Appendix V

Annotated protein sequence alignments of human NCBT variants (see Section V)

In this appendix we present ClustalW (1) sequence alignments of the variants of each of the five NCBTs, color coded per their diagrammatic representation in the Figures of the review. TM1 and TM14 of each variant are shown as gray boxes to mark the Nt/TMD and TMD/Ct boundaries. Sequence accessions are provided in Appendix IV.

Alignment 1: NBCe1 variants. An alignment of human NBCe1-A, NBCe1-B, NBCe1-C, NBCe1-D, and NBCe1-E as depicted in Figure 18 of the review. Shown are the 41-aa autostimulatory domain, the 85-aa auto inhibitory domain, the 9-aa cassette I, and the 61-aa alternative Ct that includes a PDZ-binding sequence.

```
NBCe1-A         -------------------------------------------MSTENVEGKPSNLGER 16
NBCe1-D         -------------------------------------------MSTENVEGKPSNLGER 16
NBCe1-B         MEDEAVLDRGASFLKHVCDEEEVEGHHTIYIGVHVPKSYRRRRRHKRKTGHKEKKEKERI 60
NBCe1-E         MEDEAVLDRGASFLKHVCDEEEVEGHHTIYIGVHVPKSYRRRRRHKRKTGHKEKKEKERI 60
NBCe1-C         MEDEAVLDRGASFLKHVCDEEEVEGHHTIYIGVHVPKSYRRRRRHKRKTGHKEKKEKERI 60
                                                          . :. . : .:  .

NBCe1-A         GRARSSTFLRVVQPMFNHSIFTSAVSPAAERIRFILGEEDDSPAPPQLFTELDELLAVDG 76
NBCe1-D         GRARSSTFLRVVQPMFNHSIFTSAVSPAAERIRFILGEEDDSPAPPQLFTELDELLAVDG 76
NBCe1-B         SENYSDKSDIENADESSSSILKPLISPAAERIRFILGEEDDSPAPPQLFTELDELLAVDG 120
NBCe1-E         SENYSDKSDIENADESSSSILKPLISPAAERIRFILGEEDDSPAPPQLFTELDELLAVDG 120
NBCe1-C         SENYSDKSDIENADESSSSILKPLISPAAERIRFILGEEDDSPAPPQLFTELDELLAVDG 120
                ..  *..         . **:.. :**********************************

NBCe1-A         QEMEWKETARWIKFEEKVEQGGERWSKPHVATLSLHSLFELRTCMEKGSIMLDREASSLP 136
NBCe1-D         QEMEWKETARWIKFEEKVEQGGERWSKPHVATLSLHSLFELRTCMEKGSIMLDREASSLP 136
NBCe1-B         QEMEWKETARWIKFEEKVEQGGERWSKPHVATLSLHSLFELRTCMEKGSIMLDREASSLP 180
NBCe1-E         QEMEWKETARWIKFEEKVEQGGERWSKPHVATLSLHSLFELRTCMEKGSIMLDREASSLP 180
NBCe1-C         QEMEWKETARWIKFEEKVEQGGERWSKPHVATLSLHSLFELRTCMEKGSIMLDREASSLP 180
                ************************************************************

NBCe1-A         QLVEMIVDHQIETGLLKPELKDKVTYTLLRKHRHQTKKSNLRSLADIGKTVSSASRMFTN 196
NBCe1-D         QLVEMIVDHQIETGLLKPELKDKVTYTLLRKHRHQTKKSNLRSLADIGKTVSSAS----- 191
NBCe1-B         QLVEMIVDHQIETGLLKPELKDKVTYTLLRKHRHQTKKSNLRSLADIGKTVSSASRMFTN 240
NBCe1-E         QLVEMIVDHQIETGLLKPELKDKVTYTLLRKHRHQTKKSNLRSLADIGKTVSSAS----- 235
NBCe1-C         QLVEMIVDHQIETGLLKPELKDKVTYTLLRKHRHQTKKSNLRSLADIGKTVSSASRMFTN 240
                ************************************************
```

```
NBCe1-A         PDNGSPAMTHRNLTSSSLNDISDKPEKDQLKNKFMKKLPRDAEASNVLVGEVDFLDTPFI 256
NBCe1-D         ----SPAMTHRNLTSSSLNDISDKPEKDQLKNKFMKKLPRDAEASNVLVGEVDFLDTPFI 247
NBCe1-B         PDNGSPAMTHRNLTSFSLNDISDKPEKDQLKNKFMKKLPRDAEASNVLVGEVDFLDTPFI 300
NBCe1-E         ----SPAMTHRNLTSFSLNDISDKPEKDQLKNKFMKKLPRDAEASNVLVGEVDFLDTPFI 291
NBCe1-C         PDNGSPAMTHRNLTSSSLNDISDKPEKDQLKNKFMKKLPRDAEASNVLVGEVDFLDTPFI 300
                    *********** ****************************************

NBCe1-A         AFVRLQQAVMLGALTEVPVPTRFLFILLGPKGKAKSYHEIGRAIATLMSDEVFHDIAYKA 316
NBCe1-D         AFVRLQQAVMLGALTEVPVPTRFLFILLGPKGKAKSYHEIGRAIATLMSDEVFHDIAYKA 307
NBCe1-B         AFVRLQQAVMLGALTEVPVPTRFLFILLGPKGKAKSYHEIGRAIATLMSDEVFHDIAYKA 360
NBCe1-E         AFVRLQQAVMLGALTEVPVPTRFLFILLGPKGKAKSYHEIGRAIATLMSDEVFHDIAYKA 351
NBCe1-C         AFVRLQQAVMLGALTEVPVPTRFLFILLGPKGKAKSYHEIGRAIATLMSDEVFHDIAYKA 360
                ************************************************************

NBCe1-A         KDRHDLIAGIDEFLDEVIVLPPGEWDPAIRIEPPKSLPSSDKRKNMYSGGENVQMNGDTP 376
NBCe1-D         KDRHDLIAGIDEFLDEVIVLPPGEWDPAIRIEPPKSLPSSDKRKNMYSGGENVQMNGDTP 367
NBCe1-B         KDRHDLIAGIDEFLDEVIVLPPGEWDPAIRIEPPKSLPSSDKRKNMYSGGENVQMNGDTP 420
NBCe1-E         KDRHDLIAGIDEFLDEVIVLPPGEWDPAIRIEPPKSLPSSDKRKNMYSGGENVQMNGDTP 411
NBCe1-C         KDRHDLIAGIDEFLDEVIVLPPGEWDPAIRIEPPKSLPSSDKRKNMYSGGENVQMNGDTP 420
                ************************************************************

                                                      Nt---//---TM1
NBCe1-A         HDGGHGGGGHGDCEELQRTGRFCGGLIKDIKRKAPFFASDFYDALNIQALSAILFIYLAT 436
NBCe1-D         HDGGHGGGGHGDCEELQRTGRFCGGLIKDIKRKAPFFASDFYDALNIQALSAILFIYLAT 427
NBCe1-B         HDGGHGGGGHGDCEELQRTGRFCGGLIKDIKRKAPFFASDFYDALNIQALSAILFIYLAT 480
NBCe1-E         HDGGHGGGGHGDCEELQRTGRFCGGLIKDIKRKAPFFASDFYDALNIQALSAILFIYLAT 471
NBCe1-C         HDGGHGGGGHGDCEELQRTGRFCGGLIKDIKRKAPFFASDFYDALNIQALSAILFIYLAT 480
                ************************************************************

NBCe1-A         VTNAITFGGLLGDATDNMQGVLESFLGTAVSGAIFCLFAGQPLTILSSTGPVLVFERLLF 496
NBCe1-D         VTNAITFGGLLGDATDNMQGVLESFLGTAVSGAIFCLFAGQPLTILSSTGPVLVFERLLF 487
NBCe1-B         VTNAITFGGLLGDATDNMQGVLESFLGTAVSGAIFCLFAGQPLTILSSTGPVLVFERLLF 540
NBCe1-E         VTNAITFGGLLGDATDNMQGVLESFLGTAVSGAIFCLFAGQPLTILSSTGPVLVFERLLF 531
NBCe1-C         VTNAITFGGLLGDATDNMQGVLESFLGTAVSGAIFCLFAGQPLTILSSTGPVLVFERLLF 540
                ************************************************************

NBCe1-A         NFSKDNNFDYLEFRLWIGLWSAFLCLILVATDASFLVQYFTRFTEEGFSSLISFIFIYDA 556
NBCe1-D         NFSKDNNFDYLEFRLWIGLWSAFLCLILVATDASFLVQYFTRFTEEGFSSLISFIFIYDA 547
NBCe1-B         NFSKDNNFDYLEFRLWIGLWSAFLCLILVATDASFLVQYFTRFTEEGFSSLISFIFIYDA 600
NBCe1-E         NFSKDNNFDYLEFRLWIGLWSAFLCLILVATDASFLVQYFTRFTEEGFSSLISFIFIYDA 591
NBCe1-C         NFSKDNNFDYLEFRLWIGLWSAFLCLILVATDASFLVQYFTRFTEEGFSSLISFIFIYDA 600
                ************************************************************

NBCe1-A         FKKMIKLADYYPINSNFKVGYNTLFSCTCVPPDPANISISNDTTLAPEYLPTMSSTDMYH 616
NBCe1-D         FKKMIKLADYYPINSNFKVGYNTLFSCTCVPPDPANISISNDTTLAPEYLPTMSSTDMYH 607
NBCe1-B         FKKMIKLADYYPINSNFKVGYNTLFSCTCVPPDPANISISNDTTLAPEYLPTMSSTDMYH 660
NBCe1-E         FKKMIKLADYYPINSNFKVGYNTLFSCTCVPPDPANISISNDTTLAPEYLPTMSSTDMYH 651
NBCe1-C         FKKMIKLADYYPINSNFKVGYNTLFSCTCVPPDPANISISNDTTLAPEYLPTMSSTDMYH 660
                ************************************************************

NBCe1-A         NTTFDWAFLSKKECSKYGGNLVGNNCNFVPDITLMSFILFLGTYTSSMALKKFKTSPYFP 676
NBCe1-D         NTTFDWAFLSKKECSKYGGNLVGNNCNFVPDITLMSFILFLGTYTSSMALKKFKTSPYFP 667
NBCe1-B         NTTFDWAFLSKKECSKYGGNLVGNNCNFVPDITLMSFILFLGTYTSSMALKKFKTSPYFP 720
NBCe1-E         NTTFDWAFLSKKECSKYGGNLVGNNCNFVPDITLMSFILFLGTYTSSMALKKFKTSPYFP 711
NBCe1-C         NTTFDWAFLSKKECSKYGGNLVGNNCNFVPDITLMSFILFLGTYTSSMALKKFKTSPYFP 720
                ************************************************************

NBCe1-A         TTARKLISDFAIILSILIFCVIDALVGVDTPKLIVPSEFKPTSPNRGWFVPPFGENPWWV 736
NBCe1-D         TTARKLISDFAIILSILIFCVIDALVGVDTPKLIVPSEFKPTSPNRGWFVPPFGENPWWV 727
NBCe1-B         TTARKLISDFAIILSILIFCVIDALVGVDTPKLIVPSEFKPTSPNRGWFVPPFGENPWWV 780
NBCe1-E         TTARKLISDFAIILSILIFCVIDALVGVDTPKLIVPSEFKPTSPNRGWFVPPFGENPWWV 771
```

```
NBCe1-C         TTARKLISDFAIILSILIFCVIDALVGVDTPKLIVPSEFKPTSPNRGWFVPPFGENPWWV 780
                ************************************************************

NBCe1-A         CLAAAIPALLVTILIFMDQQITAVIVNRKEHKLKKGAGYHLDLFWVAILMVICSLMALPW 796
NBCe1-D         CLAAAIPALLVTILIFMDQQITAVIVNRKEHKLKKGAGYHLDLFWVAILMVICSLMALPW 787
NBCe1-B         CLAAAIPALLVTILIFMDQQITAVIVNRKEHKLKKGAGYHLDLFWVAILMVICSLMALPW 840
NBCe1-E         CLAAAIPALLVTILIFMDQQITAVIVNRKEHKLKKGAGYHLDLFWVAILMVICSLMALPW 831
NBCe1-C         CLAAAIPALLVTILIFMDQQITAVIVNRKEHKLKKGAGYHLDLFWVAILMVICSLMALPW 840
                ************************************************************

NBCe1-A         YVAATVISIAHIDSLKMETETSAPGEQPKFLGVREQRVTGTLVFILTGLSVFMAPILKFI 856
NBCe1-D         YVAATVISIAHIDSLKMETETSAPGEQPKFLGVREQRVTGTLVFILTGLSVFMAPILKFI 847
NBCe1-B         YVAATVISIAHIDSLKMETETSAPGEQPKFLGVREQRVTGTLVFILTGLSVFMAPILKFI 900
NBCe1-E         YVAATVISIAHIDSLKMETETSAPGEQPKFLGVREQRVTGTLVFILTGLSVFMAPILKFI 891
NBCe1-C         YVAATVISIAHIDSLKMETETSAPGEQPKFLGVREQRVTGTLVFILTGLSVFMAPILKFI 900
                ************************************************************

NBCe1-A         PMPVLYGVFLYMGVASLNGVQFMDRLKLLLMPLKHQPDFIYLRHVPLRRVHLFTFLQVLC 916
NBCe1-D         PMPVLYGVFLYMGVASLNGVQFMDRLKLLLMPLKHQPDFIYLRHVPLRRVHLFTFLQVLC 907
NBCe1-B         PMPVLYGVFLYMGVASLNGVQFMDRLKLLLMPLKHQPDFIYLRHVPLRRVHLFTFLQVLC 960
NBCe1-E         PMPVLYGVFLYMGVASLNGVQFMDRLKLLLMPLKHQPDFIYLRHVPLRRVHLFTFLQVLC 951
NBCe1-C         PMPVLYGVFLYMGVASLNGVQFMDRLKLLLMPLKHQPDFIYLRHVPLRRVHLFTFLQVLC 960
                ************************************************************

                                    TM14---//---Ct
NBCe1-A         LALLWILKSTVAAIIFPVMILALVAVRKGMDYLFSQHDLSFLDDVIPEKDKKKKEDEKKK 976
NBCe1-D         LALLWILKSTVAAIIFPVMILALVAVRKGMDYLFSQHDLSFLDDVIPEKDKKKKEDEKKK 967
NBCe1-B         LALLWILKSTVAAIIFPVMILALVAVRKGMDYLFSQHDLSFLDDVIPEKDKKKKEDEKKK 1020
NBCe1-E         LALLWILKSTVAAIIFPVMILALVAVRKGMDYLFSQHDLSFLDDVIPEKDKKKKEDEKKK 1011
NBCe1-C         LALLWILKSTVAAIIFPVMILALVAVRKGMDYLFSQHDLSFLDDVIPEKDKKKKEDEKKK 1020
                ************************************************************

NBCe1-A         KKKKGSLDSDNDDSDCPYSEKVPSIKIPMDIMEQQPFLSDSKPSDRERSPTFLERHTSC- 1035
NBCe1-D         KKKKGSLDSDNDDSDCPYSEKVPSIKIPMDIMEQQPFLSDSKPSDRERSPTFLERHTSC- 1026
NBCe1-B         KKKKGSLDSDNDDSDCPYSEKVPSIKIPMDIMEQQPFLSDSKPSDRERSPTFLERHTSC- 1079
NBCe1-E         KKKKGSLDSDNDDSDCPYSEKVPSIKIPMDIMEQQPFLSDSKPSDRERSPTFLERHTSC- 1070
NBCe1-C         KKKKGSLDSDNDDEKDHQHSLNATHHADKIPFLQSLGMPSPPRTPVKVVPQIRIELEPED 1080
                *************..    .  .: :    : *.  :...  :  :  * :  .  .

NBCe1-A         --------------
NBCe1-D         --------------
NBCe1-B         --------------
NBCe1-E         --------------
NBCe1-C         NDYFWRSKGTETTL 1094
```

Alignment 2: NBCe2 variants. An alignment of human NBCe2-a and NBCe2-c as depicted in Figure 27 of the review. Shown is the 16-aa insert.

```
NBCe2-a         MKVKEEKAGVGKLDHTNHRRRFPDQKECPPIHIGLPVPTYPQRKTDQKGHLSGLQKVHWG 60
NBCe2-c         MKVKEEKAGVGKLDHTNHRRRFPDQKECPPIHIGLPVPTYPQRKTDQKGHLSGLQKVHWG 60
                ************************************************************

NBCe2-a         LRPDQPQQELTGPGSGASSQDSSMDLISRTRSPAAEQLQDILGEEDEAPNPTLFTEMDTL 120
NBCe2-c         LRPDQPQQELTGPGSGASSQDSSMDLISRTRSPAAEQLQDILGEEDEAPNPTLFTEMDTL 120
                ************************************************************

NBCe2-a         QHDGDQMEWKESARWIKFEEKVEEGGERWSKPHVSTLSLHSLFELRTCLQTGTVLLDLDS 180
NBCe2-c         QHDGDQMEWKESARWIKFEEKVEEGGERWSKPHVSTLSLHSLFELRTCLQTGTVLLDLDS 180
                ************************************************************

NBCe2-a         GSLPQIIDDVIEKQIEDGLLRPELRERVSYVLLRRHRHQTKKPIHRSLADIGKSVSTTNR 240
NBCe2-c         GSLPQIIDDVIEKQIEDGLLRPELRERVSYVLLRRHRHQTKKPIHRSLADIGKSVSTTNR 240
                ************************************************************

NBCe2-a         SPARSPGAGPSLHHSTEDLRMRQSANYGRLCHAQSRSMNDISLTPNTDQRKNKFMKKIPK 300
NBCe2-c         SPARSPGAGPSLHHSTEDLRMRQSANYGRLCHAQSRSMNDISLTPNTDQRKNKFMKKIPK 300
                ************************************************************

NBCe2-a         DSEASNVLVGEVDFLDQPFIAFVRLIQSAMLGGVTEVPVPTRFLFILLGPSGRAKSYNEI 360
NBCe2-c         DSEASNVLVGEVDFLDQPFIAFVRLIQSAMLGGVTEVPVPTRFLFILLGPSGRAKSYNEI 360
                ************************************************************

NBCe2-a         GRAIATLMVDDLFSDVAYKARNREDLIAGIDEFLDEVIVLPPGEWDPNIRIEPPKKVPSA 420
NBCe2-c         GRAIATLMVDDLFSDVAYKARNREDLIAGIDEFLDEVIVLPPGEWDPNIRIEPPKKVPSA 420
                ************************************************************

NBCe2-a         DKRKSVFSLAELGQMNGSVGGGGGAPGGGNGGGGGGGSGGGAGSGGAGGTSSGDDGEMPA 480
NBCe2-c         DKRKSVFSLAELGQMNGSVGGGGGAPGGGNGGGGGGGSGGGAGSGGAGGTSSGDDGEMPA 480
                ************************************************************

                                          Nt---//---TM1
NBCe2-a         MHEIGEELIWTGRFFGGLCLDIKRKLPWFPSDFYDGFHIQSISAILFIYLGCITNAITFG 540
NBCe2-c         MHEIGEELIWTGRFFGGLCLDIKRKLPWFPSDFYDGFHIQSISAILFIYLGCITNAITFG 540
                ************************************************************

NBCe2-a         GLLGDATDNYQGVMESFLGTAMAGSLFCLFSGQPLIILSSTGPILIFEKLLFDFSKGNGL 600
NBCe2-c         GLLGDATDNYQGVMESFLGTAMAGSLFCLFSGQPLIILSSTGPILIFEKLLFDFSKGNGL 600
                ************************************************************

NBCe2-a         DYMEFRLWIGLHSAVQCLILVATDASFIIKYITRFTEEGFSTLISFIFIYDAIKKMIGAF 660
NBCe2-c         DYMEFRLWIGLHSAVQCLILVATDASFIIKYITRFTEEGFSTLISFIFIYDAIKKMIGAF 660
                ************************************************************

NBCe2-a         KYYPINMDFKPNFITTYKCECVAPDTVNTTVFNASAPLAPDTNASLYNLLNLTALDWSLL 720
NBCe2-c         KYYPINMDFKPNFITTYKCECVAPDTVNTTVFNASAPLAPDTNASLYNLLNLTALDWSLL 720
                ************************************************************

NBCe2-a         SKKECLSYGGRLLGNSCKFIPDLALMSFILFFGTYSMTLTLKKFKFSRYFPTKVRALVAD 780
NBCe2-c         SKKECLSYGGRLLGNSCKFIPDLALMSFILFFGTYSMTLTLKKFKFSRYFPTKVRALVAD 780
                ************************************************************
```

```
NBCe2-a         FSIVFSILMFCGIDACFGLETPKLHVPSVIKPTRPDRGWFVAPFGKNPWWVYPASILPAL 840
NBCe2-c         FSIVFSILMFCGIDACFGLETPKLHVPSVIKPTRPDRGWFVAPFGKNPWWVYPASILPAL 840
                ************************************************************

NBCe2-a         LVTILIFMDQQITAVIVNRKENKLKKAAGYHLDLFWVGILMALCSFMGLPWYVAATVISI 900
NBCe2-c         LVTILIFMDQQITAVIVNRKENKLKKAAGYHLDLFWVGILMALCSFMGLPWYVAATVISI 900
                ************************************************************

                                                                    TM11
NBCe2-a         AHIDSLKMETETSAPGEQPQFLGVREQRVTGIIVFILTGISVFLAPILKCIPLPVLYGVF 960
NBCe2-c         AHIDSLKMETETSAPGEQPQFLGVREQRVTGIIVFILTGISVFLAPILKCIPLPVLYGVF 960
                ************************************************************

NBCe2-a         LYMGVASLNGIQMGTGGSEFKIQKKLTPFWERCKLFLMPAKHQPDHAFLRHVPLRRIHLF 1020
NBCe2-c         LYMGVASLNGIQ----------------FWERCKLFLMPAKHQPDHAFLRHVPLRRIHLF 1004
                *********                    ********************************

                    TM13                    TM14---//---Ct
NBCe2-a         TLVQILCLAVLWILKSTVAAIIFPVMILGLIIVRRLLDFIFSQHDLAWIDNILPEKEKKE 1080
NBCe2-c         TLVQILCLAVLWILKSTVAAIIFPVMILGLIIVRRLLDFIFSQHDLAWIDNILPEKEKKE 1064
                ************************************************************

NBCe2-a         TDKKRKRKKGAHEDCDEEPQFPPPSVIKIPMESVQSDPQNGIHCIARKRSSSWSYSL 1137
NBCe2-c         TDKKRKRKKGAHEDCDEEPQFPPPSVIKIPMESVQSDPQNGIHCIARKRSSSWSYSL 1121
                ************************************************************
```

Alignment 3: NBCn1 variants. An alignment of human NBCn1-A, NBCn1-B, NBCn1-C, NBCn1-D, and NBCn1-E as depicted in Figure 32 of the review. Shown are the alternate Nt sequences (11-aa 'MERF' vs 16-aa 'MEAD'), the 13-aa cassette I, the 124-aa cassette II, and the 36-aa cassette III. Note that the D' sequence (not depicted in Figure 32) includes an additional 4-aa sequence 'VTSR' not present in NBCn1-D.

```
NBCn1-B         MEADGAGEQMRPLLTR----GPDEEAVVDLGKTSSTVNTKFEKEELESHRAVYIGVHVPF 56
NBCn1-E         MEADGAGEQMRPLLTR----GPDEEAVVDLGKTSSTVNTKFEKEELESHRAVYIGVHVPF 56
NBCn1-A         -----MERFRLEKKLP----GPDEEAVVDLGKTSSTVNTKFEKEELESHRAVYIGVHVPF 51
NBCn1-C         MEADGAGEQMRPLLTR----GPDEEAVVDLGKTSSTVNTKFEKEELESHRAVYIGVHVPF 56
NBCn1-D         MEADGAGEQMRPLLTR----GPDEEAVVDLGKTSSTVNTKFEKEELESHRAVYIGVHVPF 56
NBCn1-D'        MEADGAGEQMRPLLTRVTSRGPDEEAVVDLGKTSSTVNTKFEKEELESHRAVYIGVHVPF 60
                                    ************************************

NBCn1-B         SKESRRRHRHRGHKHHHRRRKDKESDKEDGRESPSYDTPSQRVQFILGTEDDDEEHIPHD 116
NBCn1-E         SKESRRRHRHRGHKHHHRRRKDKESDKEDGRESPSYDTPSQRVQFILGTEDDDEEHIPHD 116
NBCn1-A         SKESRRRHRHRGHKHHHRRRKDKESDKEDGRESPSYDTPSQRVQFILGTEDDDEEHIPHD 111
NBCn1-C         SKESRRRHRHRGHKHHHRRRKDKESDKEDGRESPSYDTPSQRVQFILGTEDDDEEHIPHD 116
NBCn1-D         SKESRRRHRHRGHKHHHRRRKDKESDKEDGRESPSYDTPSQRVQFILGTEDDDEEHIPHD 116
NBCn1-D'        SKESRRRHRHRGHKHHHRRRKDKESDKEDGRESPSYDTPSQRVQFILGTEDDDEEHIPHD 120
                ************************************************************

NBCn1-B         LFTEMDELCYRDGEEYEWKETARWLKFEEDVEDGGDRWSKPYVATLSLHSLFELRSCILN 176
NBCn1-E         LFTEMDELCYRDGEEYEWKETARWLKFEEDVEDGGDRWSKPYVATLSLHSLFELRSCILN 176
NBCn1-A         LFTEMDELCYRDGEEYEWKETARWLKFEEDVEDGGDRWSKPYVATLSLHSLFELRSCILN 171
NBCn1-C         LFTEMDELCYRDGEEYEWKETARWLKFEEDVEDGGDRWSKPYVATLSLHSLFELRSCILN 176
NBCn1-D         LFTEMDELCYRDGEEYEWKETARWLKFEEDVEDGGDRWSKPYVATLSLHSLFELRSCILN 176
NBCn1-D'        LFTEMDELCYRDGEEYEWKETARWLKFEEDVEDGGDRWSKPYVATLSLHSLFELRSCILN 180
                ************************************************************

NBCn1-B         GTVMLDMRASTLDEIADMVLDNMIASGQLDESIRENVREALLKRHHHQNEKRFTSRIPLV 236
NBCn1-E         GTVMLDMRASTLDEIADMVLDNMIASGQLDESIRENVREALLKRHHHQNEKRFTSRIPLV 236
NBCn1-A         GTVMLDMRASTLDEIADMVLDNMIASGQLDESIRENVREALLKRHHHQNEKRFTSRIPLV 231
NBCn1-C         GTVMLDMRASTLDEIADMVLDNMIASGQLDESIRENVREALLKRHHHQNEKRFTSRIPLV 236
NBCn1-D         GTVMLDMRASTLDEIADMVLDNMIASGQLDESIRENVREALLKRHHHQNEKRFTSRIPLV 236
NBCn1-D'        GTVMLDMRASTLDEIADMVLDNMIASGQLDESIRENVREALLKRHHHQNEKRFTSRIPLV 240
                ************************************************************

                       Cassette I            Cassette II
NBCn1-B         RSFADIGKKHSDPHLLERNGEGLSASRHSLRTGLSASNLSLRGESPLSLLLGHLLPSSRA 296
NBCn1-E         RSFADIGKKHSDPHLLERN--------------------------------------- 256
NBCn1-A         RSFADIGKKHSDPHLLERNGEGLSASRHSLRTGLSASNLSLRGESPLSLLLGHLLPSSRA 291
NBCn1-C         RSFADI-------------GEGLSASRHSLRTGLSASNLSLRGESPLSLLLGHLLPSSRA 283
NBCn1-D         RSFADIGKKHSDPHLLERNGEGLSASRHSLRTGLSASNLSLRGESPLSLLLGHLLPSSRA 296
NBCn1-D'        RSFADIGKKHSDPHLLERNGEGLSASRHSLRTGLSASNLSLRGESPLSLLLGHLLPSSRA 300
                *******
```

```
NBCn1-B         GTPAGSRCTTPVPTPQNSPPSSPSISRLTSRSSQESQRQAPELLVSPASDDIPTVVIHPP 356
NBCn1-E         ------------------------------------------------------------
NBCn1-A         GTPAGSRCTTPVPTPQNSPPSSPSISRLTSRSSQESQRQAPELLVSPASDDIPTVVIHPP 351
NBCn1-C         GTPAGSRCTTPVPTPQNSPPSSPSISRLTSRSSQKSQRQAPELLVSPASDDIPTVVIHPP 343
NBCn1-D         GTPAGSRCTTPVPTPQNSPPSSPSISRLTSRSSQKSQRQAPELLVSPASDDIPTVVIHPP 356
NBCn1-D'        GTPAGSRCTTPVPTPQNSPPSSPSISRLTSRSSQKSQRQAPELLVSPASDDIPTVVIHPP 360


NBCn1-B         EEDLEAALKGEEQKNEENVDLTPGILASPQSAPGNLDNSKSGEIKGNGSGGSRENSTVDF 416
NBCn1-E         ----------------------GILASPQSAPGNLDNSKSGEIKGNGSGGSRENSTVDF 292
NBCn1-A         EEDLEAALKGEEQKNEENVDLTPGILASPQSAPGNLDNSKSGEIKGNGSGGSRENSTVDF 411
NBCn1-C         EEDLEAALKGEEQKNEENVDLTPGILASPQSAPGNLDNSKSGEIKGNGSGGSRENSTVDF 403
NBCn1-D         EEDLEAALKGEEQKNEENVDLTPGILASPQSAPGNLDNSKSGEIKGNGSGGSRENSTVDF 416
NBCn1-D'        EEDLEAALKGEEQKNEENVDLTPGILASPQSAPGNLDNSKSGEIKGNGSGGSRENSTVDF 420
                                       **********************************


NBCn1-B         SKVDMNFMRKIPTGAEASNVLVGEVDFLERPIIAFVRLAPAVLLTGLTEVPVPTRFLFLL 476
NBCn1-E         SKVDMNFMRKIPTGAEASNVLVGEVDFLERPIIAFVRLAPAVLLTGLTEVPVPTRFLFLL 352
NBCn1-A         SKVDMNFMRKIPTGAEASNVLVGEVDFLERPIIAFVRLAPAVLLTGLTEVPVPTRFLFLL 471
NBCn1-C         SKVDMNFMRKIPTGAEASNVLVGEVDFLERPIIAFVRLAPAVLLTGLTEVPVPTRFLFLL 463
NBCn1-D         SKVDMNFMRKIPTGAEASNVLVGEVDFLERPIIAFVRLAPAVLLTGLTEVPVPTRFLFLL 476
NBCn1-D'        SKVDMNFMRKIPTGAEASNVLVGEVDFLERPIIAFVRLAPAVLLTGLTEVPVPTRFLFLL 480
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NBCn1-B         LGPAGKAPQYHEIGRSIATLMTDEIFHDVAYKAKDRNDLLSGIDEFLDQVTVLPPGEWDP 536
NBCn1-E         LGPAGKAPQYHEIGRSIATLMTDEIFHDVAYKAKDRNDLLSGIDEFLDQVTVLPPGEWDP 412
NBCn1-A         LGPAGKAPQYHEIGRSIATLMTDEIFHDVAYKAKDRNDLLSGIDEFLDQVTVLPPGEWDP 531
NBCn1-C         LGPAGKAPQYHEIGRSIATLMTDEIFHDVAYKAKDRNDLLSGIDEFLDQVTVLPPGEWDP 523
NBCn1-D         LGPAGKAPQYHEIGRSIATLMTDEIFHDVAYKAKDRNDLLSGIDEFLDQVTVLPPGEWDP 536
NBCn1-D'        LGPAGKAPQYHEIGRSIATLMTDEIFHDVAYKAKDRNDLLSGIDEFLDQVTVLPPGEWDP 540
                ************************************************************


NBCn1-B         SIRIEPPKSVPSQEKRKIPVFHNGSTPTLGETPKEAAHHAGPELQRTGRLFGGLILDIKR 596
NBCn1-E         SIRIEPPKSVPSQEKRKIPVFHNGSTPTLGETPKEAAHHAGPELQRTGRLFGGLILDIKR 472
NBCn1-A         SIRIEPPKSVPSQEKRKIPVFHNGSTPTLGETPKEAAHHAGPELQRTGRLFGGLILDIKR 591
NBCn1-C         SIRIEPPKSVPSQEKRKIPVFHNGSTPTLGETPKEAAHHAGPELQRTGRLFGGLILDIKR 583
NBCn1-D         SIRIEPPKSVPSQEKRKIPVFHNGSTPTLGETPKEAAHHAGPELQRTGRLFGGLILDIKR 596
NBCn1-D'        SIRIEPPKSVPSQEKRKIPVFHNGSTPTLGETPKEAAHHAGPELQRTGRLFGGLILDIKR 600
                ************************************************************


                         Nt---//---TM1
NBCn1-B         KAPFFLSDFKDALSLQCLASILFLYCACMSPVITFGGLLGEATEGRISAIESLFGASLTG 656
NBCn1-E         KAPFFLSDFKDALSLQCLASILFLYCACMSPVITFGGLLGEATEGRISAIESLFGASLTG 532
NBCn1-A         KAPFFLSDFKDALSLQCLASILFLYCACMSPVITFGGLLGEATEGRISAIESLFGASLTG 651
NBCn1-C         KAPFFLSDFKDALSLQCLASILFLYCACMSPVITFGGLLGEATEGRISAIESLFGASLTG 643
NBCn1-D         KAPFFLSDFKDALSLQCLASILFLYCACMSPVITFGGLLGEATEGRISAIESLFGASLTG 656
NBCn1-D'        KAPFFLSDFKDALSLQCLASILFLYCACMSPVITFGGLLGEATEGRISAIESLFGASLTG 660
                ************************************************************


NBCn1-B         IAYSLFAGQPLTILGSTGPVLVFEKILYKFCRDYQLSYLSLRTSIGLWTSFLCIVLVATD 716
NBCn1-E         IAYSLFAGQPLTILGSTGPVLVFEKILYKFCRDYQLSYLSLRTSIGLWTSFLCIVLVATD 592
NBCn1-A         IAYSLFAGQPLTILGSTGPVLVFEKILYKFCRDYQLSYLSLRTSIGLWTSFLCIVLVATD 711
NBCn1-C         IAYSLFAGQPLTILGSTGPVLVFEKILYKFCRDYQLSYLSLRTSIGLWTSFLCIVLVATD 703
NBCn1-D         IAYSLFAGQPLTILGSTGPVLVFEKILYKFCRDYQLSYLSLRTSIGLWTSFLCIVLVATD 716
NBCn1-D'        IAYSLFAGQPLTILGSTGPVLVFEKILYKFCRDYQLSYLSLRTSIGLWTSFLCIVLVATD 720
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NBCn1-B         ASSLVCYITRFTEEAFAALICIIFIYEALEKLFDLGETYAFNMHNNLDKLTSYSCVCTEP 776
NBCn1-E         ASSLVCYITRFTEEAFAALICIIFIYEALEKLFDLGETYAFNMHNNLDKLTSYSCVCTEP 652
NBCn1-A         ASSLVCYITRFTEEAFAALICIIFIYEALEKLFDLGETYAFNMHNNLDKLTSYSCVCTEP 771
NBCn1-C         ASSLVCYITRFTEEAFAALICIIFIYEALEKLFDLGETYAFNMHNNLDKLTSYSCVCTEP 763
NBCn1-D         ASSLVCYITRFTEEAFAALICIIFIYEALEKLFDLGETYAFNMHNNLDKLTSYSCVCTEP 776
NBCn1-D'        ASSLVCYITRFTEEAFAALICIIFIYEALEKLFDLGETYAFNMHNNLDKLTSYSCVCTEP 780
                ************************************************************

NBCn1-B         PNPSNETLAQWKKDNITAHNISWRNLTVSECKKLRGVFLGSACGHHGPYIPDVLFWCVIL 836
NBCn1-E         PNPSNETLAQWKKDNITAHNISWRNLTVSECKKLRGVFLGSACGHHGPYIPDVLFWCVIL 712
NBCn1-A         PNPSNETLAQWKKDNITAHNISWRNLTVSECKKLRGVFLGSACGHHGPYIPDVLFWCVIL 831
NBCn1-C         PNPSNETLAQWKKDNITAHNISWRNLTVSECKKLRGVFLGSACGHHGPYIPDVLFWCVIL 823
NBCn1-D         PNPSNETLAQWKKDNITAHNISWRNLTVSECKKLRGVFLGSACGHHGPYIPDVLFWCVIL 836
NBCn1-D'        PNPSNETLAQWKKDNITAHNISWRNLTVSECKKLRGVFLGSACGHHGPYIPDVLFWCVIL 840
                ************************************************************

NBCn1-B         FFTTFFLSSFLKQFKTKRYFPTKVRSTISDFAVFLTIVIMVTIDYLVGVPSPKLHVPEKF 896
NBCn1-E         FFTTFFLSSFLKQFKTKRYFPTKVRSTISDFAVFLTIVIMVTIDYLVGVPSPKLHVPEKF 772
NBCn1-A         FFTTFFLSSFLKQFKTKRYFPTKVRSTISDFAVFLTIVIMVTIDYLVGVPSPKLHVPEKF 891
NBCn1-C         FFTTFFLSSFLKQFKTKRYFPTKVRSTISDFAVFLTIVIMVTIDYLVGVPSPKLHVPEKF 883
NBCn1-D         FFTTFFLSSFLKQFKTKRYFPTKVRSTISDFAVFLTIVIMVTIDYLVGVPSPKLHVPEKF 896
NBCn1-D'        FFTTFFLSSFLKQFKTKRYFPTKVRSTISDFAVFLTIVIMVTIDYLVGVPSPKLHVPEKF 900
                ************************************************************

NBCn1-B         EPTHPERGWIISPLGDNPWWTLLIAAIPALLCTILIFMDQQITAVIINRKEHKLKKGAGY 956
NBCn1-E         EPTHPERGWIISPLGDNPWWTLLIAAIPALLCTILIFMDQQITAVIINRKEHKLKKGAGY 832
NBCn1-A         EPTHPERGWIISPLGDNPWWTLLIAAIPALLCTILIFMDQQITAVIINRKEHKLKKGAGY 951
NBCn1-C         EPTHPERGWIISPLGDNPWWTLLIAAIPALLCTILIFMDQQITAVIINRKEHKLKKGAGY 943
NBCn1-D         EPTHPERGWIISPLGDNPWWTLLIAAIPALLCTILIFMDQQITAVIINRKEHKLKKGAGY 956
NBCn1-D'        EPTHPERGWIISPLGDNPWWTLLIAAIPALLCTILIFMDQQITAVIINRKEHKLKKGAGY 960
                ************************************************************

NBCn1-B         HLDLLMVGVMLGVCSVMGLPWFVAATVLSISHVNSLKVESECSAPGEQPKFLGIREQRVT 1016
NBCn1-E         HLDLLMVGVMLGVCSVMGLPWFVAATVLSISHVNSLKVESECSAPGEQPKFLGIREQRVT 892
NBCn1-A         HLDLLMVGVMLGVCSVMGLPWFVAATVLSISHVNSLKVESECSAPGEQPKFLGIREQRVT 1011
NBCn1-C         HLDLLMVGVMLGVCSVMGLPWFVAATVLSISHVNSLKVESECSAPGEQPKFLGIREQRVT 1003
NBCn1-D         HLDLLMVGVMLGVCSVMGLPWFVAATVLSISHVNSLKVESECSAPGEQPKFLGIREQRVT 1016
NBCn1-D'        HLDLLMVGVMLGVCSVMGLPWFVAATVLSISHVNSLKVESECSAPGEQPKFLGIREQRVT 1020
                ************************************************************

NBCn1-B         GLMIFILMGLSVFMTSVLKFIPMPVLYGVFLYMGVSSLKGIQLFDRIKLFGMPAKHQPDL 1076
NBCn1-E         GLMIFILMGLSVFMTSVLKFIPMPVLYGVFLYMGVSSLKGIQLFDRIKLFGMPAKHQPDL 952
NBCn1-A         GLMIFILMGLSVFMTSVLKFIPMPVLYGVFLYMGVSSLKGIQLFDRIKLFGMPAKHQPDL 1071
NBCn1-C         GLMIFILMGLSVFMTSVLKFIPMPVLYGVFLYMGVSSLKGIQLFDRIKLFGMPAKHQPDL 1063
NBCn1-D         GLMIFILMGLSVFMTSVLKFIPMPVLYGVFLYMGVSSLKGIQLFDRIKLFGMPAKHQPDL 1076
NBCn1-D'        GLMIFILMGLSVFMTSVLKFIPMPVLYGVFLYMGVSSLKGIQLFDRIKLFGMPAKHQPDL 1080
                ************************************************************

                                                    TM14---//---Ct
NBCn1-B         IYLRYVPLWKVHIFTVIQLTCLVLLWVIKVSAAAVVFPMMVLALVFVRKLMDLCFTKREL 1136
NBCn1-E         IYLRYVPLWKVHIFTVIQLTCLVLLWVIKVSAAAVVFPMMVLALVFVRKLMDLCFTKREL 1012
NBCn1-A         IYLRYVPLWKVHIFTVIQLTCLVLLWVIKVSAAAVVFPMMVLALVFVRKLMDLCFTKREL 1131
NBCn1-C         IYLRYVPLWKVHIFTVIQLTCLVLLWVIKVSAAAVVFPMMVLALVFVRKLMDLCFTKREL 1123
NBCn1-D         IYLRYVPLWKVHIFTVIQLTCLVLLWVIKVSAAAVVFPMMVLALVFVRKLMDLCFTKREL 1136
NBCn1-D'        IYLRYVPLWKVHIFTVIQLTCLVLLWVIKVSAAAVVFPMMVLALVFVRKLMDLCFTKREL 1140
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NBCn1-B         SWLDDLMPESKKKKEDDKKKKEKEEAERMLQDDDDTVHLPFEGGSLLQIPVKALKYS--- 1192
NBCn1-E         SWLDDLMPESKKKKEDDKKKKEKEEAERMLQDDDDTVHLPFEGGSLLQIPVKALKYS--- 1068
NBCn1-A         SWLDDLMPESKKKKEDDKKKKEKEEAERMLQDDDDTVHLPFEGGSLLQIPVKALKYS--- 1187
NBCn1-C         SWLDDLMPESKKKKEDDKKKKEKEEAERMLQDDDDTVHLPFEGGSLLQIPVKALKYSVDP 1183
NBCn1-D         SWLDDLMPESKKKKEDDKKKKEKEEAERMLQDDDDTVHLPFEGGSLLQIPVKALKYSVDP 1196
NBCn1-D'        SWLDDLMPESKKKKEDDKKKKEKEEAERMLQDDDDTVHLPFEGGSLLQIPVKALKYSVDP 1200
                ************************************************************

                       Cassette III
NBCn1-B         ---------------------------------PDKPVSVKISFEDEPRKKYVDAETSL 1219
NBCn1-E         ---------------------------------PDKPVSVKISFEDEPRKKYVDAETSL 1095
NBCn1-A         ---------------------------------PDKPVSVKISFEDEPRKKYVDAETSL 1214
NBCn1-C         SIVNISDEMAKTAQWKALSMNTENAKVTRSNMSPDKPVSVKISFEDEPRKKYVDAETSL 1242
NBCn1-D         SIVNISDEMAKTAQWKALSMNTENAKVTRSNMSPDKPVSVKISFEDEPRKKYVDAETSL 1255
NBCn1-D'        SIVNISDEMAKTAQWKALSMNTENAKVTRSNMSPDKPVSVKISFEDEPRKKYVDAETSL 1259
                                                 ************************
```

Alignment 4: NDCBE variants. An alignment of human NDCBE-A, NDCBE-B, NDCBE-C, and NDCBE-D as depicted in Figure 37 of the review. Shown are the alternate Nt appendages (red vs purple) and the alternative long and short Ct that includes an auto inhibitory domain. Only the Nt appendage of NDCBE-E is included in this alignment, the remainder of the protein is identical to NDCBE-B.

```
NDCBE-E         MFNKNNSNKLRSTPRYRRGDPGYLNFTELGPLKPEQKDQWSQH                  43

NDCBE-B         MPAAGSNEPDGVLSYQRPDEEAVVDQGGTSTILNIHYEKEELEGHRTLYVGVRMPLGRQS 60
NDCBE-D         ------------------------------------------------------MPLGRQS 7
NDCBE-A         MPAAGSNEPDGVLSYQRPDEEAVVDQGGTSTILNIHYEKEELEGHRTLYVGVRMPLGRQS 60
NDCBE-C         ------------------------------------------------------MPLGRQS 7
                                                                       *******

NDCBE-B         HRHHRTHGQKHRRRGRGKGASQGEEGLEALAHDTPSQRVQFILGTEEDEEHVPHELFTEL 120
NDCBE-D         HRHHRTHGQKHRRRGRGKGASQGEEGLEALAHDTPSQRVQFILGTEEDEEHVPHELFTEL 67
NDCBE-A         HRHHRTHGQKHRRRGRGKGASQGEEGLEALAHDTPSQRVQFILGTEEDEEHVPHELFTEL 120
NDCBE-C         HRHHRTHGQKHRRRGRGKGASQGEEGLEALAHDTPSQRVQFILGTEEDEEHVPHELFTEL 67
                ************************************************************

NDCBE-B         DEICMKEGEDAEWKETARWLKFEEDVEDGGERWSKPYVATLSLHSLFELRSCLINGTVLL 180
NDCBE-D         DEICMKEGEDAEWKETARWLKFEEDVEDGGERWSKPYVATLSLHSLFELRSCLINGTVLL 127
NDCBE-A         DEICMKEGEDAEWKETARWLKFEEDVEDGGERWSKPYVATLSLHSLFELRSCLINGTVLL 180
NDCBE-C         DEICMKEGEDAEWKETARWLKFEEDVEDGGERWSKPYVATLSLHSLFELRSCLINGTVLL 127
                ************************************************************

NDCBE-B         DMHANSIEEISDLILDQQELSSDLNDSMRVKVREALLKKHHHQNEKKRNNLIPIVRSFAE 240
NDCBE-D         DMHANSIEEISDLILDQQELSSDLNDSMRVKVREALLKKHHHQNEKKRNNLIPIVRSFAE 187
NDCBE-A         DMHANSIEEISDLILDQQELSSDLNDSMRVKVREALLKKHHHQNEKKRNNLIPIVRSFAE 240
NDCBE-C         DMHANSIEEISDLILDQQELSSDLNDSMRVKVREALLKKHHHQNEKKRNNLIPIVRSFAE 187
                ************************************************************

NDCBE-B         VGKKQSDPHLMDKHGQTVSPQSVPTTNLEVKNGVNCEHSPVDLSKVDLHFMKKIPTGAEA 300
NDCBE-D         VGKKQSDPHLMDKHGQTVSPQSVPTTNLEVKNGVNCEHSPVDLSKVDLHFMKKIPTGAEA 247
NDCBE-A         VGKKQSDPHLMDKHGQTVSPQSVPTTNLEVKNGVNCEHSPVDLSKVDLHFMKKIPTGAEA 300
NDCBE-C         VGKKQSDPHLMDKHGQTVSPQSVPTTNLEVKNGVNCEHSPVDLSKVDLHFMKKIPTGAEA 247
                ************************************************************

NDCBE-B         SNVLVGEVDILDRPIVAFVRLSPAVLLSGLTEVPIPTRFLFILLGPVGKGQQYHEIGRSM 360
NDCBE-D         SNVLVGEVDILDRPIVAFVRLSPAVLLSGLTEVPIPTRFLFILLGPVGKGQQYHEIGRSM 307
NDCBE-A         SNVLVGEVDILDRPIVAFVRLSPAVLLSGLTEVPIPTRFLFILLGPVGKGQQYHEIGRSM 360
NDCBE-C         SNVLVGEVDILDRPIVAFVRLSPAVLLSGLTEVPIPTRFLFILLGPVGKGQQYHEIGRSM 307
                ************************************************************

NDCBE-B         ATIMTDEIFHDVAYKAKERDDLLAGIDEFLDQVTVLPPGEWDPSIRIEPPKNVPSQEKRK 420
NDCBE-D         ATIMTDEIFHDVAYKAKERDDLLAGIDEFLDQVTVLPPGEWDPSIRIEPPKNVPSQEKRK 367
NDCBE-A         ATIMTDEIFHDVAYKAKERDDLLAGIDEFLDQVTVLPPGEWDPSIRIEPPKNVPSQEKRK 420
NDCBE-C         ATIMTDEIFHDVAYKAKERDDLLAGIDEFLDQVTVLPPGEWDPSIRIEPPKNVPSQEKRK 367
                ************************************************************

                                                                  Nt---//---TM1
NDCBE-B         MPGVPNGNVCHIEQEPHGGHSGPELQRTGRLFGGLVLDIKRKAPWYWSDYRDALSLQCLA 480
NDCBE-D         MPGVPNGNVCHIEQEPHGGHSGPELQRTGRLFGGLVLDIKRKAPWYWSDYRDALSLQCLA 427
NDCBE-A         MPGVPNGNVCHIEQEPHGGHSGPELQRTGRLFGGLVLDIKRKAPWYWSDYRDALSLQCLA 480
NDCBE-C         MPGVPNGNVCHIEQEPHGGHSGPELQRTGRLFGGLVLDIKRKAPWYWSDYRDALSLQCLA 427
                ************************************************************

NDCBE-B         SFLFLYCACMSPVITFGGLLGEATEGRISAIESLFGASMTGIAYSLFAGQALTILGSTGP 540
NDCBE-D         SFLFLYCACMSPVITFGGLLGEATEGRISAIESLFGASMTGIAYSLFAGQALTILGSTGP 487
NDCBE-A         SFLFLYCACMSPVITFGGLLGEATEGRISAIESLFGASMTGIAYSLFAGQALTILGSTGP 540
NDCBE-C         SFLFLYCACMSPVITFGGLLGEATEGRISAIESLFGASMTGIAYSLFAGQALTILGSTGP 487
                ************************************************************
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NDCBE-B         VLVFEKILFKFCKDYALSYLSLRACIGLWTAFLCIVLVATDASSLVCYITRFTEEAFASL 600
NDCBE-D         VLVFEKILFKFCKDYALSYLSLRACIGLWTAFLCIVLVATDASSLVCYITRFTEEAFASL 547
NDCBE-A         VLVFEKILFKFCKDYALSYLSLRACIGLWTAFLCIVLVATDASSLVCYITRFTEEAFASL 600
NDCBE-C         VLVFEKILFKFCKDYALSYLSLRACIGLWTAFLCIVLVATDASSLVCYITRFTEEAFASL 547
                ************************************************************

NDCBE-B         ICIIFIYEAIEKLIHLAETYPIHMHSQLDHLSLYYCRCTLPENPNNHTLQYWKDHNIVTA 660
NDCBE-D         ICIIFIYEAIEKLIHLAETYPIHMHSQLDHLSLYYCRCTLPENPNNHTLQYWKDHNIVTA 607
NDCBE-A         ICIIFIYEAIEKLIHLAETYPIHMHSQLDHLSLYYCRCTLPENPNNHTLQYWKDHNIVTA 660
NDCBE-C         ICIIFIYEAIEKLIHLAETYPIHMHSQLDHLSLYYCRCTLPENPNNHTLQYWKDHNIVTA 607
                ************************************************************

NDCBE-B         EVHWANLTVSECQEMHGEFMGSACGHHGPYTPDVLFWSCILFFTTFILSSTLKTFKTSRY 720
NDCBE-D         EVHWANLTVSECQEMHGEFMGSACGHHGPYTPDVLFWSCILFFTTFILSSTLKTFKTSRY 667
NDCBE-A         EVHWANLTVSECQEMHGEFMGSACGHHGPYTPDVLFWSCILFFTTFILSSTLKTFKTSRY 720
NDCBE-C         EVHWANLTVSECQEMHGEFMGSACGHHGPYTPDVLFWSCILFFTTFILSSTLKTFKTSRY 667
                ************************************************************

NDCBE-B         FPTRVRSMVSDFAVFLTIFTMVIIDFLIGVPSPKLQVPSVFKPTRDDRGWIINPIGPNPW 780
NDCBE-D         FPTRVRSMVSDFAVFLTIFTMVIIDFLIGVPSPKLQVPSVFKPTRDDRGWIINPIGPNPW 727
NDCBE-A         FPTRVRSMVSDFAVFLTIFTMVIIDFLIGVPSPKLQVPSVFKPTRDDRGWIINPIGPNPW 780
NDCBE-C         FPTRVRSMVSDFAVFLTIFTMVIIDFLIGVPSPKLQVPSVFKPTRDDRGWIINPIGPNPW 727
                ************************************************************

NDCBE-B         WTVIAAIIPALLCTILIFMDQQITAVIINRKEHKLKKGCGYHLDLLMVAIMLGVCSIMGL 840
NDCBE-D         WTVIAAIIPALLCTILIFMDQQITAVIINRKEHKLKKGCGYHLDLLMVAIMLGVCSIMGL 787
NDCBE-A         WTVIAAIIPALLCTILIFMDQQITAVIINRKEHKLKKGCGYHLDLLMVAIMLGVCSIMGL 840
NDCBE-C         WTVIAAIIPALLCTILIFMDQQITAVIINRKEHKLKKGCGYHLDLLMVAIMLGVCSIMGL 787
                ************************************************************

NDCBE-B         PWFVAATVLSITHVNSLKLESECSAPGEQPKFLGIREQRVTGLMIFVLMGCSVFMTAILK 900
NDCBE-D         PWFVAATVLSITHVNSLKLESECSAPGEQPKFLGIREQRVTGLMIFVLMGCSVFMTAILK 847
NDCBE-A         PWFVAATVLSITHVNSLKLESECSAPGEQPKFLGIREQRVTGLMIFVLMGCSVFMTAILK 900
NDCBE-C         PWFVAATVLSITHVNSLKLESECSAPGEQPKFLGIREQRVTGLMIFVLMGCSVFMTAILK 847
                ************************************************************

NDCBE-B         FIPMPVLYGVFLYMGVSSLQGIQFFDRLKLFGMPAKHQPDFIYLRHVPLRKVHLFTLIQL 960
NDCBE-D         FIPMPVLYGVFLYMGVSSLQGIQFFDRLKLFGMPAKHQPDFIYLRHVPLRKVHLFTLIQL 907
NDCBE-A         FIPMPVLYGVFLYMGVSSLQGIQFFDRLKLFGMPAKHQPDFIYLRHVPLRKVHLFTLIQL 960
NDCBE-C         FIPMPVLYGVFLYMGVSSLQGIQFFDRLKLFGMPAKHQPDFIYLRHVPLRKVHLFTLIQL 907
                ************************************************************

                                    TM14---//---Ct
NDCBE-B         TCLVLLWVIKASPAAIVFPMMVLALVFVRKVMDLCFSKRELSWLDDLMPESKKKKLDDAK 1020
NDCBE-D         TCLVLLWVIKASPAAIVFPMMVLALVFVRKVMDLCFSKRELSWLDDLMPESKKKKLDDAK 967
NDCBE-A         TCLVLLWVIKASPAAIVFPMMVLALVFVRKVMDLCFSKRELSWLDDLMPESKKKKLDDAK 1020
NDCBE-C         TCLVLLWVIKASPAAIVFPMMVLALVFVRKVMDLCFSKRELSWLDDLMPESKKKKLDDAK 967
                ************************************************************

NDCBE-B         KKAKEEEVIVLAPTVYLGASNYRT---------------------------------- 1044
NDCBE-D         KKAKEEEVIVLAPTVYLGASNYRT---------------------------------- 991
NDCBE-A         KKAKEEEEAEKMLEIGGDKFPLESRKLLSSPGKNISCRCDPSEINISDEMPKTTVWKALS 1080
NDCBE-C         KKAKEEEEAEKMLEIGGDKFPLESRKLLSSPGKNISCRCDPSEINISDEMPKTTVWKALS 1027
                *******       :  .    .:

NDCBE-B         -------------
NDCBE-D         -------------
NDCBE-A         MNSGNAKEKSLFN 1093
NDCBE-C         MNSGNAKEKSLFN 1040
```

Alignment 4: NBCn2 variants. An alignment of human NBCn2-A, NBCn2-B, NBCn2-C, and NBCn-D as depicted in Figure 40 of the review. Shown are the 30-aa cassette A and the alternative short and long Ct that includes a PDZ-protein binding motif. Note that the C-termini of human NBCn2-C and -D sequences are derived from an EST sequence (CD102396) as the full-length variants have not been cloned from human cDNA. Only the C-terminal sequence of rb3NCBE (emboldened) is included in this alignment.

```
NBCn2-B         MEIKDQGAQMEPLLPTRNDEEAVVDRGGTRSILKTHFEKEDLEGHRTLFIGVHVPLGGRK 60
NBCn2-D         MEIKDQGAQMEPLLPTRNDEEAVVDRGGTRSILKTHFEKEDLEGHRTLFIGVHVPLGGRK 60
NBCn2-A         MEIKDQGAQMEPLLPTRNDEEAVVDRGGTRSILKTHFEKEDLEGHRTLFIGVHVPLGGRK 60
NBCn2-C         MEIKDQGAQMEPLLPTRNDEEAVVDRGGTRSILKTHFEKEDLEGHRTLFIGVHVPLGGRK 60
                ************************************************************

NBCn2-B         SHRRHRHRGHKHRKRDRERDSGLEDGRESPSFDTPSQRVQFILGTEDDDEEHIPHDLFTE 120
NBCn2-D         SHRRHRHRGHKHRKRDRERDSGLEDGRESPSFDTPSQRVQFILGTEDDDEEHIPHDLFTE 120
NBCn2-A         SHRRHRHRGHKHRKRDRERDSGLEDGRESPSFDTPSQRVQFILGTEDDDEEHIPHDLFTE 120
NBCn2-C         SHRRHRHRGHKHRKRDRERDSGLEDGRESPSFDTPSQRVQFILGTEDDDEEHIPHDLFTE 120
                ************************************************************

NBCn2-B         LDEICWREGEDAEWRETARWLKFEEDVEDGGERWSKPYVATLSLHSLFELRSCILNGTVL 180
NBCn2-D         LDEICWREGEDAEWRETARWLKFEEDVEDGGERWSKPYVATLSLHSLFELRSCILNGTVL 180
NBCn2-A         LDEICWREGEDAEWRETARWLKFEEDVEDGGERWSKPYVATLSLHSLFELRSCILNGTVL 180
NBCn2-C         LDEICWREGEDAEWRETARWLKFEEDVEDGGERWSKPYVATLSLHSLFELRSCILNGTVL 180
                ************************************************************

NBCn2-B         LDMHANTLEEIADMVLDQQVSSGQLNEDVRHRVHEALMKQHHHQNQKKLTNRIPIVRSFA 240
NBCn2-D         LDMHANTLEEIADMVLDQQVSSGQLNEDVRHRVHEALMKQHHHQNQKKLTNRIPIVRSFA 240
NBCn2-A         LDMHANTLEEIADMVLDQQVSSGQLNEDVRHRVHEALMKQHHHQNQKKLTNRIPIVRSFA 240
NBCn2-C         LDMHANTLEEIADMVLDQQVSSGQLNEDVRHRVHEALMKQHHHQNQKKLTNRIPIVRSFA 240
                ************************************************************

                                                          Cassette A
NBCn2-B         DIGKKQSEPNSMDKNAGQVVSPQSAPACVENKNDVSRENSTVDFSKGLGGQQKGHTSPCG 300
NBCn2-D         DIGKKQSEPNSMDKNAGQVVSPQSAPACVENKNDVSRENSTVDFSKGLGGQQKGHTSPCG 300
NBCn2-A         DIGKKQSEPNSMDKNAGQVVSPQSAPACVENKNDVSRENSTVDFSK-------------- 286
NBCn2-C         DIGKKQSEPNSMDKNAGQVVSPQSAPACVENKNDVSRENSTVDFSK-------------- 286
                ******************************************

NBCn2-B         MKQRHEKGPPHQQEREVDLHFMKKIPPGAEASNILVGELEFLDRTVVAFVRLSPAVLLQG 360
NBCn2-D         MKQRHEKGPPHQQEREVDLHFMKKIPPGAEASNILVGELEFLDRTVVAFVRLSPAVLLQG 360
NBCn2-A         ----------------VDLHFMKKIPPGAEASNILVGELEFLDRTVVAFVRLSPAVLLQG 330
NBCn2-C         ----------------VDLHFMKKIPPGAEASNILVGELEFLDRTVVAFVRLSPAVLLQG 330
                                ****************************************

NBCn2-B         LAEVPIPTRFLFILLGPLGKGQQYHEIGRSIATLMTDEVFHDVAYKAKDRNDLVSGIDEF 420
NBCn2-D         LAEVPIPTRFLFILLGPLGKGQQYHEIGRSIATLMTDEVFHDVAYKAKDRNDLVSGIDEF 420
NBCn2-A         LAEVPIPTRFLFILLGPLGKGQQYHEIGRSIATLMTDEVFHDVAYKAKDRNDLVSGIDEF 390
NBCn2-C         LAEVPIPTRFLFILLGPLGKGQQYHEIGRSIATLMTDEVFHDVAYKAKDRNDLVSGIDEF 390
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NBCn2-B         LDQVTVLPPGEWDPSIRIEPPKNVPSQEKRKIPAVPNGTAAHGEAEPHGGHSGPELQRTG 480
NBCn2-D         LDQVTVLPPGEWDPSIRIEPPKNVPSQEKRKIPAVPNGTAAHGEAEPHGGHSGPELQRTG 480
NBCn2-A         LDQVTVLPPGEWDPSIRIEPPKNVPSQEKRKIPAVPNGTAAHGEAEPHGGHSGPELQRTG 450
NBCn2-C         LDQVTVLPPGEWDPSIRIEPPKNVPSQEKRKIPAVPNGTAAHGEAEPHGGHSGPELQRTG 450
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                                  Nt---//---TM1
NBCn2-B         RIFGGLILDIKRKAPYFWSDFRDAFSLQCLASFLFLYCACMSPVITFGGLLGEATEGRIS 540
NBCn2-D         RIFGGLILDIKRKAPYFWSDFRDAFSLQCLASFLFLYCACMSPVITFGGLLGEATEGRIS 540
NBCn2-A         RIFGGLILDIKRKAPYFWSDFRDAFSLQCLASFLFLYCACMSPVITFGGLLGEATEGRIS 510
NBCn2-C         RIFGGLILDIKRKAPYFWSDFRDAFSLQCLASFLFLYCACMSPVITFGGLLGEATEGRIS 510
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NBCn2-B         AIESLFGASMTGIAYSLFGGQPLTILGSTGPVLVFEKILFKFCKEYGLSYLSLRASIGLW 600
NBCn2-D         AIESLFGASMTGIAYSLFGGQPLTILGSTGPVLVFEKILFKFCKEYGLSYLSLRASIGLW 600
NBCn2-A         AIESLFGASMTGIAYSLFGGQPLTILGSTGPVLVFEKILFKFCKEYGLSYLSLRASIGLW 570
NBCn2-C         AIESLFGASMTGIAYSLFGGQPLTILGSTGPVLVFEKILFKFCKEYGLSYLSLRASIGLW 570
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NBCn2-B         TATLCIILVATDASSLVCYITRFTEEAFASLICIIFIYEALEKLFELSEAYPINMHNDLE 660
NBCn2-D         TATLCIILVATDASSLVCYITRFTEEAFASLICIIFIYEALEKLFELSEAYPINMHNDLE 660
NBCn2-A         TATLCIILVATDASSLVCYITRFTEEAFASLICIIFIYEALEKLFELSEAYPINMHNDLE 630
NBCn2-C         TATLCIILVATDASSLVCYITRFTEEAFASLICIIFIYEALEKLFELSEAYPINMHNDLE 630
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NBCn2-B         LLTQYSCNCVEPHNPSNGTLKEWRESNISASDIIWENLTVSECKSLHGEYVGRACGHDHP 720
NBCn2-D         LLTQYSCNCVEPHNPSNGTLKEWRESNISASDIIWENLTVSECKSLHGEYVGRACGHDHP 720
NBCn2-A         LLTQYSCNCVEPHNPSNGTLKEWRESNISASDIIWENLTVSECKSLHGEYVGRACGHDHP 690
NBCn2-C         LLTQYSCNCVEPHNPSNGTLKEWRESNISASDIIWENLTVSECKSLHGEYVGRACGHDHP 690
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NBCn2-B         YVPDVLFWSVILFFSTVTLSATLKQFKTSRYFPTKVRSIVSDFAVFLTILCMVLIDYAIG 780
NBCn2-D         YVPDVLFWSVILFFSTVTLSATLKQFKTSRYFPTKVRSIVSDFAVFLTILCMVLIDYAIG 780
NBCn2-A         YVPDVLFWSVILFFSTVTLSATLKQFKTSRYFPTKVRSIVSDFAVFLTILCMVLIDYAIG 750
NBCn2-C         YVPDVLFWSVILFFSTVTLSATLKQFKTSRYFPTKVRSIVSDFAVFLTILCMVLIDYAIG 750
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NBCn2-B         IPSPKLQVPSVFKPTRDDRGWFVTPLGPNPWWTVIAAIIPALLCTILIFMDQQITAVIIN 840
NBCn2-D         IPSPKLQVPSVFKPTRDDRGWFVTPLGPNPWWTVIAAIIPALLCTILIFMDQQITAVIIN 840
NBCn2-A         IPSPKLQVPSVFKPTRDDRGWFVTPLGPNPWWTVIAAIIPALLCTILIFMDQQITAVIIN 810
NBCn2-C         IPSPKLQVPSVFKPTRDDRGWFVTPLGPNPWWTVIAAIIPALLCTILIFMDQQITAVIIN 810
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NBCn2-B         RKEHKLKKGCGYHLDLLMVAVMLGVCSIMGLPWFVAATVLSITHVNSLKLESECSAPGEQ 900
NBCn2-D         RKEHKLKKGCGYHLDLLMVAVMLGVCSIMGLPWFVAATVLSITHVNSLKLESECSAPGEQ 900
NBCn2-A         RKEHKLKKGCGYHLDLLMVAVMLGVCSIMGLPWFVAATVLSITHVNSLKLESECSAPGEQ 870
NBCn2-C         RKEHKLKKGCGYHLDLLMVAVMLGVCSIMGLPWFVAATVLSITHVNSLKLESECSAPGEQ 870
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NBCn2-B         PKFLGIREQRVTGLMIFILMGSSVFMTSILKFIPMPVLYGVFLYMGASSLKGIQFFDRIK 960
NBCn2-D         PKFLGIREQRVTGLMIFILMGSSVFMTSILKFIPMPVLYGVFLYMGASSLKGIQFFDRIK 960
NBCn2-A         PKFLGIREQRVTGLMIFILMGSSVFMTSILKFIPMPVLYGVFLYMGASSLKGIQFFDRIK 930
NBCn2-C         PKFLGIREQRVTGLMIFILMGSSVFMTSILKFIPMPVLYGVFLYMGASSLKGIQFFDRIK 930
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NBCn2-B         LFWMPAKHQPDFIYLRHVPLRKVHLFTIIQMSCLGLLWIIKVSRAAIVFPMMVLALVFVR 1020
NBCn2-D         LFWMPAKHQPDFIYLRHVPLRKVHLFTIIQMSCLGLLWIIKVSRAAIVFPMMVLALVFVR 1020
NBCn2-A         LFWMPAKHQPDFIYLRHVPLRKVHLFTIIQMSCLGLLWIIKVSRAAIVFPMMVLALVFVR 990
NBCn2-C         LFWMPAKHQPDFIYLRHVPLRKVHLFTIIQMSCLGLLWIIKVSRAAIVFPMMVLALVFVR 990
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          TM14---//---Ct
NBCn2-B          KLMDLLFTKRELSWLDDLMPESKKKKLEDAEKEEEQSMLAMEDEGTVQLPLEGHYRDDPS 1080
NBCn2-D          KLMDLLFTKRELSWLDDLMPESKKKKLEDAEKEEEQSMLAMEDEGTVQLPLEGHYRDDPS 1080
NBCn2-A          KLMDLLFTKRELSWLDDLMPESKKKKLEDAEKEEEQSMLAMEDEGTVQLPLEGHYRDDPS 1050
NBCn2-C          KLMDLLFTKRELSWLDDLMPESKKKKLEDAEKEEEQSMLAMEDEGTVQLPLEGHYRDDPS 1050
rb3NCBE          KLMDFLFTKRELSWLDDLMPESKKKKLEDAEKEH                             1054
                 ****:**************************************************

NBCn2-B          VINISDEMSKTALWRNLLITADNSKDKESSFPSKSSPS----------------- 1118
NBCn2-D          VINISDEMSKTALWRNLLITADNSKDKESSFPSKSIESRKEKKADSGKGVDRETCL 1136
NBCn2-A          VINISDEMSKTALWRNLLITADNSKDKESSFPSKSSPS----------------- 1088
NBCn2-C          VINISDEMSKTALWRNLLITADNSKDKESSFPSKSIESRKEKKADSGKGVDRETCL 1106
                 **********************************  *
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References

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