

MvChR1	1	-----MSPPTSPTPDTGHDTPDTGHD TGGHGAVEICFAPCEEDCV	40
eMvChR1#1	1	MSRRPWLLALALAVALAAGSAGASTGSDATVPVATQDGPDYVFHRAHERMLFQTSYTLN	60
eMvChR1#2	1	-----MDYGGALSAVGRELLFVTN-PVVV	23
TM1			
MvChR1	41	TIRYFVENDFEGCIPGHFDQYSSHGSLHDIVKAALYICMVISILQILFYGFQWWRKTCGW	100
eMvChR1#1	61	NGSVICIPNNGQCFCLHFDQYSSHGSLHDIVKAALYICMVISILQILFYGFQWWRKTCGW	120
eMvChR1#2	24	NGSVL-VPED-QCYCAHFDQYSSHGSLHDIVKAALYICMVISILQILFYGFQWWRKTCGW	81
TM2			
MvChR1	101	EVWVACIETSIYIIAITSEADSPFTLYLTNGQISPQLRYMEWLMTCPVILIALSNITGM	160
eMvChR1#1	121	EVWVACIETSIYIIAITSEADSPFTLYLTNGQISPQLRYMEWLMTCPVILIALSNITGM	180
eMvChR1#2	82	EVWVACIETSIYIIAITSEADSPFTLYLTNGQISPQLRYMEWLMTCPVILIALSNITGM	141
TM4			
MvChR1	161	AE EYNKRTMTLLTSDVCCIVLGMSAASKPRLKGILYAVGWAFGAWTYWTALQVYRDAHK	220
eMvChR1#1	181	AE EYNKRTMTLLTSDVCCIVLGMSAASKPRLKGILYAVGWAFGAWTYWTALQVYRDAHK	240
eMvChR1#2	142	AE EYNKRTMTLLTSDVCCIVLGMSAASKPRLKGILYAVGWAFGAWTYWTALQVYRDAHK	201
TM5			
TM6			
MvChR1	221	AVPKPLAW-YVRAMGYVFFTSWLT FPGWFL LGPEGLEVVTGTVSTLMHACSDLISKNLWG	279
eMvChR1#1	241	AVPKPLAW-YVRAMGYVFFTSWLT FPGWFL LGPEGLEVVTGTVSTLMHACSDLISKNLWG	299
eMvChR1#2	202	AVPKPLAW-YVRAMGYVFFTSWLT FPGWFL LGPEGLEVVTGTVSTLMHACSDLISKNLWG	260
TM7			
MvChR1	280	FMDWHLRVLVARHHRKLFKAEEEEHALKKGQTLEPGMPRSTSFVR	323
eMvChR1#1	300	FMDWHLRVLVARHHRKLFKAEEEEHALKKGQTLEPGMPRSTSFVR	343
eMvChR1#2	261	FMDWHLRVLVARHHRKLFKAEEEEHALKKGQTLEPGMPRSTSFVR	304

Fig. S1 Enhanced MvChR1 variants.

The MvChR1 photocurrent was enhanced by substituting N-terminal 1-56 sequence with the N-terminal 76 amino acids from ChR1 (eMvChR1#1) or with the N-terminal 37 amino acids from ChR2 (eMvChR1#2). Putative transmembrane helixes (red lines TM1-7) were conserved among these molecules.