**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

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**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

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**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.