269   
R52.6           41 ----------------------------   41   
T01D1.8a        91 ----------------------------   91 

**Class IIIa**

CUT-1          308 ----------------------------  308   
CUT-3          264 ----------------------------  264   
CUT-4          357 ----------------------------  357   
CUT-5a         252 ----------------------------  252   
CUT-5b         251 ----------------------------  251   
CUTL-1         271 ----------------------------  271   
CUTL-2         270 ----------------------------  270   
CUTL-3         292 ----------------------------  292   
CUTL-4         334 ----------------------------  334   
CUTL-14        239 ----------------------------  239   
CUTL-15        239 ----------------------------  239   
F46G11.6       160 ----------------------------  160   
T01D1.8b       186 ----------------------------  186 

**Class IIIb**

CUT-6          269 ----------------------------  269   
CUTL-5         305 ----------------------------  305   
CUTL-6         258 ----------------------------  258   
CUTL-7         254 ----------------------------  254   
CUTL-8a        358 GIESVSKTFETEDDLASSSVTPEPKSKK  385   
CUTL-9         265 ----------------------------  265   
CUTL-10        267 ----------------------------  267   
CUTL-11        262 ----------------------------  262   
CUTL-12a       259 ----------------------------  259   
CUTL-12b       213 ----------------------------  213   
CUTL-13        322 ----------------------------  322   
CUTL-16        326 ----------------------------  326   
CUTL-22a       279 ----------------------------  279   
CUTL-23a,b     252 ----------------------------  252   
CUTL-26a,b     335 ----------------------------  335   
FBN-1a-k       243 ----------------------------  243   
LET-653a       514 ----------------------------  514   
LET-653b       355 ----------------------------  355   
LET-653c       395 ----------------------------  395   
M01E10.2a,b    248 ----------------------------  248   
RAM-5          240 ----------------------------  240 

**Figure S2.** M-Coffee multiple sequence alignment of *C. elegans* ZP proteins

ZP domain sequences were obtained from Uniprot and extended to include all sequence up to a furin-type cleavage site as determined by ProP (DUCKERT *et al.* 2004). Sequences were aligned via M-Coffee (WALLACE *et al.* 2006; MORETTI *et al.* 2007) using default settings, and then manually adjusted to minimize gaps and maximize alignment of cysteines and surrounding residues. Cysteines and other amino acids present in at least 75% of protein sequences within a given class were highlighted to indicate conservation. Proteins are sorted by class and subclass, then alphabetically.