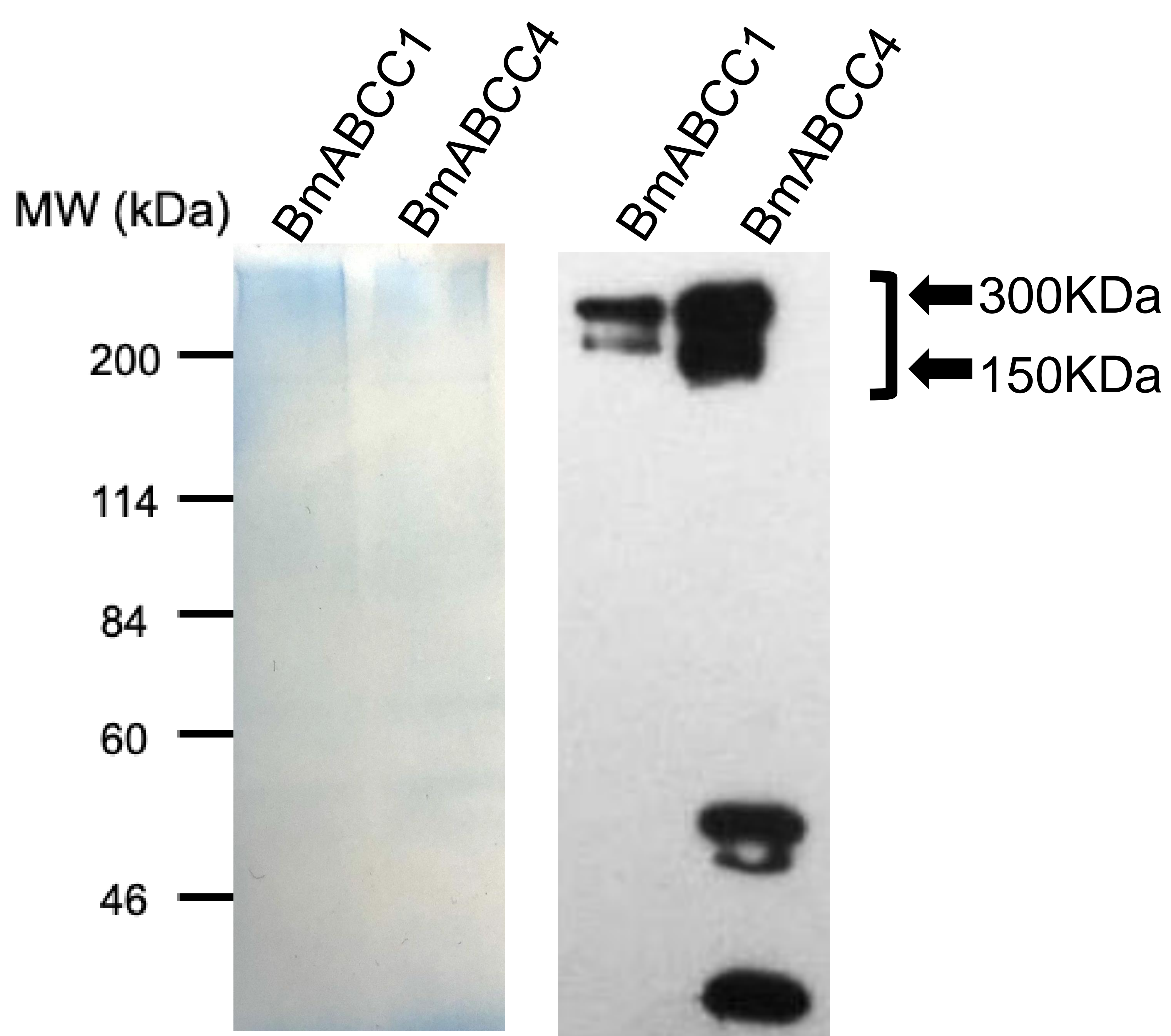


A

CBB

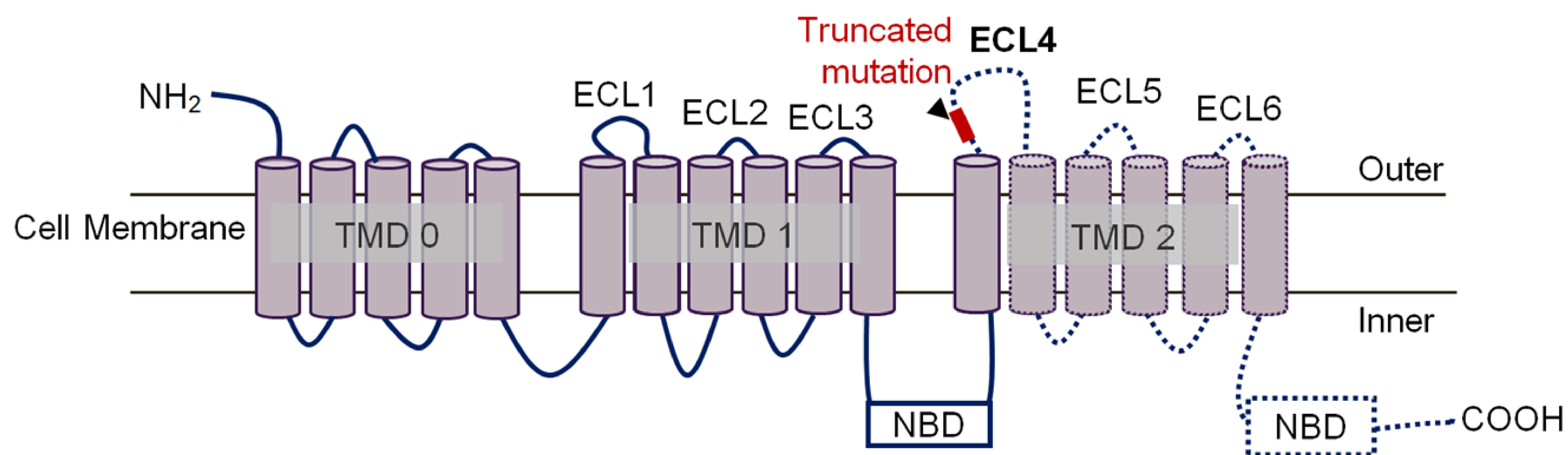
B

Ultra
CBB

WB
(Anti-FLAG
antibody)

Supplementary Figure 1.

A

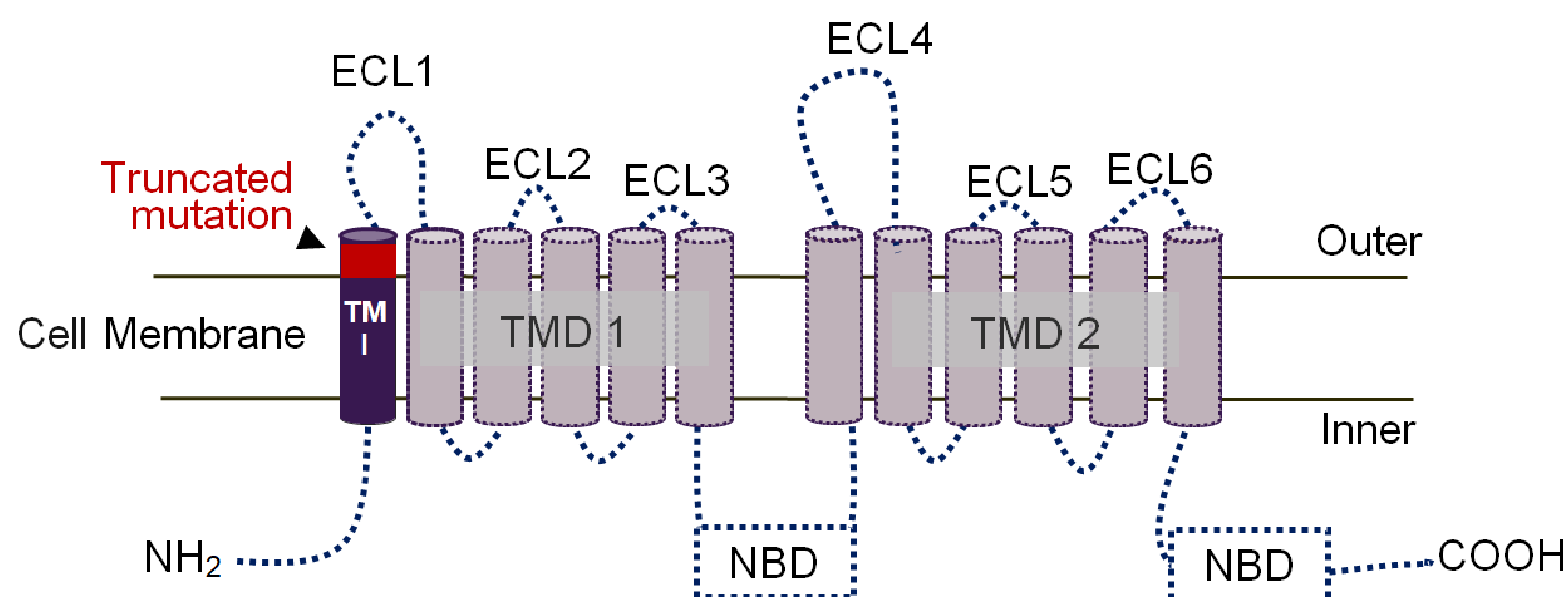


B

Wild ATTCTGATGAATCTGATCCTGCAAGTGTTCCAAGTCGGCTCCAACTACTGGCTGGCGGAG
 Ile Leu Met Asn Leu Ile Leu Gln Val Phe Gln Val Gly Ser Asn Tyr Trp Leu Ala Glu

C1T09 ATTCTGATGAAT-----GTTCCAAGTCGGCTCCAACTACTGGCTGGCGGAG (-14nt)

C



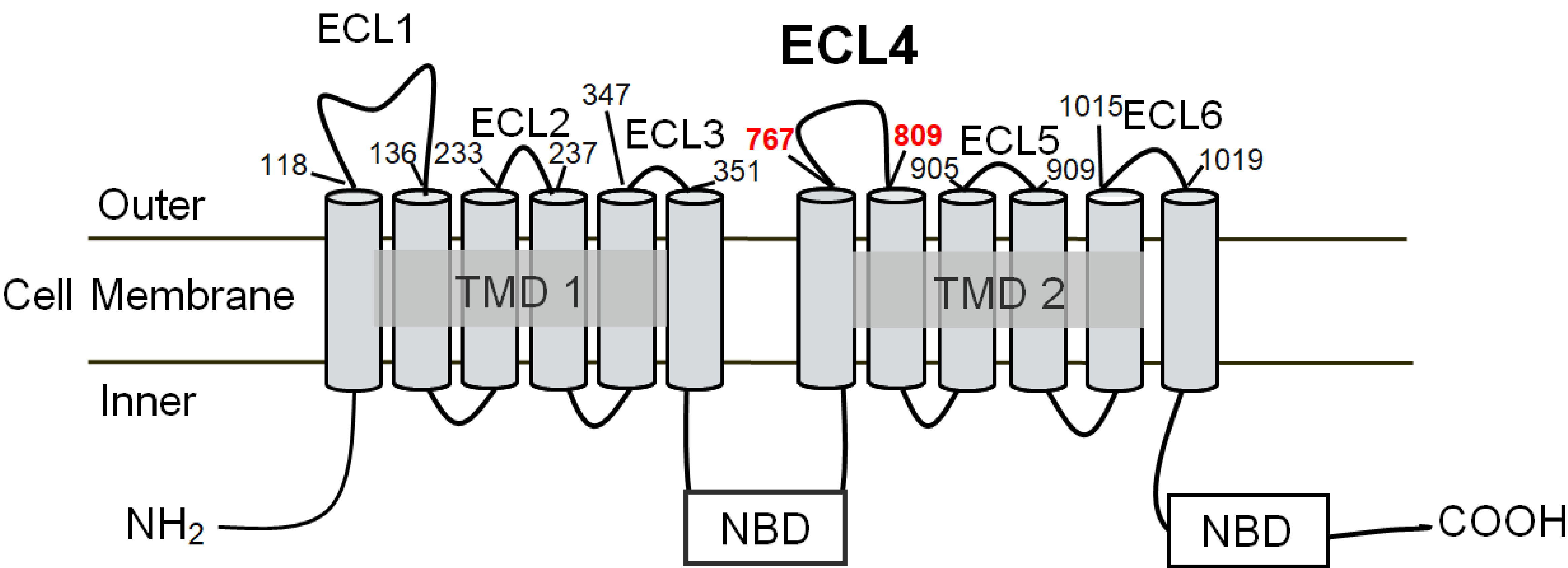
D

Wild CTGGTTCCGTTTACACTAGCATTGTTTATCGGATATTTCTCTGGAGAAAAATCACCTGAA
 Leu Val Pro Phe Thr Leu Ala Leu Phe Ile Gly Tyr Phe Ser Gly Glu Lys Ser Pro Glu

C4T02 CTGGTTCCGTTTACACT-----TGTTTATCGGATATTTCTCTGGAGAAAAATCACCTGAA (-5nt)

Supplementary Figure 2.

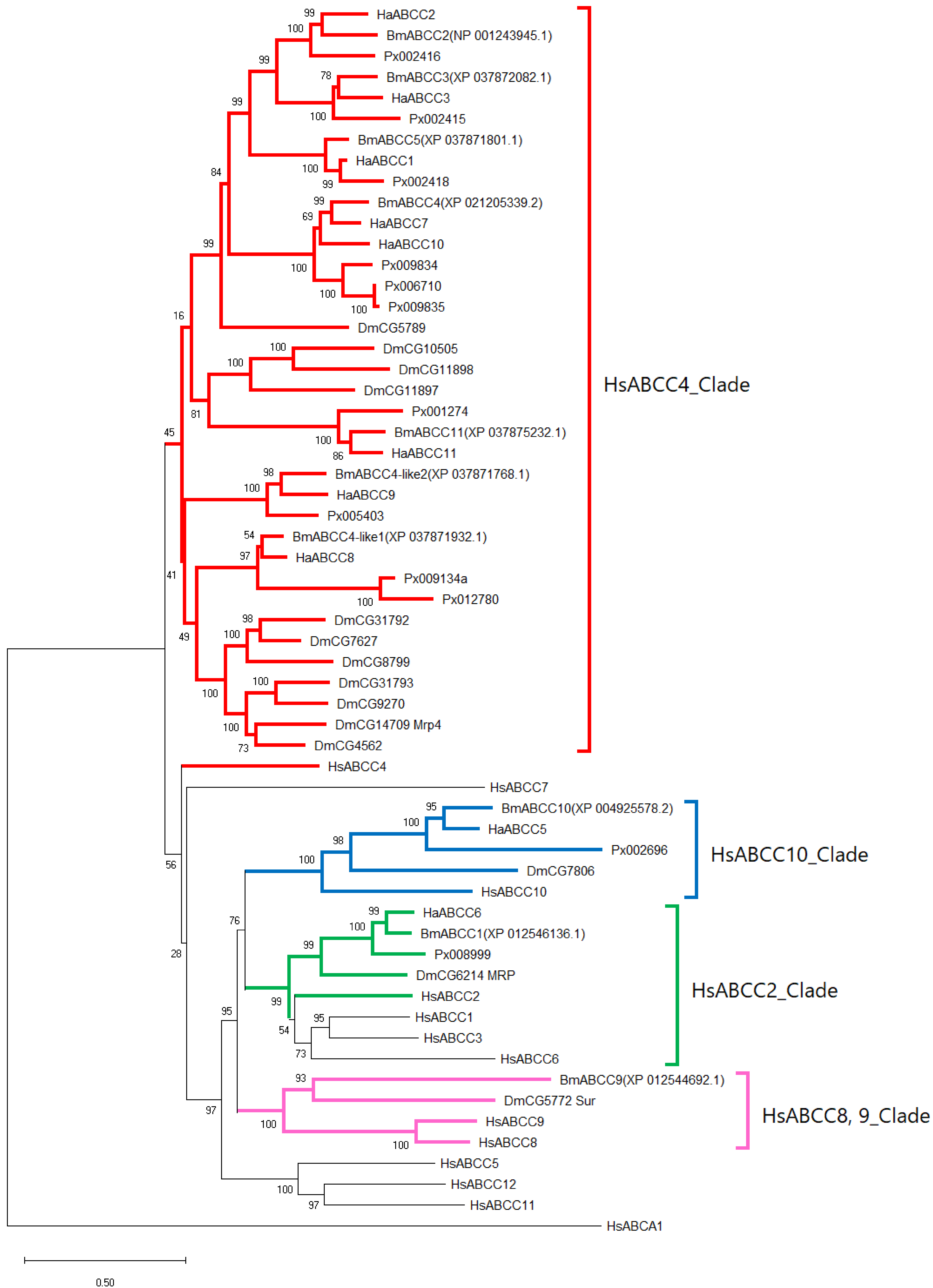
A



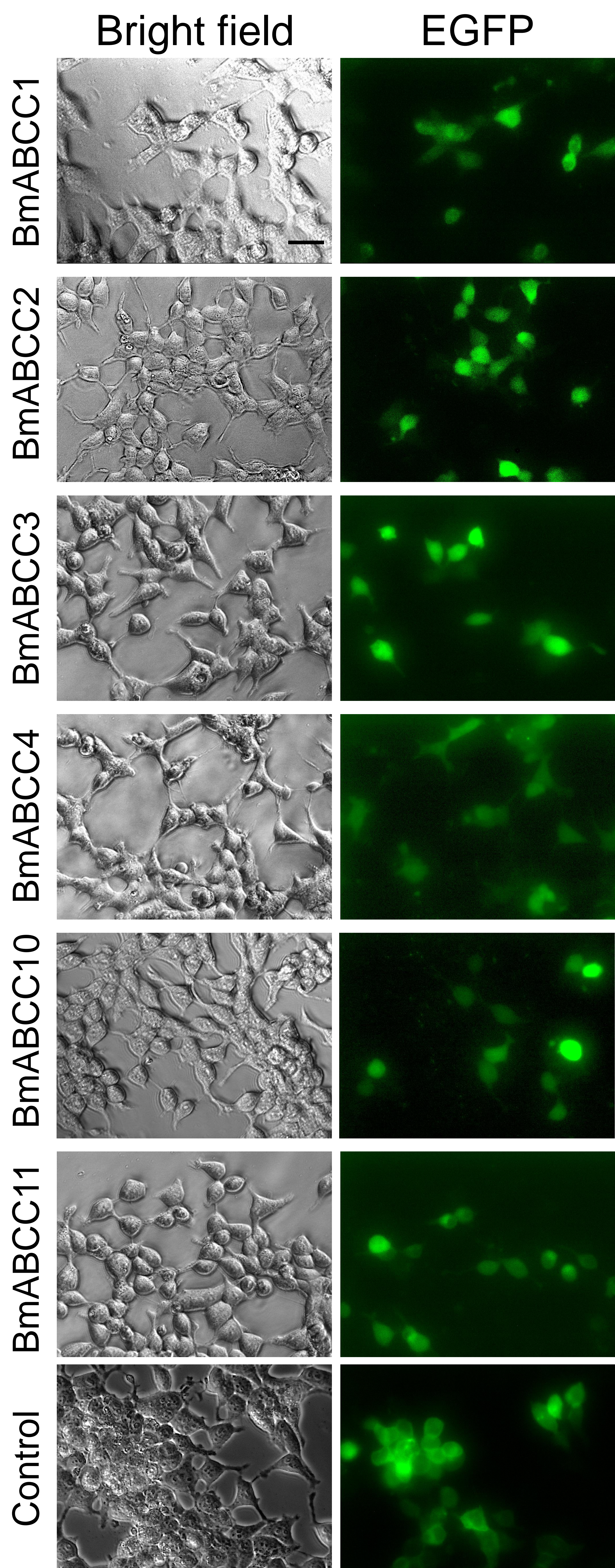
B

BmABCC1	954	A	S	V	V	T	I	L	M	N	L	I	L	Q	V	F	Q	V	G	S	N	Y	W	L	976
BmABCC2	767	T	F	I	D	Y	W	L	S	F	W	T	N	Q	V	D	E	Y	E	Q	S	L	A	E	789
BmABCC1	977	A	E	W	S	S	D	S	K	I	I	V	N	G	T	V	D	R	A	K	R	D	M	Y	1003
BmABCC2	790	G	E	E	P	S	T	S	L	D	T	Q	A	G	A	F	T	L	G	-	-	-	V	Y	809

Supplementary Figure 3.

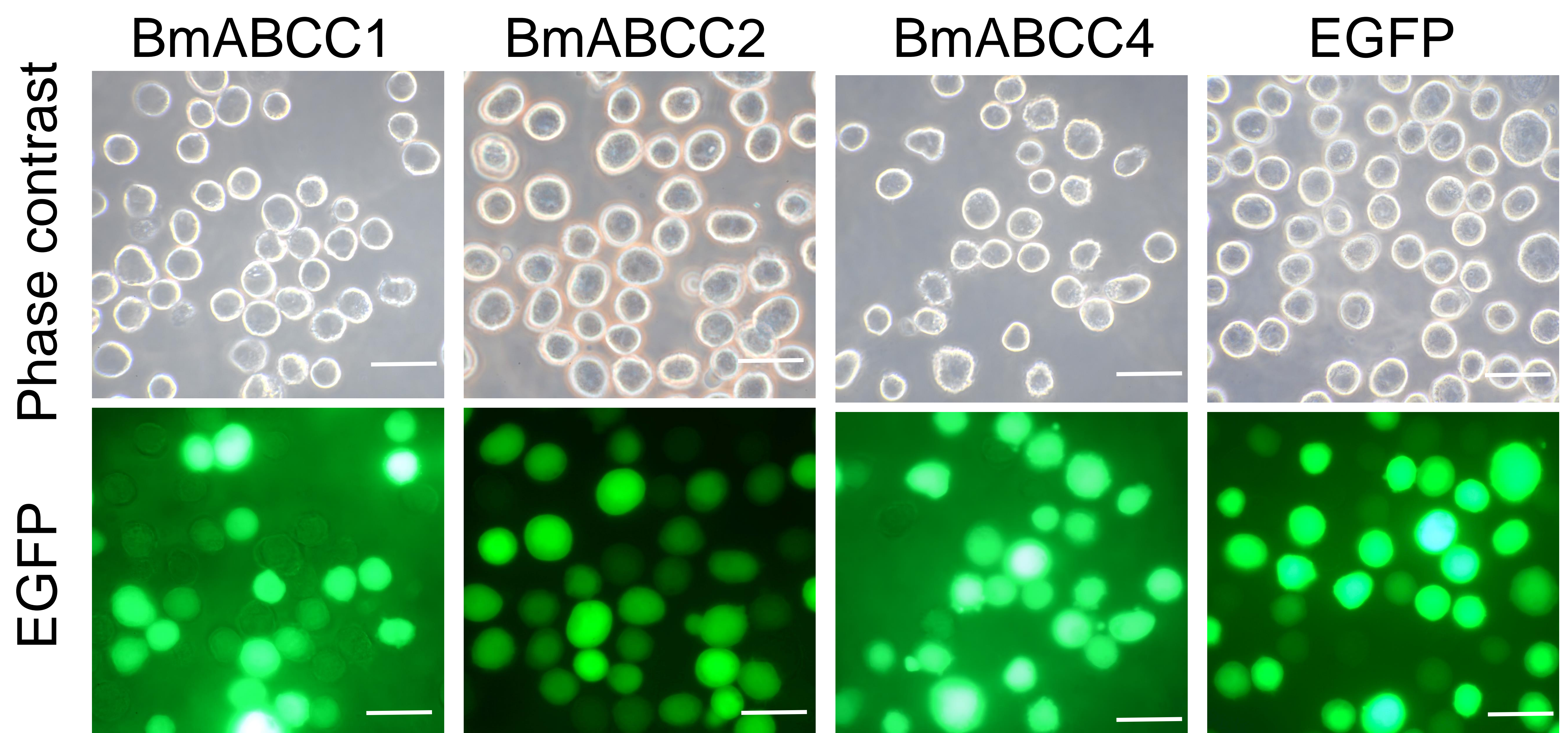


Supplementary Figure 5.



Supplementary Figure 6.

A



Supplementary Figure 7.

	PID	
1 BmABCC2	100.0%	-----
2 BmABCC3	51.4%	-----
3 BmABCC4	38.3%	-----
4 BmABCC11	32.4%	-----
5 BmABCC1	25.2%	----MSYNSTLDSFCGTPFWNSTATWYTDNPETPCFQQTVL I WTPCL YLWVFAFLDLYYIFNSKERNIPWNILNITKLLVTCLL I VLKFVDLGVAVHLSNNGEKEVYNANYSPVIK IL
6 BmABCC10	21.9%	MSF ILNINWKWEDMCGP---GG LHPWNDATKDFSVCFQELFLQVP---VYF I I AIVSGYFVGYRKDWVIREKTQERA I IFRSFVVLGLAF IP I I E IYIFTTKPDFTL YPVDYFAAGSSCL
1 BmABCC2	100.0%	-----MNSDGRAGENSAAETRRKPHKPN-----ILSRIF
2 BmABCC3	51.4%	-----MGVGSSEKVDEKKKKKQLPTMKEPDG-----AFSRSLF
3 BmABCC4	38.3%	-----MESKVVLNKNKPNHDEAN-----ILSKTE
4 BmABCC11	32.4%	-----MDPQYFDIERKQDPREKAN-----FLSKLCF
5 BmABCC1	25.2%	TFGLSATLLFYNRKYGMRASG---VLFFFWLLL VVAGIPQLRSE I IDHKNLDDDENVKYNF ISYMVVYYP---L I VLMF ILNCFADLPKDPYKYQKNQCPENAAG-----FPSRLTF
6 BmABCC10	21.9%	AWLVHFQYVVALKHRLGRSSRGPMVQLFLWCCTVLLNL IALRSN I ISGSGTGFTAAALCCHVL YFL TL IPSNYSRPTFYSPCLVGSQSHSHSVTPL IPHVDDDVLTGTAMQGNSSFFSKLMF
1 BmABCC2	100.0%	WWWMPYLVKGNORDIYEDD LIPKKSFNSENGGEYERYWQEYEAAIKEKREPSTWIALRKAYWGYMPGAIYL IIS
2 BmABCC3	51.4%	CWMFPLFYRCNYRDLEEDLVPPKQYNSKLVGDQLERAWLFEHNARAAGRPSIKVFAITFGWSFLPGGILQFGFA
3 BmABCC4	38.3%	TWSFTLFKRYKQGISTDDWQARGADHSKQLGDRLEVAVERELERAKQTGTKPSFKATIRSEFWYMLCGITFVGFLFI
4 BmABCC11	32.4%	GYTLPVFVKGRKQGLSISDYVRCLPYLKATPRGDALGAMTQELKKKE-SGRKPSLAAILRIYGLKFFIGNTIFSLFDT
5 BmABCC1	25.2%	SWFDP LALTGFRSSLVENDWALNPPDS-----SKECVPKFDKFWERSLKKRELSNGT-----KATYRKTSASVNFKPENKKPASILPALCLAFGGQFLFSLIK-LIND
6 BmABCC10	21.9%	TWVNP LQKSL ENKLKDPEELFDIPAEYRSSYIGARMDRALVGNVDHHQQYADIPHEPFI STGYGAIGETVPQASTPVTSTSRVRVHPVRRQNVSLRALHVF AVEFYSIGLLK-LVSD
1 BmABCC2	100.0%	VFRITQLVFAELSYWSVEA LITREASYYALALLGINFNMCOHNSLFVARFGLKVKVACSSLYRKLRDDQVALGDVSG--GKLVNLSNDVARFDYAFMLHYWVVPVQA
2 BmABCC3	51.4%	ILRLITPLLFGELLITYWTVDP-PIIQMEAVYYALSMITINWIAAYLNHHGNLFCSQFGMKLRITATSSMFRKVMRNNGALGDITTA---GKLVNLSNDLQRYDNAETFLHFVWLIPTQL
3 BmABCC4	38.3%	VLWPLVPFTLALFIGVSGSKSPENYKNAHIYNFLMNFSLITTSMLNLHLQLSQGRVGMIRIRIASCSSLYRKILKLDRTGLAKTEP---GGVINMSNDVNRFDLVVLFLNYIWMPIVV
4 BmABCC11	32.4%	AAKLSITPLCLEGINYFSPSHGGVPFEHAYLYAAGVVGCMVASAMMHPFLWLLDTAVKIRVGCSSLYRKLRIDLTVGGKATEGLAGHYVNLITTDIAQRFDMASL IAMDILRTPIDS
5 BmABCC1	25.2%	ILMFISPQLLKLISVKNDE--PDWKG-YAYAVALLCAITQTMLLAIFYIRMYLVGMIRIRIALTSAIRKSLSN-SARKEST--VGEIVNMSVDIAQRFVELTAYINMIISAPLOI
6 BmABCC10	21.9%	MAGFAGP L LNKLVFVEDTT--IDEHIGYTFVSL I IATLGSTIFIVQFNWLMSTIGLKMKGALVTTILRKITSVSTETIKAFS--VGEITNFMSTIDTDRIVNSCPSEFALVSTPQL
1 BmABCC2	100.0%	AVVL YFLYTSAGYAP-VGFEGVVILITLPIQAG LKTSVVRRETQRIDRR K MTE LINGIQVIMYAWKEPFOAIVKVARNE MIALRKSIFIRSVFLGLMLFTERSLIFITCLITELL
2 BmABCC3	51.4%	VAVCYLGYLQAGVAALIGLASLYVIALPIQGYGNIVGKVRARNAVKIDRILKMSVLSG IQVIMYAWKEVPQKSAEKRSDLEKEVRTATILRTILFGMTITERAALFITILITFI
3 BmABCC4	38.3%	PVVSYLWQHTGWATLAALIVIFLQTQVYVQAYSNMQGYRGKIAKRIDERVKVMSFLVNGVQVIMYAWKEPFEKLVDKLRLKVHYIMRTSMKGFSTASVTERILFAATIVAEVV
4 BmABCC11	32.4%	TITIIYLMYRQIGVATLIG-VAFLLFIPQGYGKISSNLRKRVAVRIDHRIRLMNVVQSL EALIMYAWENAARITGDARKKKNVIKXSWLRAYMISCVKLNTRVALFSIISYIT
5 BmABCC1	25.2%	ALALYELWAILGPSVLAG-LAVMILITIPVNGLIANRVKTLQTKQMKYKDERVKMNEVLNGIKVIMYAWEPS-EDQILQIRNKEVHV-KQTAYLNSATSF IWSCAFLVSLMSFGCIV
6 BmABCC10	21.9%	FITFLYQQVQLSFLAG-VG-SVILIPINKL IANKIGQLSTELMKHKDTRVSLISDLLKGI RTVAVHVVEDYVDVRYSGARAEHRYLRGRKYLDAYCVVLWATIPVLVAAL LGLTHAL
1 BmABCC2	100.0%	IG--NLVTATITPTIQQYISTIQNTIMLPLATASSEMVSERIQNFLVKDEREDVQITPKSYGDDNRITFN-----NKASGPQNETIFPKKYATDGGASTITN-----
2 BmABCC3	51.4%	LG--NALSATITVYLPQQFMNAADNITILILPLILTFTAELMVSRRVQEFLYAEDRPDLVKRDSLMPAGSNIFRN-----VTGSFRKSEPTVRPLSYSQKTEILPTIDFSSNNLV
3 BmABCC4	38.3%	MG--GEIRSEITFSLVOYFNLLQACNITFFPLAFALASKVSVSRLLEEFLLLDEIDTKQNEPIKAAMDSLIL-----TNGNAKDTEKIK-----
4 BmABCC11	32.4%	LG--NELTAAKVFTLSYYDILKYTVDFPLAITFTL EAYSVKR IQEELLPVDNQDGVDLVTIEKTQVQGVFEKIGNGQQAYVKSEAN-----
5 BmABCC1	25.2%	VNDKETLDSEKAFVALSLFNILRFPLS-MLPNVLINNVQTSVGIKRLNKMNCDEDIS---SVDHDKKEPSPIVIE-----NGNFTWGE
6 BmABCC10	21.9%	RG--QPLEAPTFTTVALINML IAPLN-AFPWVLNGITAWVSIKRIQKLDLPDMNSEEYDRVNVNRDEDK I I IFR-----NATFAWARPMKRD-----
1 BmABCC2	100.0%	----PVLSTDPAVCDYPIE SKVDATWSSSTIDISEMIRN LIRIGRCKCATIGPVGSGKSSILOVLLKEPVCGGSLRINGRLSYACQESWLPATVRENILFGLPYDSQ
2 BmABCC3	51.4%	KRNN SRLRRMSHLDJITAVVLDVVSASWTGDPNFLAIRNISMKLKRGKCVITIGAVGSGKSSILOQLLKELPATG---IVSTIYG-KVSYASQEAWLPSTVRENILFGLPFEPE
3 BmABCC4	38.3%	-----SKSTGLSITGVVSASWSTDPIVHITRNITSAEPGEFVG IAGLYGACKSSILOVLLGEPKPSQG---TVSLDGAIRISYASQEPWLPFATVRENILFGLPYDKT
4 BmABCC11	32.4%	-----LENLKPOVLVSMKDFNAHKNAEDESMQKVTALAVNITIKPETITTVGTGVGACKSTLQATIREITPSSG--HLEVNG-VVAYAADPWLEASVRENILFGQELDLR
5 BmABCC1	25.2%	-----KDADPVLKTNVNPVRGSLVATVGAVGSGKSSLAAMGEMNKISG---RVNTHGSIAYVPQAAIQONATLQDNILFQKPLQQQ
6 BmABCC10	21.9%	----NMKNKEKGKSNKNKRKLN IQRSDSLTSEEGGQDAPFTLKDISLEIGREEF IGVGTSGSGKTSLLAVIGMLKKNGLDQEPESLNSFGYVAKPWVIRGTIRNILEGKPYDET
1 BmABCC2	100.0%	KYHEVCKACSLLPDFKQFPYGDLSVGERGVSSGGQRRINLARAVYREADIYLLDDPLSAVDANVGRQLFDGCTIK--GYRGRITCVLVTHQIHYKAAADITVILNEGATENVGSYDD
2 BmABCC3	51.4%	KYKMYCKACALEKDFKQFPYGDITLVGERGVSSGGQRRINLARAVYREADIYLLDDPLSAVDANVGRQLFECCIN--GYRRIRILVTHQIHYKAAADIVLVMNEGRIENMGTFDEL
3 BmABCC4	38.3%	RYKKVYTACALRDFEQLPAGDCTLVGERGTSGGQRRARVGLARACYRQADIYLLDDPLSAVDITHVGKHLVSECVN--GLQNHIRILVTHQIHYKKTADKVIILRNGETEMQGFEEA
4 BmABCC11	32.4%	RYKQVIRCCQLKSDLETLPHEGKTIVGERGASGGQRRARISLARCVYQNDVYLLDDPLAAVDAKVASAMYEECVR--GMRDKAVLVTHVQYARGASNVLIMRSCKITVAGGTVEE
5 BmABCC1	25.2%	SYNNVINVCALKPDEDVLPGGDQTEIGKGINSGGQRRVSLARAVYHEADNYLLDDPLSAVDSHVGKHI-DKVI GPAGLLKDRIRVWVTHNVSLAQTDLVVVRDGGQVSEAGSYQHL
6 BmABCC10	21.9%	KFKSLIDACALTEDNLVLGWN--AYVGEGGCTSGGQRRARIALARAVYQDKQVYLLDDVLAGLDARVSGHVLCQL--MGLRHTIRLFAQSPKHLARVSRLLVREGRITVNLGPPMET
1 BmABCC2	100.0%	VNTGTEFSKLL-----INQESNDNENGPEKNFLRAISKISTKSVEDPD-----NEKVQYEEEEKRAKGNKFSVLKYKSAVKSWEVLVLMVYLVIITQ
2 BmABCC3	51.4%	TAAGKAFSLML-----SSLQETSEKEDIESLGRGKEEKNPVLFKNQLSITETDDE-----QFEAQKMADEFRQSGN KWSVIAAYFRAGGNICFLFLTLLITL I A
3 BmABCC4	38.3%	SRCLPFSMEEE-----EDEPDEKNL KHLR-----KRTISIQKTSVSTTHDGSQ--VDVEDEDKSEELTGSGRVSGLYMSYFRAGGGWALFWTLFSIILAQ
4 BmABCC11	32.4%	KSSVPEEKIL-----EMGKVVEEKLKQKAASYENQESIIEHKLKQRSMSQASQMSFNIDLDNLDPKYEGSQGTGSVSNVSYMAYVRSGGNKWSMTLIALFLVAQ
5 BmABCC1	25.2%	LEKKGAADFGLHHL-----SDIEKTSPPDEL DYLKQDLETKLGTGFQNKLRARSLSESTSESEQTPAGDRAGSVKQXTPDALTQSNLKEKNKLIEAEK--AETGSKWSLYK
6 BmABCC10	21.9%	LHDIEFYLPSDSESLGDDLPRQKQIEGSDEDNISRNSLDDEETVSEGTVGFWVIGLYLKSVGIFLTVAITLSLILMQVSONFTTFWLT IWLKNRTKNSTALTDSEFNHENTTVLDHSFN
1 BmABCC2	100.0%	GCAITIDYWSPWINQVDEYEQSLAEELPSISLDITQAGAFILGVYLWYGGVILITLIVSHVRILITFVITIMRASSN
2 BmABCC3	51.4%	ASSAGADYWLISYWINAMAAYDEELAG-AEVDITLDVOVGLFITGQYMIHGAIVLVTITLITNIRVIPFAELCVTASSR
3 BmABCC4	38.3%	AVTSMSDMWITHMNDVEVYLTPTTFETDLLIDRNETNNLNL TSEVPTVVDSAAFPNNLTVIGTIMKTAMAIQNATEIERENYNHSYYIYIWAIGILGCIILTTARSMMLWYCVRRSSIK
4 BmABCC11	32.4%	FYSSSTDVWLKEWYNLEEKNVINVTKNNDLSPETL FKNMPSNYHLIREQCYYIGGLIAYCVFTFWNKLVTYNTICIRASIS
5 BmABCC1	25.2%	HYLMSVGVFASVVTILMNLILQVFQVGSNYWLAEWSSDSKI I VNGTVDRAKRDMYLGYYGALGAGQAIASFFADIMPYLACWRAAKV
6 BmABCC10	21.9%	AVDGI VHKLINTTMMLINSIDGHKNNVSEPSSTLTNARATLEISIPQYNDNFYLEAYFGLAGLNLVFTVMAFLIAYGGVKAATK
1 BmABCC2	100.0%	FHDIVYKKLITIVMRFFDMNPSRVLNRFSKDGMAMDEFLPRS FETVOYLYLCSILILNATALPWLTIPITAVLLILFFVLLKWLNAACAVKRFGTTKSPVLGMINSTIGLSTIRS
2 BmABCC3	51.4%	LHNSMFSTMKGIMRFFDITSSSRITLNRFTKDMGALDEILPRTLDVLQIYATIGAILVLNATALYWTIPSVILLITFYFFVLYVLYKTQCSIKREGTTKSPVFGMVTSSLNGIATIRS
3 BmABCC4	38.3%	LHNQMFSNIAATMRFFDITNPSRVLNRFSKDQGVVDEILPRMFLDSIQIFMVMIGILVMVAIVSPMMLTIVVCGVLYLWTVVYLTIAQAVKRVGISRSPVFSHYASMAELSTVRA
4 BmABCC11	32.4%	LHDNMFKGVYAPMWFFHNHNSRITLNRFSKDMQGVVDITLPLAVDCLGFFLEVLALVVVCLVNWVILITPVVAALLRAMFLATSRDLKRLEAIARSQSNHYVSGTVHGLPITIRS
5 BmABCC1	25.2%	IHELLLDNVLKPLQFTEVTPICRILSRFGKDVVDLITSLSEASDVITCYFEVLGTIVFSVSTPLFVITVPVGLIYYVITQRFYVATSRQLKRESISRSPIYSHFGESTIGASTIRA
6 BmABCC10	21.9%	IKVLLKVIIVRAQVKFFDVTICRIVNRFSSDITYTVDSSLPFIINILLAQFFSIGALAVTIYGLPWLVGVAPLAFVYYRLQRYVIRITSRQLKRQSVITSPITYTHFNDITLEGSSIRA
1 BmABCC2	100.0%	SNSQGRLLQFDNAQNHTSAFYTFVGGSTAFGLYDALCLVYLGVILTIFLYIDFSTIPVGSVGLAVSQSMVLTMMQLMAARFTADFLGQMTAYERVL EYTELPMEE-----NM
2 BmABCC3	51.4%	S-GAEDRLISNFDVLQDHSSAWNGYLGQGITFGFYDITMCLYLITVILVITFDGNVIAVGSVGLAVTQSNITLAMLQHGARMVLVELAQITSVERVLEYTKIESK-----NL
3 BmABCC4	38.3%	C-NAEMMLADQDDKQDVHTAAWYLTLVNTAFSIWLSLSALVYIVVAYTELLDGG-TIKSGNVGLALSGQLILVNMVQYGIKQITTEVISQMTSVERVIOQITSLPEK-----TE
4 BmABCC11	32.4%	TROHRAIVAEFDKLQDHSAAWSLVLSTNRAELGWMDWVCCMYALVTFSEFV-ASG-DTIGGSVGLAITQVIGLVGMCQYGMRTAEVENQMTSVERTLEYRNLPPHPLETDEAAIR
5 BmABCC1	25.2%	Y-GVTRDFIEESESRYDHNQSCYYPSCIANRWLAIRLEMIGNFIIFSAAVFAVLGR--NSIYPGIVGLSISYALQITITQTNWLVRMISEVETNIVAVERIKVAFETQGA
6 BmABCC10	21.9%	L-GGAAAWEEERGCELVESWQRAALSASAAQWLARLQAAAVLVYAAAALAVLQRTLHTADPGLVGLAISYALSMISL SNVLNSFTETETEREVI AVERVGEYIRQVEIS-----
1 BmABCC2	100.0%	YDGSQ-LPKDWPITHRIEFQNLFNYSQEDPVLKDLNFVLENGWKVGIVGRTGAGKSSMSALFRYEQL-HIRDGDITNIAKTERSKSITIPQEPILFSASV
2 BmABCC3	51.4%	FEQKQMPPTWPAICRIIMDVLSLQYAPEEALVLKNLNIIVLESGWKVGIVGRTGAGKSSLSALFRFAYIDG-SITIDGLDTSVLSKQGLRSKSITIPQEPVLFSAIT
3 BmABCC4	38.3%	G---PAPPSPWPQRAVVKDNLRYQKDSQVLRNLNITILESGWKVGIVGRTGAGKSSLSALFRAPITEG-HIYLDVETIGEIALKALRSKSITIPQEPVLFSAITL
4 BmABCC11	32.4%	KNHPGLDLSKWPITKGEISFNVYLEVEKPKPGKNEAPRPEAPVYATKGVSKVQPAEKVAVVGRTGAGKSSLLNALFRSRIAG-TVSVDQVTAEQVGLRCWR SRLCALPQPALFAASL
5 BmABCC1	25.2%	WNLEKGPQATPETALQLEQITLYRPGEPALRDVICTVAPRDKLIVGRTGAGKSITLTLGFRITVEAAAGRIIDGVDIATLGLHQLRSRITITIPQEPILFSGITL
6 BmABCC10	21.9%	VDGE-SPPYGVWPSIGVVFEEDVHLNYSVRERA-----TAAICGVSITSWAGEKGVVGRTGAGKSSLLAALRLAPLSRGTVRVDGVVHKLHLHLSRSRIGVITPQEPFITSSGI
1 BmABCC2	100.0%	RYNLDPFDSYSDDELWRALQVLEKEVIP---ALDYKSEGGSNFSVQQRQLVCLARAVLRSNKLIVMDEATANVDQTDALQTTIRREFASGVITITIAHRNTIMDSDRVLVMDKGV
2 BmABCC3	51.4%	RYNLDPFVSYSDDELWRALQVDMKAAPV---SLDKVTEGGSNFSVQQRQLMCLARAILRSNKLITMDEATANVDQTDNFIQOTRRAFASGVITITIAHRNTIMDSDRVLVMDSTGE
3 BmABCC4	38.3%	RYNLDPFDAYTDAETWTALQVLEKNTVT---SLSSSVASGGSNFSVQQRQLCLARAALARNRLVLDEATANVDQTDALQKSTIRKHAADGVVTVIAHRLHTVADSDRVVMEAGQ
4 BmABCC11	32.4%	RDNLDPTHSATDAQIYAALQVLELDLVSSLPAGNTKLGDDGGSLSSQQRQLCLARAALAGSSVLLDEATANVDITEPKQIQRTIRTKFSNATVLTITIAHRNTIVMDYDRIVVMDKGR
5 BmABCC1	25.2%	RSNLDPFAYSDDELWRALFAHLRAFVQGLPAGRHEVAEGGENSVQQRQLVCLARALLKPTPLLVLDEATAAVDLETDITLQKTRSEFASGVLTITIAHRNTIMDSKVMVLDRGQ
6 BmABCC10	21.9%	RENVDPLROYSETVWRALACGVDRDAVS-ARGGHIHSAAS---LSRGIAQLCTRALLQRAKVLVDEATANQDQTERLIDTIRCSFSGATVLFVAHRLAGVLECSRLVVLGGQK
1 BmABCC2	100.0%	VAEYDTPYALLSDPNSIFSSMVRETGDI NSKVLFRVAEDKHLGRNTEK-----
2 BmABCC3	51.4%	VAEYDHPYILMSDPNSHLSSMVRETGEKNSLKLFEVAKDAYFQSNKENMR-----
3 BmABCC4	38.3%	IVCGHPYELLKNDNGHESKMVKQLGPASEQSLRELARDAHAQHIOYVDADDQDKTK-----
4 BmABCC11	32.4%	IVSGHPHELLTQSGPDQTRRTLLSKNQAPLAVPEECEGAVHRSRTYSEKSADSELEATGVKTLVQETGKETAAMLRAAAESYKTWLEKXKST-----
5 BmABCC1	25.2%	LVYAAPQQLLNDKNSIFYSMAKDAGIVN-----
6 BmABCC10	21.9%	VELRTPDDALSDDTSYFYNMLYAS-----

Supplementary Figure 8.