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Sphingolipids containing very-long-chain fatty acids define a secretory pathway for specific polar plasma membrane protein targeting in Arabidopsis.

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Sequences (p. 1-5) and alignment (p. 6-10) used for phylogenetic analysis in Supplemental Figure 1B (FASTA format)

>SlAsc-2

MDSIWANNGAPAVSHLFYAIFFAFGFVIVRFLDRFIFRRLAVLLLRLGTTHLRNDEATRKGKIVKCESESMWK
FAYYATIEFCVLKVAYHEPWFLDVKGYFSGWPNQELTAGIKLIYMCQCGFYLYSIAALVWETRKRKDFAVMM
SHHIVTVFLISSYILSFFRIGIVILALHDGSDVFLEAAKVKYSEKELGASVLFVCFVSWFPLRLVFFPF
WWIRSSSYLCEVLKLSSEYDTMIYFFNTMLLTLLVFHIYWWILYISMIMKQLRNRGQVGEDIRSDSEDD

>PtLOH2

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HHVITVILIGYSYSTSFFRIGTIICAVHDASDVLEAAKVKYSGKELASILFGLFAISWVILRLVFFPF
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>AtLOH2

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KDFAVMMSHHVITIIILLSYSYLTSTFRIGAIILALHDASDFMETAKIFKYSEKEFGASVCFALFAVSWLL
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SDSEDDDD

>SbLOH2

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STLIGVSYLTGFFRIGTIILALHDASDVLETAKLCKYTEKELGASLFFGLFAISWLLRLIYFPFIIKAS
SYHSIAFLRKLDEFPTALYYILNTMLLTLLVFHMYWKLICLMIMRQLNKGQVTDVRSDEDE

>SlAsc-1

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ALVFTSLRIICYPFWIIRSTCYELLYVLDIQKERTTGIILYFVFNALLICLLVLHLFWFKIILRMVKNQILS
RGHITDDVRESESDDDHKD

>SlAsc-3

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FAAHMIHHITSVSLILLSYIFGMARAGSMAALIHGSDVLEIAKMSLYSGFHSVADISFALFALSLLLLRL
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>PtLOH1a

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>PtLOH1b

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>VvLOH1

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>BrLOH1

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SESVRSDESDEHED

>AtLOH1

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QDRGKLSVRSDESDEHED

>AtLOH3

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>AlLOH3

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>OcLOH1

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>OcLOH3

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>GmLOH1

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>GmLOH3

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>RcLOH3

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>PtLOH3

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>AtLOH4

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>AlLOH4

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>HsCerS2

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 IILISFSWFANYIRAGTLIMALHDSSDYLLSAAKMFNYAGWKNTCENNIFIVFAIVFIITRLVILPFWILHCT
 LVYPLELYPAFFGYFFNSMMGVLQLLHIFWAYLILRMAHKFITGKLVEDERSDREETESSE
 GEEAAAGGAKSRPLANGHPILNNHRKND

>HsCerS3

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>HsCerS4

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>HsCerS5

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>HsCerS6

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>HsCerS1

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>ScLAG1

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>ScLAC1

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Alignment used for phylogenetic analysis in Supplemental Figure 1B

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SlAsc-2 -----
PtLOH2 -----
AtLOH2 -----
SbLOH2 -----
SlAsc-1 -----
SlAsc-3 -----
PtLOH1a -----
PtLOH1b -----
VvLOH1 -----
BrLOH1 -----
AtLOH1 -----
AtLOH3 -----
AlLOH3 -----
OcLOH1 -----
OcLOH3 -----
GmLOH1 -----
GmLOH3 -----
RcLOH3 -----
PtLOH3 -----
AtLOH4 -----
AlLOH4 -----
HsCerS2 -----MLQTLYDYFWWERLWLP
HsCerS3 -----MFWTFKEFWLERFWLP
HsCerS4 -----MLSSFNEWFWQDRFWLP
HsCerS5 -----MATAAQGPLSLLWGWLWSEFWLP
HsCerS6 -----MAGILAWFNERFWLP
HsCerS1 -----
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ScLAC1 MSTIKPSPSNNLKVRSRPRRK-SSIGKIDLGDTVPSLGTMFETKESKTAAKRRMQRLSE

SlAsc-2 -----MDSIWANN GAP
PtLOH2 -----MDPILTFNGSA
AtLOH2 -----MESVSSRGGDPVVKPSM
SbLOH2 -----MAAVR
SlAsc-1 -----MKNLDHIAASVDWEKESLP
SlAsc-3 -----MDWDTESYR
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PtLOH1b -----MGFMEYAKSIQWEHESYP
VvLOH1 -----MGLLESAASINWEHESFP
BrLOH1 -----MGFFESVKSINWEHESFP
AtLOH1 -----MGLFESVKSIDWEQESFP
AtLOH3 -----MGLLESVKINWEHESFP
AlLOH3 -----MGLLESVKINWEHESFP
OcLOH1 -----MGFLDLMNPIDWEYESYP
OcLOH3 -----MGFLEMVKSVDWEQESYS
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GmLOH3 -----MGTWVLQQVTSIDWNWNHESYP
RcLOH3 -----MGVVGTNGFINWESESY
PtLOH3 -----MGVLGINNIDWESESY
AtLOH4 -----MDLKLLSRPDWDQESYP
AlLOH4 -----MDLKLLSR- DWDHESYP
HsCerS2 VNLTWADLED-RDGRVYAKASDLYITLPLALLFLIVRYFFELYVATPLAALLNIKEKTRL

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 HsCerS5 ENVSWADLEGPADGYGYPRGRHILSVFPLAAGIFFVRLLEFERFIAKPCALCIGIEDSGPY
 HsCerS6 HNVTWADLKN-TEEATFPQAEDLYLAFPLAFCIFMVRLIFERFVAKPCAIALNIQANGPQ
 HsCerS1 -----MAAAGPAAGPTGPEPMPSYAQLVQRGWSALAAARGCTDCGW
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 ScLAC1 ATKNDSDLVKKIWFWSFREISYRHAWIAPLMILIAVYSAYFTSGNTTKTNVLRHFVAVSQ

SlAsc-2 AVSHLFYAIFFAFGFVIVRFLDRFIFRRLAVLLLRLGTTHLRNDEATR-----KIVKC
 PtLOH2 NPSHFLLPYAFGFLLARFILDRIFRKLAIWLLYSKAKAISSRIDEAT-----IVKC
 AtLOH2 EVWHFQIAVYFAFGFFLRLVLDRIYVQRIALWLLSTGSAPIKLNDAATRA-----KIVKC
 SbLOH2 GGEAVSVALLFSLAFFCARLLLDRLVYKPLAVYLFNTKASKLMNDEARQA-----KIVKF
 SlAsc-1 EYQDLIFLLFFALFFPVLRFILDRFVFEALAKRMIFGKKTVVNINGREERK-----KINKF
 SlAsc-3 EYKDLIFIPFFALFFPILRFILDRLVFEALAKRMICGKDAKVIKNGSSIKRK---KMNKF
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 PtLOH3 VATDFIAIPLFAVFFSVRFVLDKYVFECSARRFIFGKGHVTVDVGKHGHRK---KVNKF
 AtLOH4 DSSDFLVLIFFAPFFLRLILDRCIFERVARRLVVPKGLCA---DSNERRK---KVKKF
 AllOH4 AFSDLWLIFFAPFFLRLILDRCIFERVARRLVVPRGHY---DSNERRK---KIVKF
 HsCerS2 RAPPNATLEKHFYLTSGKQPKQVEVELLSRQSGLSGRQVERWFRRRRNQDRPS---LLKKF
 HsCerS3 VTP-NTVLENFFKHSTRQPLQTDIYGLAKKCNLTERQVERWFRSRRNQERPS---RLKKF
 HsCerS4 QVKPNATLEKHFLTEGHRPKEPQLSLLAAQCGLTLQQTQRWFRRRRNQDRPQ---LTKKF
 HsCerS5 QAQPNAILEKVVISITKYPDKRLEGLSKQLDWNVRKIQCWFRHRRNQDKPP---TLTKF
 HsCerS6 IAPPNAILEKVFTAITKHPDEKRLEGLSKQLDWDVRSIQRWFRQRRNQEKPS---TLTRF
 HsCerS1 GLARRGLAEHAHLAPPELLLLALGALGWTALRSAATARLFRPLAKRCCLQPR---DAAKM
 ScLAG1 VDGTDYAKGKIDLSFVFFYMIFFTFLEFLMDVIRPFTVYLVNTSEHRQK-----RM
 ScLAC1 IGDTNAYGKGINDLFCVFFYMIFFTFLEFLMDVIRPFAIRLHVTSKHKRIK-----RI

SlAsc-2 SESMWKFAYYATIEFCVLKVAYHEPWFLDVKGYFSG-----WPNQELTAGIKLIYMCQCG
 PtLOH2 SESMWKLTYYATVEICVLKITCNEPWRDTEKEYFRG-----WPHQELGFPIMLFYMCQCG
 AtLOH2 KESLWKLLEYAACDFVLQVIYHEPWARDIKLYFHG-----WPNQELKLSIKLYYMCQCG
 SbLOH2 SESSWKLTYASVQAWVLMIIKQEPWSLDMMQYFDG-----WPNQPIASSLMLFYMCQCG
 SlAsc-1 KESAWKFVYFLSAELLALSVCNEPWFTDSRYFWAGPGDVVWPNLKMMLKLLKLLYMYAGG
 SlAsc-3 KESAWKFMYFLSAEIFALYVTYNEPWFTNTTRYWTGPGDQVWPDQKMKLKLKGWMTMYAGG
 PtLOH1a KESAWKCIYFLSSEILVLCVYDEPWLVNTKYFWVGPQSQAQWPDQKMKLKLKAVYMYAAG
 PtLOH1b KESAWKCIYFLSAEILVLYVYDEPWFGNTKYFWVGPQSQVWPDQKMKLKLKGAYMYAAG
 VvLOH1 KESAWKCVYFLSAELLALSVCYDEPWFTNTKYFWVGPQNVWPDQKIKLKLKGLYMYCGG
 BrLOH1 KESAWKCIYFLSAEVLALSVCYNEPWFTDTLYFWIGPGDIWPNQMKIKLKLFLYMYTAG
 AtLOH1 KESAWKCIYFLSAELLALSVCYNEPWFTNTLYFWIGPGDIWPDQPMKMKLKLFLYMYAAG
 AtLOH3 KESAWKCVYFLSAEILALSVCYNEPWFMNTKYFWVGPQDQWPDQKTKLKLKLLYMFVAG
 AllOH3 KESAWKCVYFLSAEILALSVCYNEPWFMNTKYFWVGPQDQWPDQKTKLKLKLLYMFVAG
 OcLOH1 KESAWKCVYFLSAEILALAVTYNEPWFTTKTYFWLGPQNVWPDQAYKLLKGLYMFVGG
 OcLOH3 KESAWKCVYFLSADFFALAATYKESWFTNTKHFWEVGPQNVWPDQKYNLKLKGLYMYTGG
 GmLOH1 KESAWKCVYFLSAEILALSVCYDEPWFTNTINFVGPRTQVWPDQKIKLKLKAVYMYAAG
 GmLOH3 MESAWKCVYFLSAEILALAVTYNEPWFTDTRYFWVGPQNIWPDQKIKLKLKGLYMYAAG
 RcLOH3 KESAWKYIYFSSAEILALSVCYNEPWFTNTKYFWVGPEDQIWPDQKIKLKLKGLYMFVAG
 PtLOH3 KESAWKCVYFLCAEILALYVSYDEPWFTNTKYFWVGPQDQWPDQKLFELKVLKLYMYAGG

AtLOH4 KESAWKCLCSFSVEAFALYVTYKEPWFKDRSFWLGGDQVWPDQKIKLKMKGMYMFVGG
 AllOH4 KESAWKCLCSFSVEALALYVTYKEPWFKDRCFWLGGDQIWPDQKIKRLKMKGMYMFVGG
 HsCerS2 REASWRFTFYLIAFIAGMAVIVDKPWFYDMKKVWEG-----YPIQSTIPSQYWYYMIELS
 HsCerS3 QEACWRFAFYLMITVAGIAFLYDKPWLIDLWEVWNG-----YPKQPLPSQYWYYILEMS
 HsCerS4 CEASWRFLFYLSSFVGGSLVLYHESWLWAPVMCWD-----YPNQTLKPSLYWYYLLELG
 HsCerS5 CESMWRFTFYLCIFCYGIRFLWSSPWFWDIRQCWHN-----YPFQPLSSGLYHYIIMELA
 HsCerS6 CESMWRFSFYLYVFTYGVRFLLKTPWLWNTRHCWYN-----YPPQPLTTDLHYIILELS
 HsCerS1 PESAWKFLFYLGWSYSAYLLFGTDYPPFFHDPSPVFD--WTPGMVPRDIAAAYLLQGS
 ScLAG1 LEQMYAIFYCGVSGPFGLYIMYHSDLWLFKTKPMYRT----YPVITNPFLLKIFYLQQA
 ScLAC1 MEQMYAIFYTGVSGPFGIYCMYHSDLWFFNTKAMYRT----YPDFTNPFLLKVFYLGQA

SlAsc-2 FYL-YSIAALVWETRKRDFAVMMSHHIVTVFLISSYILSFFRIGIVILALHDGSDVFL
 PtLOH2 FYI-YSIAALLIWETRKRDFSVMMSHHIVITVILIGYSYSTSFFRIGTIICAVHDASDVFL
 AtLOH2 FYV-YGVAALLAWETRKRDFAVMMSHHIVITIIILLSYSYLTSSFFRIGAIILALHDASDVFM
 SbLOH2 FYI-YSIGALVAWETRKRDFAVMMSHHIVITSTLIGVSYLTGFFRIGTIILALHDASDVFL
 SlAsc-1 FYF-YSIFATLYWETRRYDFAAQIIHHVTTVSLIVLSYVYGFARIGSVLALHDGSDVFM
 SlAsc-3 FYL-YSIFALIYWETRRSDFAAHMIHHITSVSLILLSYIFGMARAGSMAALIHGSDVLM
 PtLOH1a FYT-YSIFALIFWETRRSDFGVSMHHVATVILIVLSYILRFGRVGSVLAIHGSDVFL
 PtLOH1b FYT-YSIFALIFWETRRSDFGVSMHHVATVILIVLSYILRFGRAGSIVLAIHGSDVFL
 VvLOH1 FYT-YSIFALIFWETRRSDFGVSMGHHVATFILIVLSYIFRFARVGSVLAIHGSDVFL
 BrLOH1 FYT-YSIFALIFWETRRSDFGVSMGHHITTVILIVLSYICRFSRAGSVLALHDGSDVFL
 AtLOH1 FYT-YSIFALVFWETRRSDFGVSMGHHITTLVILIVLSYICRLTRAGSVILALHDGSDVFL
 AtLOH3 FYT-YSIFALVFWETRRSDFGVSMGHHIATLILIVLSYVCSFSRVGSVLAIHGSDVFL
 AllOH3 FYT-YSIFALIFWETRRSDFGVSMGHHIATLILIVLSYVCSFSRVGSVLAIHGSDVFL
 OcLOH1 FYT-YSIFALIFWETRRSDFGVSMHHVATFILIVLSYVLRFARAGSVLALHDGSDVFL
 OcLOH3 FYT-YSIFALIFWETRRSDFGVSMGHHVASSVILIVLSYVF-----GSVLAIHGSDVFL
 GmLOH1 FYS-YSIFALIFWETRRSDFGVSMHHVATVILIVLSYIFRFARVGSVLAIHGSDVFL
 GmLOH3 FYT-YSILALVFWETKRSDFVSMGHHVITVILIVLSYIFRFVVRVGSVLAIHGSDVFI
 RcLOH3 FYI-YSIFALIFWETRRSDFAVSMAHHVATVILLVMSYILRFARVGSIVLALHDVCDGFL
 PtLOH3 FYT-YSIFALVFWETRRSDFGVSMGHHIVTVFLIVLSYILRFGRVGAVALHDATDVFM
 AtLOH4 LNV-YAFFALFFWETRRSDFKVMLVHHIVTSFLIILSYVFRFARIGSVILALHEISDVFL
 AllOH4 GLNVYAFFALFFWETRRSDFKVMLVHHIVTSFLIILSYVFRFARIGSVILALHEISDVFL
 HsCerS2 FY--WSSLFSIASDVKRKDFKEQIIHHVATIILISFSWFANYIRAGTLIMALHDSSDYLL
 HsCerS3 FY--WSSLFRLGFDVKKRDFLAHIIHHLAAISLMSFSWCANYIRSGTLVMIVHDVADIWL
 HsCerS4 FY--LSLLIRLPFDVKKRDFKEQVIHFFVAVILMTFSYSANLLRIGSLVLLLDSSDYLL
 HsCerS5 FY--WSLMFSQFTDIKRKDFLIMFVHHLVTIGLISFSYINMVRVGTLMCLHDVSDVFL
 HsCerS6 FY--WSLMFSQFTDIKRKDFGIMFLHHLVSIFLITFSYVNNMARVGTLLVCLHDSADALL
 HsCerS1 FYG-HSIYATLYMDTWRKDSVVMLLHHVVTLLILIVSSYAFRYHNVGILVFLHDISDVQL
 ScLAG1 FWAQQACVLVLQLEKPRKDYKELVFHHIVTLLLIIWSSYVFHFTKMGLAIYITMDVSDVFL
 ScLAC1 FWAQQACILVLQLEKPRKDHNELTFHHIVTLLLIIWSSYVFHFTKMGLPIYITMDVSDVFL

SlAsc-2 EAAKVKYSEKELGASVLFGCFAVSWFPLRLVFFPFWIRSSSYLCEVLKLSSEYD---
 PtLOH2 EAAKVKYSGKELASILFGLFAISWILRLVFFPFWIIKATSVELVEFLDLSLAYDK--
 AtLOH2 ETAKIFKYSEKEFGASVCFALFAVSWLLLRLLIYFPFWIIRATSIELLDYLDMTSA-----
 SbLOH2 ETAKLCKYTEKELGASLFFGLFAISWLLLRLLIYFPFWIIRKASSYHSIAFLRKLDEF-----
 SlAsc-1 EIAKMSKYSGFDLIADIFFSLFALVFTSLRIICYPFWIIIRSTCYELLYVLDIQKER-----
 SlAsc-3 EIAKMSLYSGFHSVADISFALFALSLLRLIYFPFFIIYSTSYEVLFIVDKEKQ-----
 PtLOH1a EVGKMSKYSGAEGVASFALFVLSWILLRLIYYPFWLWSTSYEVLILLDKEK-----
 PtLOH1b EVGKMSKYSGAEGIASFALFVLSWILLRLIYYPFWLWSTSYEVLILLDKEK-----
 VvLOH1 EVGKMSKYKGAETTASISFILFVLSWIVLRLIYYPFWILRSTSYEVILLDKEK-----
 BrLOH1 EVGKMSKYSGFEGIAAFSFLFALSLLRLIYYPFWILWSTSYQIIMTVDKK-----
 AtLOH1 EIGKMSKYCGAESLASISFVLFALSLLRLIYYPFWILWSTSYQIIMTVDKK-----
 AtLOH3 EVGKMSKYSGAERIASFSFILFVLSWILLRLIYYPFWILWSTSYEVVLELDKDK-----
 AllOH3 EVGKMSKYSGAERIASFSFILFVMSWILLRLIYYPFWILWSTSYEVVLELDKDK-----
 OcLOH1 EVGKMSKYSGAETIASISFVLFVLSWVLLRLIYYPFWILWSTSYEVIQTVDKK-----
 OcLOH3 EVGKMSKYSGAETLASCFSVLFVLSWVLLRLIYYPFWILWSTSCETIIPFLDKDT-----
 GmLOH1 EIGKMSKYSGAETMASFALFVLSWIVLRLIYYPFWILWSTSYEVLILLDKEK-----

GmLOH3 ETGKMSKYSGAETTASIAFILFVLCFTVTTRIIYYPFWILRSTSYEVVHALKMD-----
 RcLOH3 EIAKMSRYSYGEWISSIFFVLFVLSWTIFRIIYYPFWILRSTSYEVVLTLDMMK-----
 PtLOH3 EIAKMSKYSYELMASVFFLLFVLFWTILRIIYYPFWILRSTSYEIVSALNKEK-----
 AtLOH4 EIGKMCKYSGAETMTSVSFVLFLLSWTTLRLIYYPFWILWSTSYESIKVKTEYWDKHLML
 ALLOH4 EIGKMCKYSGAEAMTSVSVFVLFLLSWTALRLIYYPFWILWSTSYESIKVKMEYWDKKNLM
 HsCerS2 ESAKMFNYAGWKNTCNNIFIVFAIVFIITRLVILPFWILHCTLVYPLELYPAFFG-----
 HsCerS3 ESAKMFNYAGWTQTCNTLFFIFSTIFFISRLIVFPFWILYCTLILPMYHLEPFFS-----
 HsCerS4 EACKMVNYMQYQQVCDALFLIFSFVFFYTRLVLFPTQILYTTYYESISNRGPPFFG-----
 HsCerS5 EAAKLANYAKYQRLCDTLFVIFSAVFMVTRLGIYPFWILNTTLFESWEIIGPYAS-----
 HsCerS6 EAAKMANYAKFQKMCDDL FVMFAVVFITTRLGIFPLWVLTTLFESWEIVGPYPS-----
 HsCerS1 EFTKLNIIYFKSRGGSYHRLHALAADLGLCSFGFSWFWRFLYWFPLKVLATSHCSLRTVP
 ScLAG1 SLSKTLNLYNSVFTPFVFGFLVFFFWIYLRHVVNIRILWSVLTEFRHEGNYVLFATQQYK
 ScLAC1 SFSKTLNLYLDSGLAFFSFAIFVVAWIYLRHYINLKILWSVLTQFRTEGNYVLFATQQYK

SlAsc-2 -----TMIYYFFNTMLLTLVLFHIYWVWILYISMIMKQLRNRGQVGEDIRSDSEDDDD---
 PtLOH2 -----LLYYVFNTMLLMLLVFHIYWVWILYISMIMRQLRNRGRVGEDIRSDSEDDDE---
 AtLOH2 ----EGTLMYYSFNTMLLMLLVFHIYWVWYLICAMIVRLLKNRGKVGEDIRSDSEDDDD---
 SbLOH2 -----PTALYYILNTMLLTLVLFHMYWVKLICLMIMRQLNKGQVTDVRSDEDDDE---
 SlAsc-1 ---TTGIILYFVFNALLICLLVLFHFWFKIILRMVKNQILSRGHITDDVREDSSEDDDD-H
 SlAsc-3 -QNINGIILYFVINSMLICLLLLHIYWVWTLICRVIINIL-KKGQF-DDVRSDESESEDED
 PtLOH1a -HPVDGPIYYYYVFNTLLYCLLFLHVIYWVWLIYQMLAKQIQARGHLSDVRSDESEGEDE-H
 PtLOH1b -HAVDGPPIYYYYVFNTLLYGLLVLHIYWVWVLMYRMLVKQIQARGQLSDVRSDESEGEDE-H
 VvLOH1 -HAVEGPPIYYLFFNTLLFCLLVLHIYWVWVLMYRMLVKQVQARGQLSDVRSDESEDEDE-H
 BrLOH1 -HPIEGPIYYMFNTLLFCLLVLHIFWVWLIYRMLVKQVQDRGKLSDEVRSDESDDDE-H
 AtLOH1 -HP-NGPILYYMFNTLLYFLLVLFHIFWVWLIYRMLVKQVQDRGKLSDEVRSDESDDDE-H
 AtLOH3 -HPIEGPIYYMFNTLLYCLLVLHIYWVWVLMYRMLVKQIQDRGKLSDEVRSDESEGEDE-H
 ALLOH3 -HPIEGPIYYMFNTLLYCLLVLHIYWVWVLMYRMLVKQIQDRGKLSDEVRSDESEGEDE-H
 OcLOH1 -HRADGPPIYYVFNLSLLFSLLVLHIYWVWVLMYRMLVKQIQARGVSEDVRSDESEDEDE-H
 OcLOH3 -HKVDGPPIYYVFNLSLLFSLLVLHIYWVWVLMYRMLVKQIQARGVSEDVRSDESEDEET-Q
 GmLOH1 -HRVDGPPIYYVFNLSLLYCLLVLMHIYWVWLIYRMLVKQIQARGKVSDEVRSDESEDEDA-H
 GmLOH3 --LVDGPLYYYVFNLSLLYFLQVLHIYWVWVLMRMLVKQIQEKGVSEDIRSDSEDEDEDE-H
 RcLOH3 -HMVDGPLNYLFFNTLLFCILVFNIIYWVWILMVRMVVEQIKARGKVSDDVRSDESEGEDE-H
 PtLOH3 -QMVDGSIYYLFFNTLLFSLLVLHIYWVWVLMVGMVMAQIQAGGQVSDVRSDESEGEDD-H
 AtLOH4 ETGPPLILFYVFNNTLLYCLQILHIYWVWILYRVLISQIRAKGKVAKDIRSDSEGEDDEH
 ALLOH4 ETGPNLMVFFVFNNTLLYCLQILHIYWVWILYRVLISQIRAKGKVAKDIRSDSEGEDDEH
 HsCerS2 -----YFFNSMMGVQLLHIFWAYLILRMAHKFIT--GKLVEDERSDREETESSE
 HsCerS3 -----YIFLNLQMLILQVLHLYWGYIILKMLNRCIF--MKSIQDVRSDDEDYEEEE
 HsCerS4 -----YFFNGLLMLLQLLHVFWSCILRMLYSFMK-KGQMEKDIRSDVEESDSSE
 HsCerS5 -----WLLNGLLLTLQLLHVWISYLIARIALKALI-RGKVSDDRSDVESSESEEE
 HsCerS6 -----WVFNLLLLLVQGLNCFWSYLIVKIAACKAVS-RGKVSDDRSDIESSSDEE
 HsCerS1 D-----IPFYFFFNALLLLLTLMNLYWFLYIVAFAAKVLTGQVHELKDLREYDTAEAQSL
 ScLAG1 C-----WISLPIVFLVIAALQLVNLVWFLFILRILYRLIW-QG-IQKDRSDSDSDESAE
 ScLAC1 C-----WISLPIVFLVIGALQLVNLVWFLIFRVLRYRILW-RG-ILKDDRSDSESDEESD

SlAsc-2 -----
 PtLOH2 -----
 AtLOH2 -----
 SbLOH2 -----
 SlAsc-1 KD-----
 SlAsc-3 EHKQS-----
 PtLOH1a ED-----
 PtLOH1b ED-----
 VvLOH1 ED-----
 BrLOH1 ED-----
 AtLOH1 ED-----
 AtLOH3 ED-----
 ALLOH3 ED-----

OcLOH1 ED-----
OcLOH3 DD-----
GmLOH1 EHED-----
GmLOH3 KHEE-----
RcLOH3 DD-----
PtLOH3 DD-----
AtLOH4 QD-----
AlLOH4 HD
HsCerS2 GEEAAAGGGAKSRPLANGHPILNNHRKND-----
HsCerS3 EEEEEATKGKEMDCLKNGLRAERHLIPNGQHG-----
HsCerS4 EAAAAQEPLQLKNGAAGGPRPAPT DGPRSRVAGRLTNRHTTAT
HsCerS5 DVTTCTKSPCDSSSSNGANRVNGHMG-GSYWAE-----
HsCerS6 DSEPPGKNPHTATTTNGTSGTNGYLLTGSCSMDD-----
HsCerS1 KPSKAEKPLRNGLVKDKRF-----
ScLAG1 NEESKEKCE-----
ScLAC1 ESSTTPTDSTPTKKDI-----