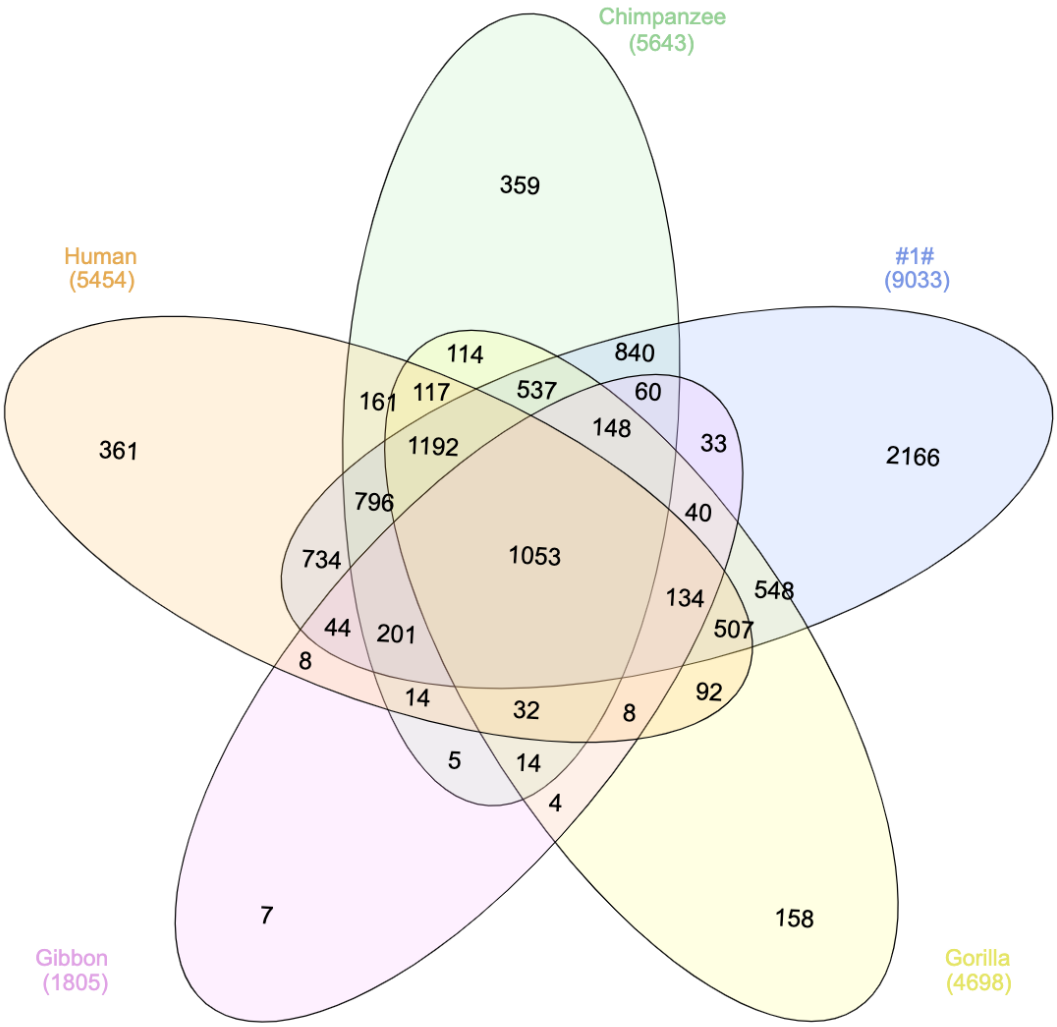
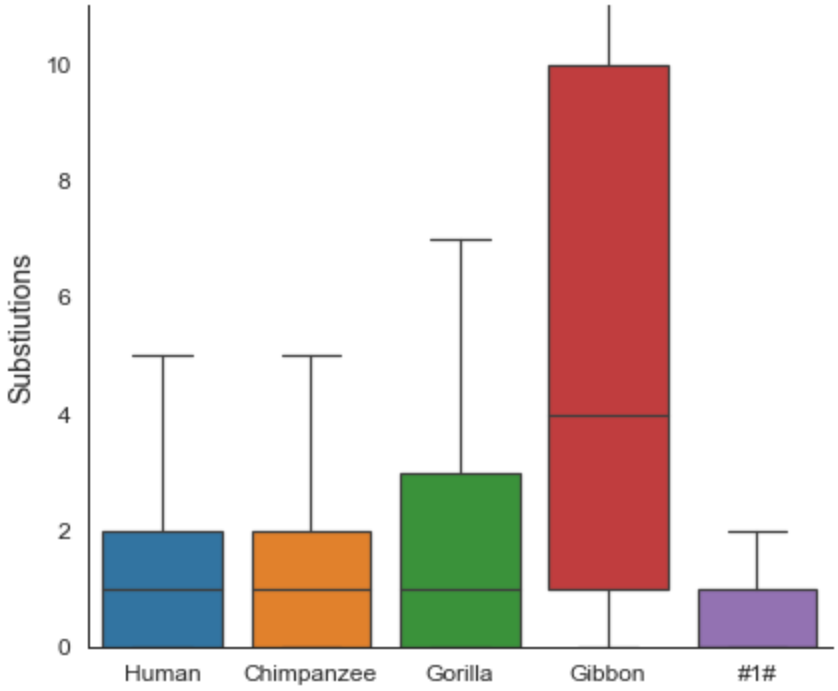
Supporting information

Filtered ortholog families

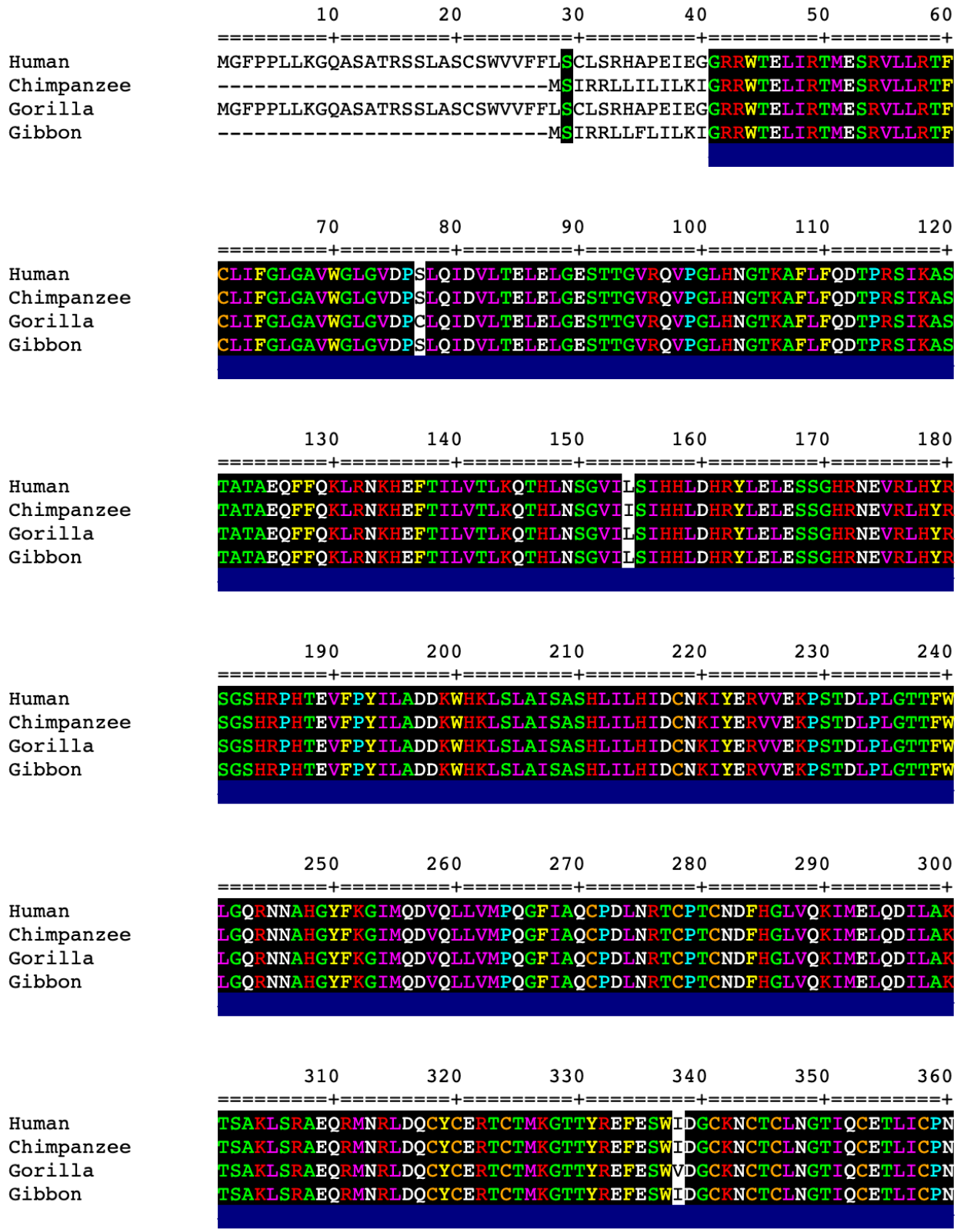
Three ortholog families (out of 12,621) did not contain even a single alignment block. Two of these families (ENST00000262304, ENST00000301788) have truncated genes found next to genome gaps in *Nomascus leucogenys*. *Pan troglodytes* gene from ENST00000397748 family also appears to be truncated due to a genome gap. The truncated version of genes from these families do not share enough sequence overlap with their orthologs, and hence Gblocks does not find any conserved block.



S1 Fig: Families with branch-specific null substitution.



S2 Fig: Branch-specific substitution count interquartile range.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Chimpanzee ----------MSIRRLLILILKIGRRWTELIRTMESRVLLRTF
Gorilla MGFPPLLKGQASATRSSLASCSWVVFFLSCLSRHAPEIEGGRRWTELIRTMESRVLLRTF
Gibbon ----------MSIRRLLFLILKIGRRWTELIRTMESRVLLRTF
70 80 90 100 110 120
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Chimpanzee CLIFGLGAVWGLGVDPSLQIDVLTELELGESTTGVRQVPGLHNGTKAFLFQDTPRSIKAS
Gorilla CLIFGLGAVWGLGVDPCLQIDVLTELELGESTTGVRQVPGLHNGTKAFLFQDTPRSIKAS
Gibbon CLIFGLGAVWGLGVDPSLQIDVLTELELGESTTGVRQVPGLHNGTKAFLFQDTPRSIKAS
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Gorilla SGSHRPHTEVFPYILADDKWHKLSLAISASHLILHIDCNKIYERVVEKPSTDLPLGTTFW
Gibbon SGSHRPHTEVFPYILADDKWHKLSLAISASHLILHIDCNKIYERVVEKPSTDLPLGTTFW
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Gorilla TSAKLSRAEQRMNRLDQCYCERTCTMKGTTYREFESWVDGCKNCTCLNGTIQCETLICPN
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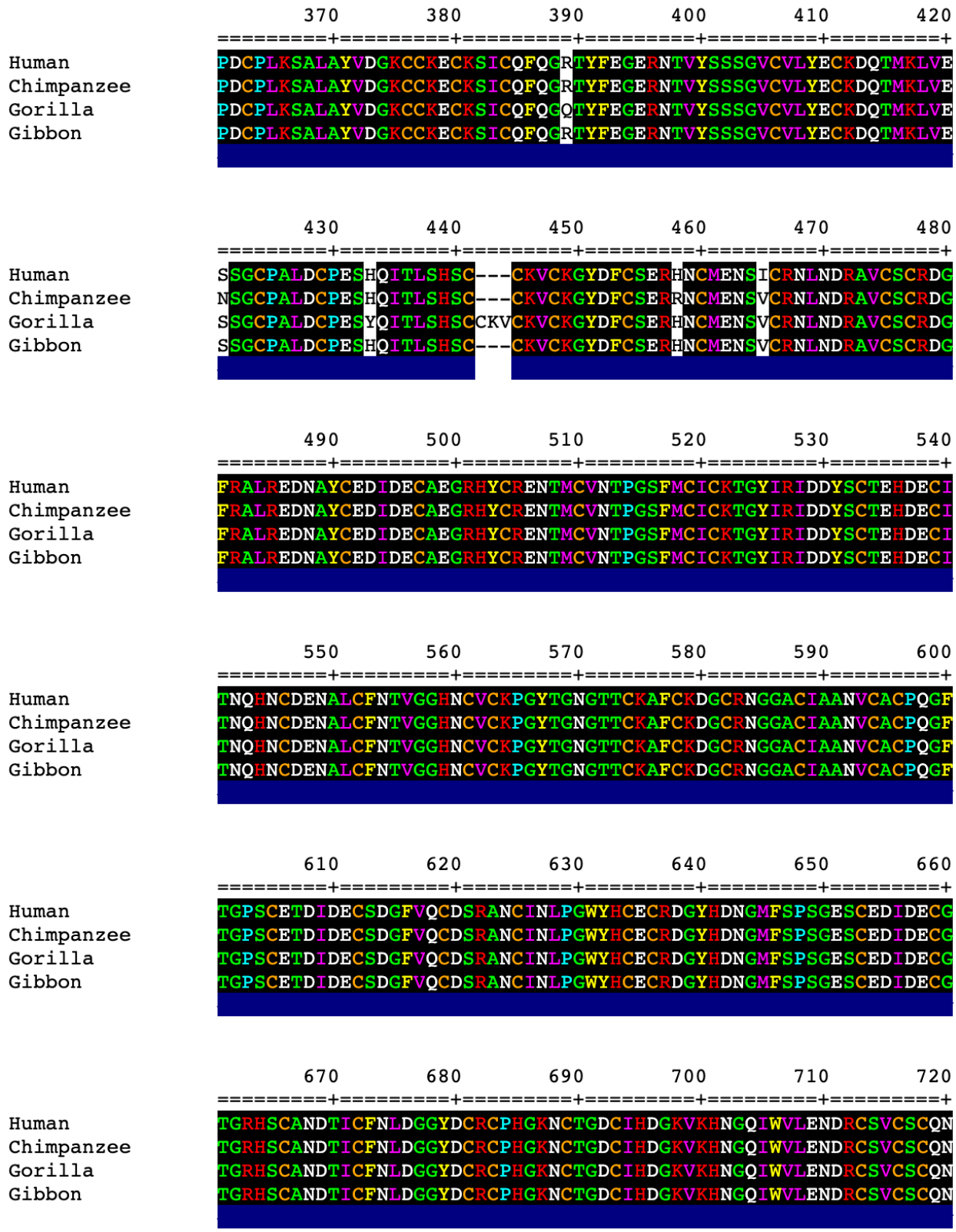
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Chimpanzee PDCPLKSALAYVDGKCCKECKSICQFQGRTYFEGERNTVYSSSGVCVLYECKDQTMKLVE
Gorilla PDCPLKSALAYVDGKCCKECKSICQFQGQTYFEGERNTVYSSSGVCVLYECKDQTMKLVE
Gibbon PDCPLKSALAYVDGKCCKECKSICQFQGRTYFEGERNTVYSSSGVCVLYECKDQTMKLVE
430 440 450 460 470 480
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Chimpanzee NSGCPALDCPESHQITLSHSC---CKVCKGYDFCSERRNCMENSVCRNLNDRAVCSCRDG
Gorilla SSGCPALDCPESYQITLSHSCCKVCKVCKGYDFCSERHNCMENSVCRNLNDRAVCSCRDG
Gibbon SSGCPALDCPESHQITLSHSC---CKVCKGYDFCSERHNCMENSVCRNLNDRAVCSCRDG
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Gorilla FRALREDNAYCEDIDECAEGRHYCRENTMCVNTPGSFMCICKTGYIRIDDYSCTEHDECI
Gibbon FRALREDNAYCEDIDECAEGRHYCRENTMCVNTPGSFMCICKTGYIRIDDYSCTEHDECI
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Gorilla TNQHNCDENALCFNTVGGHNCVCKPGYTGNGTTCKAFCKDGCRNGGACIAANVCACPQGF
Gibbon TNQHNCDENALCFNTVGGHNCVCKPGYTGNGTTCKAFCKDGCRNGGACIAANVCACPQGF
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Gorilla TGPSCETDIDECSDGFVQCDSRANCINLPGWYHCECRDGYHDNGMFSPSGESCEDIDECG
Gibbon TGPSCETDIDECSDGFVQCDSRANCINLPGWYHCECRDGYHDNGMFSPSGESCEDIDECG
670 680 690 700 710 720
Human TGRHSCANDTICFNLDGGYDCRCPHGKNCTGDCIHDGKVKHNGQIWVLENDRCSVCSCQN
Chimpanzee TGRHSCANDTICFNLDGGYDCRCPHGKNCTGDCIHDGKVKHNGQIWVLENDRCSVCSCQN
Gorilla TGRHSCANDTICFNLDGGYDCRCPHGKNCTGDCIHDGKVKHNGQIWVLENDRCSVCSCQN
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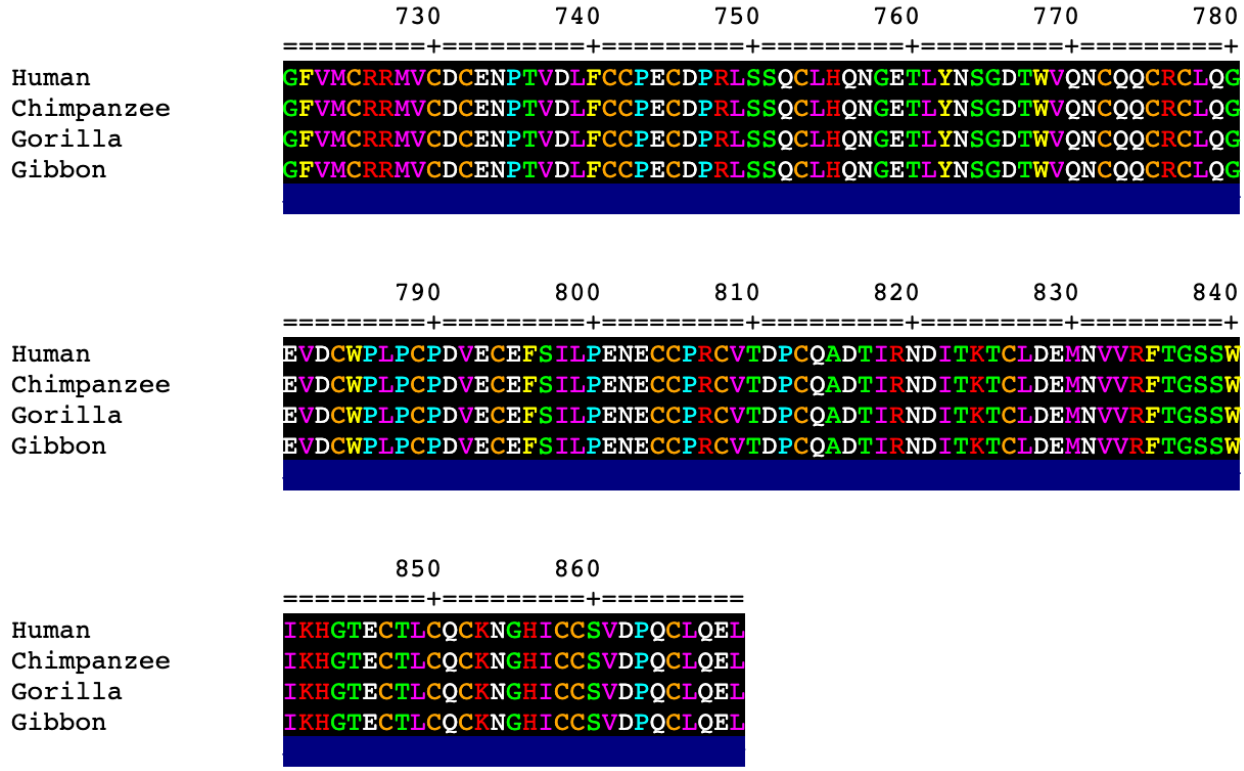
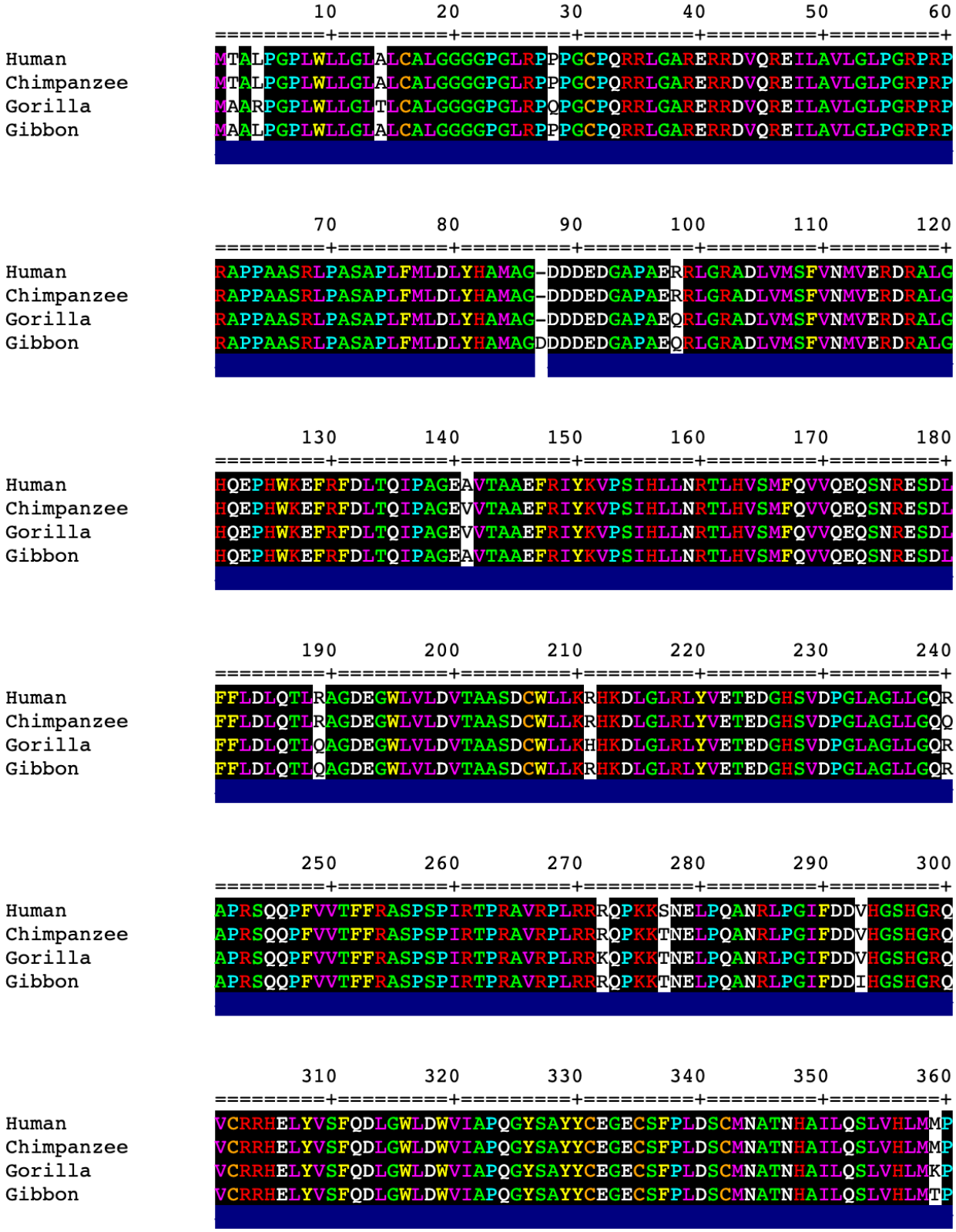


S3 Fig: Protein alignment of the NELL orthologs. Sites retained in the final alignment are underlined by the blue blocks.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Gorilla MAARPGPLWLLGLTLCALGGGGPGLRPQPGCPQRRLGARERRDVQREILAVLGLPGRPRP
Gibbon MAALPGPLWLLGLALCALGGGGPGLRPPPGCPQRRLGARERRDVQREILAVLGLPGRPRP
70 80 90 100 110 120
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Chimpanzee RAPPAASRLPASAPLFMLDLYHAMAG-DDDEDGAPAERRLGRADLVMSFVNMVERDRALG
Gorilla RAPPAASRLPASAPLFMLDLYHAMAG-DDDEDGAPAEQRLGRADLVMSFVNMVERDRALG
Gibbon RAPPAASRLPASAPLFMLDLYHAMAGDDDDEDGAPAEQRLGRADLVMSFVNMVERDRALG
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Gibbon HQEPHWKEFRFDLTQIPAGEAVTAAEFRIYKVPSIHLLNRTLHVSMFQVVQEQSNRESDL
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Gorilla FFLDLQTLQAGDEGWLVLDVTAASDCWLLKHHKDLGLRLYVETEDGHSVDPGLAGLLGQR
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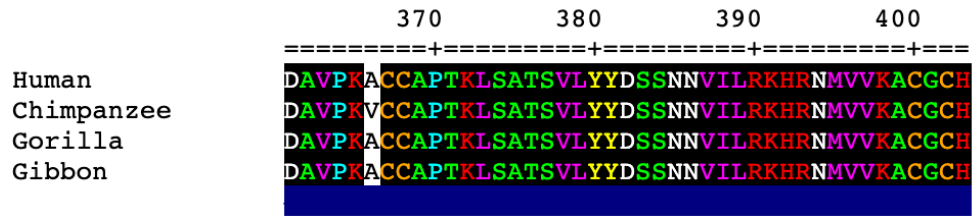
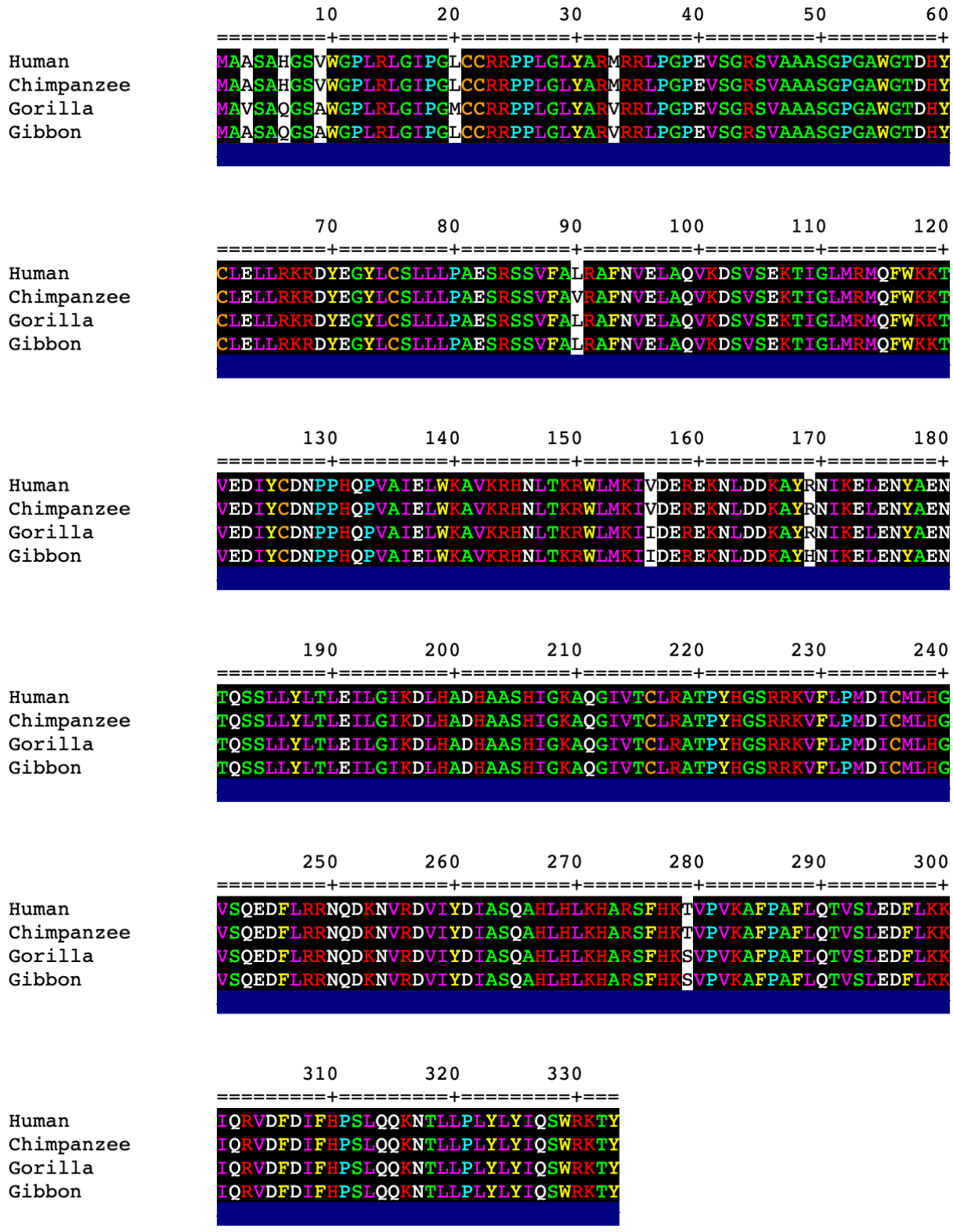
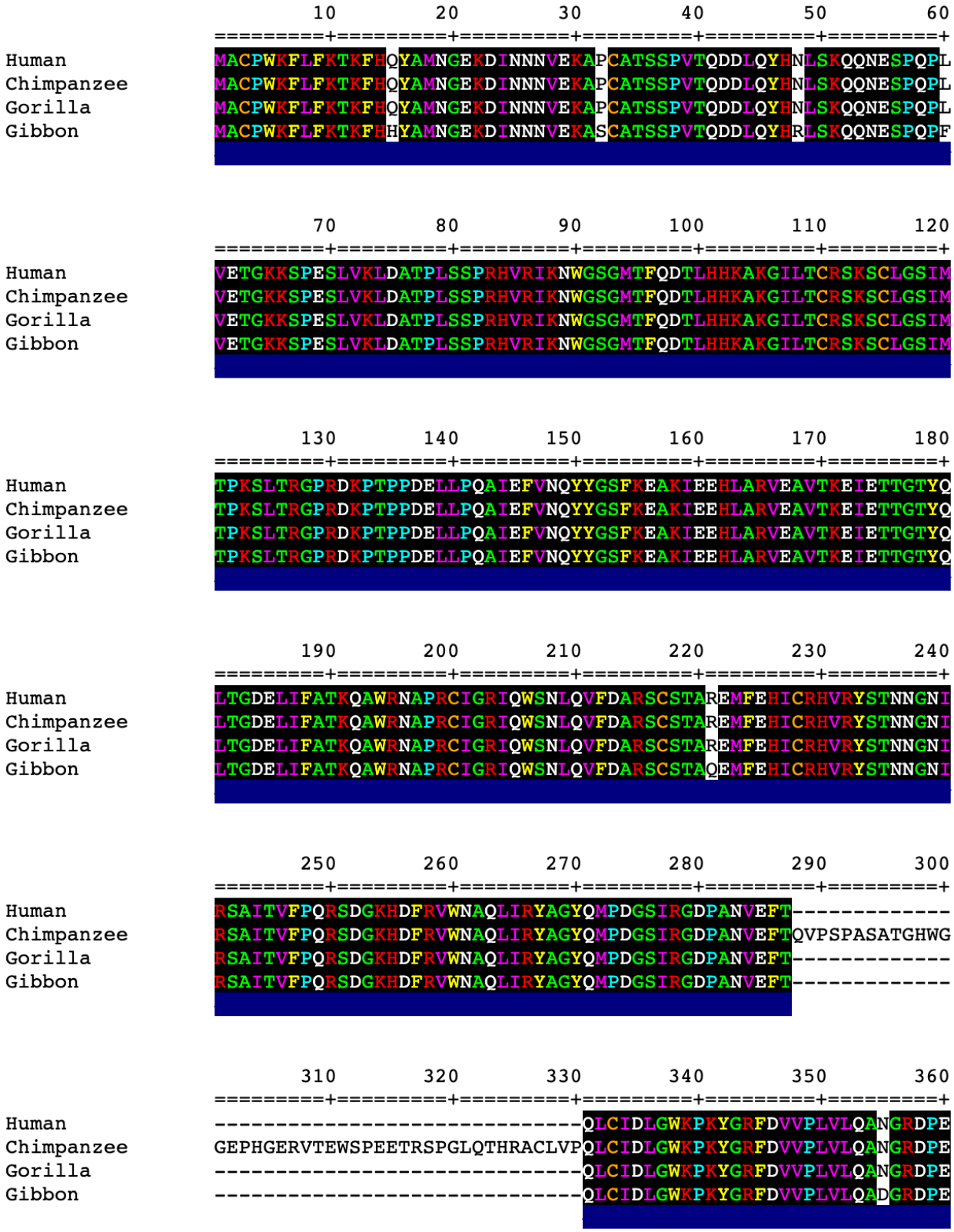


S4 Fig: Protein alignment of the BMP8B orthologs. Sites retained in the final alignment are underlined by the blue blocks.



S5 Fig: Protein alignment of the NDUFAF6 orthologs. Sites retained in the final alignment are underlined by the blue blocks.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Gorilla MACPWKFLFKTKFHQYAMNGEKDINNNVEKAPCATSSPVTQDDLQYHNLSKQQNESPQPL
Gibbon MACPWKFLFKTKFHHYAMNGEKDINNNVEKASCATSSPVTQDDLQYHRLSKQQNESPQPF
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Gorilla VETGKKSPESLVKLDATPLSSPRHVRIKNWGSGMTFQDTLHHKAKGILTCRSKSCLGSIM
Gibbon VETGKKSPESLVKLDATPLSSPRHVRIKNWGSGMTFQDTLHHKAKGILTCRSKSCLGSIM
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Chimpanzee TPKSLTRGPRDKPTPPDELLPQAIEFVNQYYGSFKEAKIEEHLARVEAVTKEIETTGTYQ
Gorilla TPKSLTRGPRDKPTPPDELLPQAIEFVNQYYGSFKEAKIEEHLARVEAVTKEIETTGTYQ
Gibbon TPKSLTRGPRDKPTPPDELLPQAIEFVNQYYGSFKEAKIEEHLARVEAVTKEIETTGTYQ
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Gorilla LTGDELIFATKQAWRNAPRCIGRIQWSNLQVFDARSCSTAREMFEHICRHVRYSTNNGNI
Gibbon LTGDELIFATKQAWRNAPRCIGRIQWSNLQVFDARSCSTAQEMFEHICRHVRYSTNNGNI
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Chimpanzee RSAITVFPQRSDGKHDFRVWNAQLIRYAGYQMPDGSIRGDPANVEFTQVPSPASATGHWG
Gorilla RSAITVFPQRSDGKHDFRVWNAQLIRYAGYQMPDGSIRGDPANVEFT----------
Gibbon RSAITVFPQRSDGKHDFRVWNAQLIRYAGYQMPDGSIRGDPANVEFT----------
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Chimpanzee GEPHGERVTEWSPEETRSPGLQTHRACLVPQLCIDLGWKPKYGRFDVVPLVLQANGRDPE
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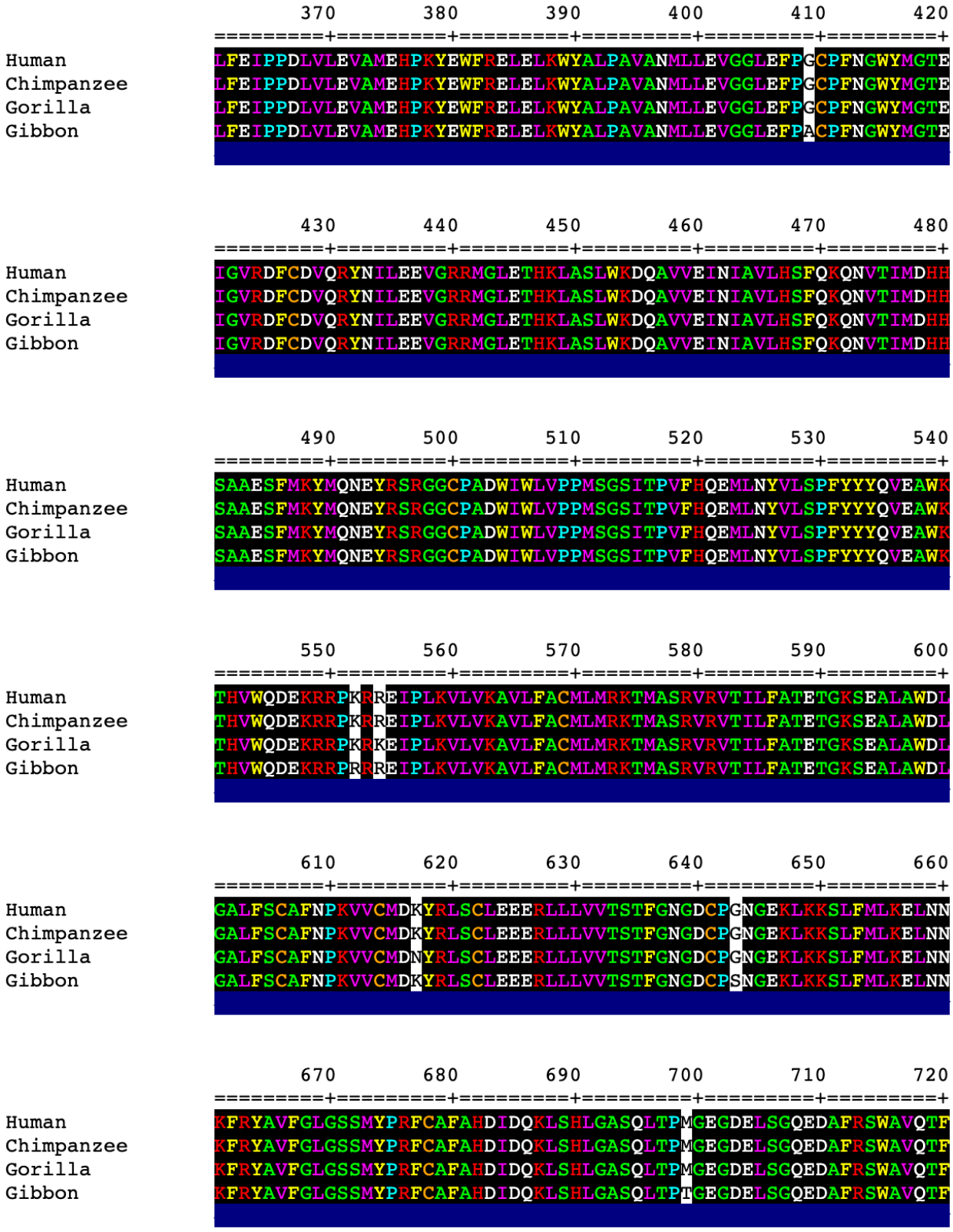
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Gorilla LFEIPPDLVLEVAMEHPKYEWFRELELKWYALPAVANMLLEVGGLEFPGCPFNGWYMGTE
Gibbon LFEIPPDLVLEVAMEHPKYEWFRELELKWYALPAVANMLLEVGGLEFPACPFNGWYMGTE
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Gibbon IGVRDFCDVQRYNILEEVGRRMGLETHKLASLWKDQAVVEINIAVLHSFQKQNVTIMDHH
490 500 510 520 530 540
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Human THVWQDEKRRPKRREIPLKVLVKAVLFACMLMRKTMASRVRVTILFATETGKSEALAWDL
Chimpanzee THVWQDEKRRPKRREIPLKVLVKAVLFACMLMRKTMASRVRVTILFATETGKSEALAWDL
Gorilla THVWQDEKRRPKRKEIPLKVLVKAVLFACMLMRKTMASRVRVTILFATETGKSEALAWDL
Gibbon THVWQDEKRRPRRREIPLKVLVKAVLFACMLMRKTMASRVRVTILFATETGKSEALAWDL
610 620 630 640 650 660
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670 680 690 700 710 720
Human KFRYAVFGLGSSMYPRFCAFAHDIDQKLSHLGASQLTPMGEGDELSGQEDAFRSWAVQTF
Chimpanzee KFRYAVFGLGSSMYPRFCAFAHDIDQKLSHLGASQLTPMGEGDELSGQEDAFRSWAVQTF
Gorilla KFRYAVFGLGSSMYPRFCAFAHDIDQKLSHLGASQLTPMGEGDELSGQEDAFRSWAVQTF
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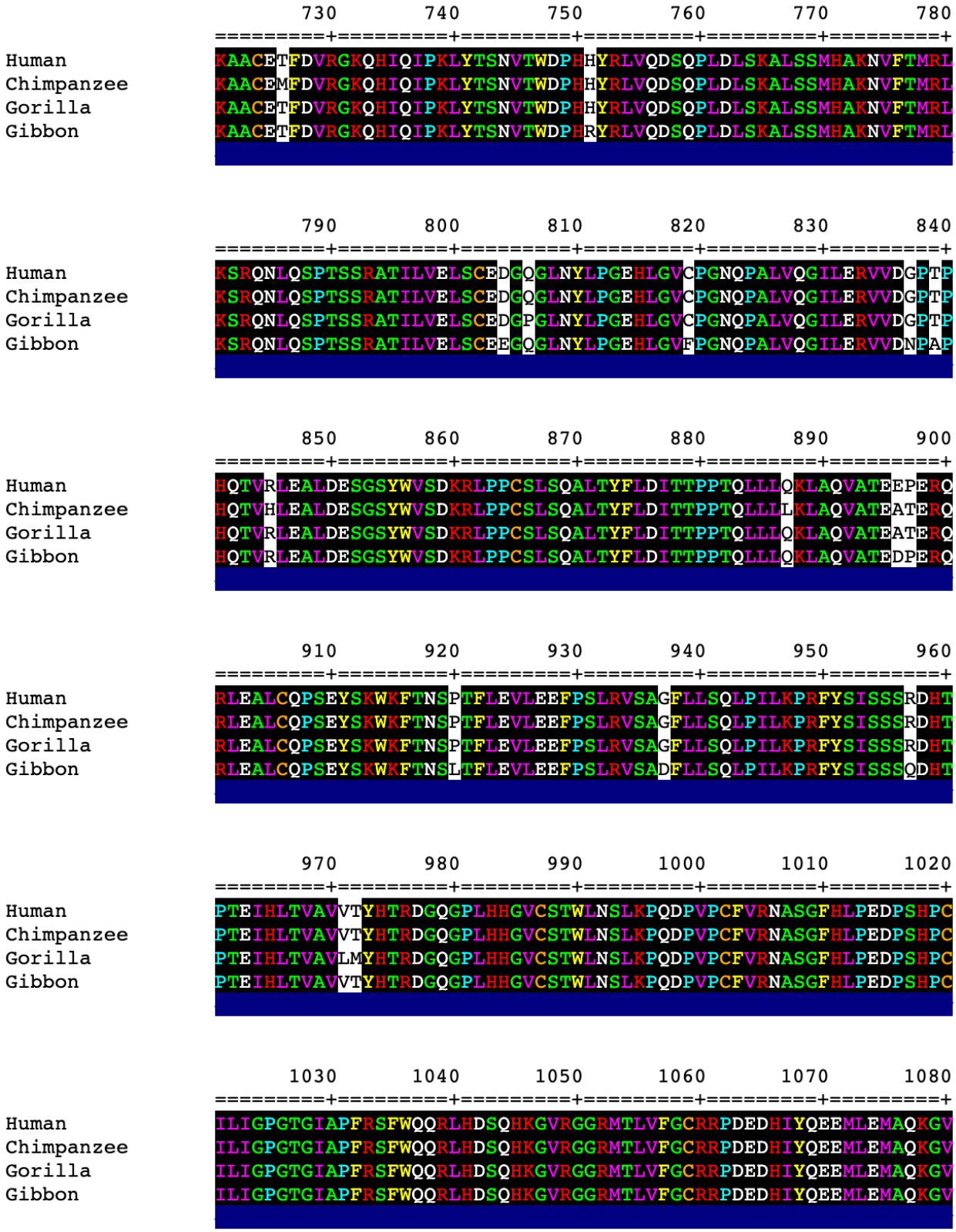
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Gibbon KSRQNLQSPTSSRATILVELSCEEGQGLNYLPGEHLGVFPGNQPALVQGILERVVDNPAP
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Gorilla HQTVRLEALDESGSYWVSDKRLPPCSLSQALTYFLDITTPPTQLLLQKLAQVATEATERQ
Gibbon HQTVRLEALDESGSYWVSDKRLPPCSLSQALTYFLDITTPPTQLLLQKLAQVATEDPEPQ
910 920 930 940 950 960
Human RLEALCQPSEYSKWKFTNSPTFLEVLEEFPSLRVSAGFLLSQLPILKPRFYSISSSRDHT
Chimpanzee RLEALCQPSEYSKWKFTNSPTFLEVLEEFPSLRVSAGFLLSQLPILKPRFYSISSSRDHT
Gorilla RLEALCQPSEYSKWKFTNSPTFLEVLEEFPSLRVSAGFLLSQLPILKPRFYSISSSRDHT
Gibbon RLEALCQPSEYSKWKFTNSLTFLEVLEEFPSLRVSADFLLSQLPILKPRFYSISSSQDHT
970 980 990 1000 1010 1020
Human PTEIHLTVAVVTYHTRDGQGPLHHGVCSTWLNSLKPQDPVPCFVRNASGFHLPEDPSHPC
Chimpanzee PTEIHLTVAVVTYHTRDGQGPLHHGVCSTWLNSLKPQDPVPCFVRNASGFHLPEDPSHPC
Gorilla PTEIHLTVAVLMYHTRDGQGPLHHGVCSTWLNSLKPQDPVPCFVRNASGFHLPEDPSHPC
Gibbon PTEIHLTVAVVTYHTRDGQGPLHHGVCSTWLNSLKPQDPVPCFVRNASGFHLPEDPSHPC
1030 1040 1050 1060 1070 1080
Human ILIGPGTGIAPFRSFWQQRLHDSQHKGVRGGRMTLVFGCRRPDEDHIYQEEMLEMAQKGV
Chimpanzee ILIGPGTGIAPFRSFWQQRLHDSQHKGVRGGRMTLVFGCRRPDEDHIYQEEMLEMAQKGV
Gorilla ILIGPGTGIAPFRSFWQQRLHDSQHKGVRGGRMTLVFGCRRPDEDHIYQEEMLEMAQKGV
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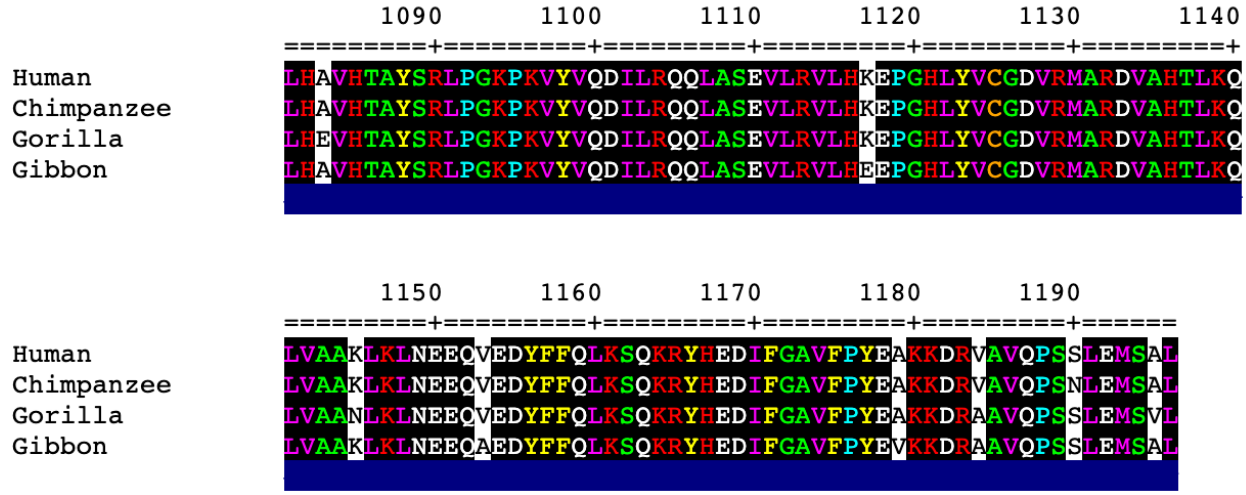

S6 Fig: Protein alignment of the NOS2 orthologs. Sites retained in the final alignment are underlined by the blue blocks.

S1 Table: Lower than expected substitution rate on the gibbon branch

Gene	Gibbon % subs per site	Gibbon norm branch length	Human subs	Chimp subs	Gorilla subs	#1# subs	Gibbon subs	Align overlap	Align Sat	Higher in
ASIC1	0.00	0.04	0	20	0	0	0	307	64.09	Chimpanzee
CALU	0.00	0.04	0	20	0	0	0	320	99.07	Chimpanzee
ZDHHC3	0.00	0.05	0	0	12	1	0	274	82.28	Gorilla
POLR2A	0.00	0.06	12	0	1	0	0	1904	97.14	
SNAP25	0.00	0.07	0	0	9	0	0	206	100.00	Gorilla
HM13	0.00	0.07	0	9	0	0	0	363	85.21	Chimpanzee
SRF	0.00	0.07	0	1	8	0	0	358	75.69	Gorilla
VPS45	0.00	0.08	6	0	2	0	0	550	95.16	
NELL2	0.00	0.08	1	3	4	0	0	826	98.45	
DACT3	0.00	0.08	7	0	0	0	0	180	99.45	Human
ITPKA	0.00	0.08	0	0	7	0	0	312	75.54	Gorilla
PGM1	0.00	0.08	7	0	0	0	0	474	81.72	Human
GRIA4	0.00	0.08	1	5	1	0	0	897	99.45	
GABRD	0.00	0.09	0	0	6	0	0	319	70.42	Gorilla
NEURL1	0.00	0.09	0	6	0	0	0	446	82.14	Chimpanzee
CAAP1	0.00	0.09	0	2	4	0	0	342	98.84	
BLVRB	0.00	0.10	4	0	1	0	0	180	87.38	Human
PAX5	0.00	0.10	0	0	5	0	0	364	93.09	
LANCL3	0.00	0.10	0	0	5	0	0	400	97.09	
HERC2	0.00	0.10	0	0	5	0	0	411	78.59	
APBB1	0.00	0.10	0	5	0	0	0	495	86.24	
KDM2A	0.00	0.10	0	0	5	0	0	664	91.84	
ZC3H7A	0.10	0.11	2	2	9	0	1	971	100.00	
UPRT	0.00	0.11	0	4	0	0	0	138	79.77	Chimpanzee
PAICS	0.24	0.11	3	2	7	0	1	421	98.14	Gorilla
PDCL	0.00	0.11	4	0	0	0	0	301	100.00	
UNC93B1	0.00	0.11	0	0	4	0	0	343	84.28	
SEPT7	0.00	0.11	0	0	4	0	0	346	90.10	
DYRK2	0.00	0.11	0	0	4	0	0	577	96.65	
ACAP2	0.00	0.11	0	0	4	0	0	732	97.21	
BMP8B	0.25	0.12	1	2	5	3	1	402	100.00	
SLC9A3	0.17	0.12	6	1	3	1	1	593	78.54	
AASS	0.11	0.13	2	1	5	1	1	872	97.76	
CACUL1	0.28	0.14	1	1	6	0	1	352	95.65	Gorilla
GMPS	0.20	0.14	0	7	1	0	1	506	86.20	Chimpanzee
NDUFAF6	0.30	0.14	0	1	2	5	1	333	100.00	#1#
ZDHHC8	0.15	0.14	0	7	1	0	1	684	89.41	
POU2F3	0.23	0.14	4	2	2	0	1	427	97.94	
METTL11B	0.37	0.15	1	1	5	0	1	272	97.84	Gorilla
GFPT2	0.15	0.15	0	1	5	1	1	654	98.20	
SIM1	0.13	0.15	4	3	0	0	1	765	99.87	
AMPD3	0.13	0.15	3	0	4	0	1	774	99.74	
GRIA1	0.11	0.15	1	1	5	0	1	912	99.56	
BIN2	0.38	0.16	6	2	3	1	2	532	98.15	
COPB2	0.22	0.17	1	0	10	0	2	889	99.44	
TATDN1	0.35	0.17	1	1	4	0	1	284	95.62	
NFATC1	0.15	0.17	1	5	0	0	1	665	77.96	
NUDT9	0.58	0.17	3	3	4	1	2	345	98.85	
TBX18	0.18	0.17	0	1	4	1	1	550	95.16	
MYEF2	0.17	0.17	4	1	1	0	1	600	100.00	
SLC25A24	0.46	0.18	0	0	10	0	2	436	95.20	Gorilla
GLDC	0.21	0.18	2	2	4	2	2	935	100.00	
SPTBN4	0.08	0.18	2	4	3	1	2	2389	96.56	
PCBP3	0.38	0.18	0	5	0	0	1	260	78.31	Chimpanzee
PAX6	0.28	0.18	0	5	0	0	1	354	81.19	
DNAJC9	0.41	0.18	0	4	1	0	1	241	97.57	Chimpanzee
ESRRA	0.24	0.18	0	0	5	0	1	422	100.00	
SCAMP1	0.34	0.18	1	4	0	0	1	290	92.65	
SYT12	0.24	0.18	1	0	4	0	1	420	100.00	
CLIP2	0.30	0.18	2	2	9	1	3	1010	96.56	
LONP1	0.15	0.18	0	1	4	0	1	664	91.97	
XPO4	0.09	0.18	0	5	0	0	1	1078	94.48	
ADAM23	0.12	0.18	0	0	4	1	1	832	100.00	
TBXA2R	0.61	0.19	1	0	8	0	2	328	95.63	Gorilla
NACC2	0.52	0.19	1	2	6	0	2	382	78.60	
NMBR	0.51	0.19	2	3	4	0	2	390	100.00	
PLCD3	0.29	0.19	1	5	3	0	2	682	88.57	
ZNF707	0.55	0.19	2	4	2	1	2	366	98.65	
ITPR1	0.08	0.19	8	0	1	0	2	2652	98.22	
RCOR3	0.20	0.20	0	0	4	0	1	508	92.87	
CCT6B	0.58	0.20	1	3	6	2	3	515	97.17	
PTCHD4	0.24	0.20	4	0	4	0	2	846	100.00	
RBMX2	0.63	0.20	1	1	4	2	2	320	99.38	

INSC	0.35	0.20	4	1	3	0	2	569	100.00	
ADAMTS19	0.19	0.20	5	0	2	1	2	1059	99.53	
NUP107	0.32	0.20	5	5	1	1	3	925	100.00	
TMEM245	0.34	0.21	4	2	5	0	3	872	99.32	
MEX3A	0.47	0.21	0	0	7	0	2	424	94.64	Gorilla
MEX3B	0.36	0.21	1	1	5	0	2	549	96.49	
ZBTB24	0.29	0.21	1	1	5	0	2	695	99.86	
MCM4	0.24	0.21	2	0	5	0	2	851	98.84	
TMEM43	0.50	0.21	1	2	4	0	2	400	100.00	
GPAM	0.24	0.21	3	0	4	0	2	828	100.00	
TAX1BP1	0.51	0.22	3	4	6	1	4	778	99.87	
TLN2	0.14	0.22	2	6	2	0	3	2125	92.84	
GALNT14	0.54	0.22	2	4	3	1	3	554	100.00	
CDH24	0.50	0.23	6	5	2	0	4	793	96.83	
ULK1	0.77	0.23	2	12	2	0	5	646	76.00	Chimpanzee
ADA	0.57	0.23	5	1	0	0	2	352	96.97	
NIM1K	0.46	0.23	0	1	5	0	2	436	100.00	
NUMBL	0.35	0.23	0	0	5	1	2	575	95.67	
PDSS2	0.50	0.23	4	0	2	0	2	399	100.00	
ATP6AP1	0.47	0.23	0	2	4	0	2	422	94.62	
ALDH1A2	0.40	0.23	2	0	4	0	2	500	96.53	
MGAT4B	0.39	0.23	0	1	1	4	2	507	92.52	
GALNT3	0.32	0.23	1	4	1	0	2	633	100.00	
NR2C1	0.51	0.24	3	5	1	0	3	592	98.18	
PRR12	0.21	0.24	2	3	4	0	3	1435	99.03	
TTC17	0.26	0.24	1	3	4	1	3	1141	100.00	
PCDH8	0.32	0.24	2	4	2	1	3	928	95.38	
SEC23IP	0.40	0.24	6	4	2	0	4	992	99.20	
NUP205	0.20	0.24	2	5	5	0	4	1998	99.30	
SIPA1L2	0.23	0.24	4	3	5	0	4	1722	100.00	
TP53BP2	0.44	0.24	5	6	3	1	5	1125	99.21	
FBXL4	0.81	0.24	4	5	4	2	5	621	100.00	
CHPF	0.39	0.25	6	1	1	0	3	763	99.22	
LACTB	0.55	0.25	3	0	5	0	3	547	100.00	
TRAF5	0.54	0.25	5	0	3	0	3	557	100.00	
FLNB	0.16	0.25	5	3	3	0	4	2541	98.30	
AMOTL1	0.32	0.25	1	3	4	0	3	938	98.12	
CAMSAP2	0.27	0.25	2	6	1	2	4	1464	98.32	
CIC	0.21	0.25	5	2	6	1	5	2353	98.66	
BAG6	0.37	0.25	4	2	5	0	4	1073	95.89	
SLC26A7	0.47	0.25	2	2	4	0	3	635	97.54	
FAM135A	0.54	0.25	4	7	10	2	8	1470	97.03	
TPX2	0.63	0.25	3	3	5	0	4	634	90.96	
CRBN	0.62	0.25	4	2	2	0	3	487	99.39	
GNL2	0.41	0.25	1	2	4	1	3	730	100.00	
MANEA	0.65	0.25	2	4	2	0	3	462	100.00	
GATAD2A	0.47	0.25	1	1	4	2	3	634	100.00	
MAP9	0.65	0.25	1	2	4	1	3	464	100.00	
NID1	0.56	0.26	6	5	5	3	7	1247	100.00	
CDC42BPB	0.27	0.26	2	5	3	0	4	1462	91.78	
AFDN	0.23	0.26	1	4	4	1	4	1709	95.32	
EML6	0.22	0.26	3	4	2	1	4	1858	97.79	
SLC26A4	0.51	0.26	5	2	3	0	4	780	100.00	
CLSTN2	0.46	0.26	4	4	2	0	4	868	95.91	
ELOA	0.54	0.26	4	3	3	0	4	747	100.00	
NDST4	0.46	0.26	2	4	2	2	4	872	100.00	
SORBS1	0.46	0.27	6	3	5	1	6	1293	100.00	
SLC4A2	0.47	0.27	1	2	9	0	5	1055	95.39	
DDX18	0.75	0.27	7	3	1	1	5	670	100.00	
LGR6	0.89	0.27	7	6	6	1	8	896	100.00	
GRIP2	0.88	0.28	12	6	7	0	10	1132	99.30	Human
RET	0.82	0.28	12	7	3	0	9	1097	98.47	Human
MYOM1	0.60	0.28	13	3	2	1	8	1333	97.16	Human
DPP6	0.64	0.29	2	5	4	0	5	786	97.88	
IQSEC1	0.47	0.29	4	2	2	3	5	1066	97.09	
IGSF22	0.55	0.30	10	1	4	0	7	1281	98.69	
LRIG2	0.81	0.30	3	8	3	1	7	859	87.03	
KIF16B	0.65	0.30	4	3	8	4	9	1392	100.00	
CEP128	0.92	0.31	6	8	6	1	10	1091	99.73	
LUZP1	0.93	0.31	7	4	6	3	10	1076	100.00	
TMC3	1.00	0.32	7	7	7	1	11	1100	100.00	
PCDH15	0.92	0.32	8	11	13	2	17	1847	98.72	
HERC1	0.23	0.32	7	6	7	1	11	4854	100.00	
LCT	1.19	0.35	11	11	10	9	23	1927	100.00	

S2 Table: Lower than expected substitution rate on the human branch

Gene	Human % subs per site	Human norm branch length	Human subs	Chimp subs	Gorilla subs	#1# subs	Gibbon subs	Align overlap	Align Sat	Higher in
CEP295NL	0.00	0.01	0	5	9	7	41	589	98.66	Gibbon
PODXL	0.00	0.02	0	4	7	1	39	478	85.97	Gibbon
C2orf81	0.00	0.02	0	4	9	2	33	537	99.63	Gibbon
HSF5	0.00	0.02	0	3	7	2	32	593	99.50	Gibbon
PTCD3	0.00	0.02	0	5	6	2	29	686	99.56	Gibbon
MUC1	0.00	0.02	0	3	6	0	29	470	97.31	Gibbon
LEKR1	0.00	0.02	0	1	6	0	31	692	100.00	Gibbon
RIPK1	0.00	0.02	0	4	2	2	30	671	100.00	Gibbon
NOS2	0.00	0.03	0	4	8	1	21	1153	100.00	
PER2	0.00	0.03	0	3	4	3	22	1255	100.00	
SEL1L2	0.00	0.03	0	5	4	1	21	688	100.00	Gibbon
RFC1	0.00	0.03	0	3	4	2	22	1102	97.52	
USP54	0.00	0.03	0	7	6	1	17	1437	100.00	
CD4	0.00	0.03	0	4	7	3	15	458	100.00	
CEP68	0.00	0.03	0	2	10	2	15	573	98.79	Gorilla
CAGE1	0.12	0.03	1	6	13	0	42	839	100.00	Gibbon
IFT81	0.00	0.03	0	1	4	0	23	676	100.00	Gibbon
CCPG1	0.00	0.03	0	3	4	1	20	786	97.64	
GCM2	0.00	0.03	0	5	7	3	13	506	100.00	
TEX11	0.11	0.03	1	10	11	2	36	906	99.34	Gibbon
CHFR	0.00	0.03	0	2	5	1	19	543	85.92	Gibbon
C10orf67	0.00	0.03	0	4	2	4	17	547	99.64	
ITGA10	0.00	0.03	0	5	4	0	18	1167	100.00	
C3orf20	0.12	0.03	1	3	11	3	39	853	99.53	Gibbon
ATF7IP2	0.00	0.03	0	3	4	0	19	671	99.70	Gibbon
SYNPO2L	0.00	0.03	0	3	5	0	18	976	99.90	
IARS	0.00	0.03	0	3	8	1	14	1136	96.35	
RSL1D1	0.00	0.03	0	2	5	1	17	490	100.00	
VARS2	0.00	0.03	0	4	3	0	18	1010	94.75	
FAM171A1	0.00	0.03	0	2	10	0	13	851	97.15	
ZNF536	0.00	0.03	0	1	7	2	15	1299	99.92	
MAPKBP1	0.07	0.03	1	7	20	2	24	1497	98.88	Gorilla
KIAA1257	0.00	0.03	0	3	6	1	14	558	97.55	
MBD4	0.00	0.03	0	3	7	1	13	578	100.00	
DEPDC1	0.00	0.03	0	4	4	1	15	722	100.00	
PLA2G6	0.00	0.03	0	3	8	0	13	751	93.29	
SWT1	0.00	0.04	0	2	5	1	15	521	94.90	
NOX3	0.00	0.04	0	4	8	0	11	568	100.00	Gorilla
ATG9B	0.00	0.04	0	2	6	2	13	757	96.80	
USP38	0.00	0.04	0	4	3	0	16	977	100.00	
SMYD4	0.00	0.04	0	4	3	4	12	683	91.80	
KIF9	0.00	0.04	0	4	7	0	12	790	100.00	
CENPC	0.11	0.04	1	5	7	1	35	943	100.00	Gibbon
CCDC77	0.00	0.04	0	3	4	0	15	474	99.79	
SERGEF	0.00	0.04	0	5	2	1	14	454	99.34	
TRMT61B	0.00	0.04	0	4	3	1	14	464	97.68	
SPINT1	0.00	0.04	0	1	6	2	13	523	98.87	
TREH	0.00	0.04	0	3	6	0	13	582	99.83	
TRPM6	0.05	0.04	1	4	7	1	36	2007	99.50	
SETMAR	0.00	0.04	0	3	5	1	13	684	100.00	
USP43	0.00	0.04	0	4	3	0	15	1103	100.00	
PIWIL4	0.00	0.04	0	5	7	0	10	806	99.38	
PELP1	0.00	0.04	0	4	2	1	15	1159	98.30	
PNLDC1	0.00	0.04	0	5	2	2	12	505	97.12	
RPS6KL1	0.00	0.04	0	2	8	2	9	549	100.00	Gorilla
DNTTIP2	0.00	0.04	0	2	7	0	12	753	99.87	
UTP14A	0.00	0.04	0	5	4	0	12	754	98.69	
INPP5D	0.00	0.04	0	3	4	0	14	1027	96.34	
PHKB	0.00	0.04	0	10	2	0	9	1084	99.18	
ZNF16	0.00	0.04	0	7	1	1	11	627	94.86	
CCDC80	0.00	0.04	0	2	5	0	13	921	98.82	
MAPK8IP3	0.00	0.04	0	6	3	0	11	1189	90.49	
CKAP5	0.00	0.04	0	3	4	0	13	1989	97.88	
SMC1B	0.08	0.04	1	6	4	0	33	1197	98.76	Gibbon
CTTN	0.00	0.04	0	1	4	1	13	512	93.26	
SELENOO	0.00	0.04	0	2	5	0	12	509	100.00	
CYP17A1	0.00	0.04	0	1	6	1	11	503	99.41	
SSC4D	0.00	0.04	0	4	5	0	10	469	100.00	
RXFP1	0.00	0.04	0	1	9	0	9	726	96.16	
THNSL1	0.00	0.04	0	1	5	2	11	743	100.00	
IQCA1	0.00	0.04	0	4	1	2	12	830	100.00	
ANO6	0.00	0.04	0	1	11	0	7	901	97.83	Gorilla
SEMA7A	0.00	0.04	0	4	6	2	7	664	100.00	

NOL6	0.09	0.04	1	3	5	2	30	1111	96.95	Gibbon
FAM124A	0.00	0.04	0	2	4	0	12	582	100.00	
TFR2	0.00	0.04	0	4	1	1	12	610	87.39	
B4GALNT4	0.00	0.04	0	2	4	0	12	627	71.41	
METTL25	0.00	0.04	0	3	4	1	10	603	100.00	
BACH1	0.00	0.04	0	2	5	1	10	736	100.00	
LBR	0.00	0.04	0	6	4	1	7	615	100.00	
JMY	0.00	0.04	0	6	2	0	10	930	100.00	
NCOR1	0.00	0.04	0	3	5	0	10	2360	98.91	
OTOL1	0.00	0.05	0	1	6	0	10	463	98.51	
ZWILCH	0.00	0.05	0	1	7	0	9	513	92.93	Gorilla
P3H3	0.00	0.05	0	2	4	0	11	736	100.00	
SPICE1	0.00	0.05	0	5	3	0	9	673	93.47	
DCLK3	0.00	0.05	0	2	4	0	11	817	100.00	
STAT6	0.00	0.05	0	1	7	0	9	839	99.64	
WDR63	0.00	0.05	0	5	1	1	10	836	97.55	
GAS2L3	0.00	0.05	0	2	5	2	8	694	100.00	
BMP2K	0.00	0.05	0	1	4	0	12	1138	99.56	
LOXL4	0.00	0.05	0	4	5	1	7	756	100.00	
NEFH	0.12	0.05	1	4	4	3	25	834	96.08	Gibbon
TTLL13P	0.13	0.05	1	5	6	3	22	775	97.12	
BRIP1	0.08	0.05	1	3	6	0	27	1215	98.86	
NUP210L	0.11	0.05	2	7	6	3	40	1777	96.31	
NARFL	0.00	0.05	0	2	4	0	10	464	97.68	
MIEF2	0.00	0.05	0	2	4	1	9	461	99.35	
CAPN15	0.00	0.05	0	1	8	0	7	565	80.48	Gorilla
ZSCAN22	0.00	0.05	0	4	4	0	8	489	99.59	
ABHD15	0.00	0.05	0	4	5	0	7	468	100.00	
ZBTB47	0.00	0.05	0	4	2	0	10	648	98.93	
VPS9D1	0.00	0.05	0	4	3	0	9	631	100.00	
CRIM1	0.00	0.05	0	3	4	1	8	925	100.00	
CCDC39	0.12	0.05	1	4	5	0	26	867	100.00	Gibbon
MPHOSPH9	0.09	0.05	1	6	7	0	22	1147	100.00	
CEP350	0.13	0.05	4	12	18	8	55	3063	98.97	
JCAD	0.15	0.05	2	10	8	2	34	1332	98.38	Gibbon
OTOF	0.10	0.05	2	8	13	2	31	1962	99.70	
CC2D2B	0.19	0.05	2	6	5	6	36	1043	98.58	Gibbon
CIZ1	0.12	0.05	1	3	9	4	18	860	95.56	
CDKL3	0.00	0.05	0	1	4	1	9	537	100.00	
GNL3L	0.00	0.05	0	2	5	0	8	575	98.80	
AMHR2	0.00	0.05	0	2	4	1	8	573	100.00	
ASIC5	0.00	0.05	0	2	4	2	7	505	100.00	
TMCO3	0.00	0.05	0	5	2	1	7	564	84.30	
BCLAF3	0.00	0.05	0	1	6	1	7	682	100.00	
RNF216	0.00	0.05	0	2	6	2	5	705	82.65	
MAP3K15	0.00	0.05	0	7	2	0	6	943	82.43	
STARD13	0.00	0.05	0	1	6	1	7	930	100.00	
ZNF512B	0.00	0.05	0	3	5	1	6	806	94.38	
KIDINS220	0.00	0.05	0	2	6	1	6	1706	98.44	
NCOA3	0.07	0.05	1	5	3	2	23	1415	99.72	
AASDH	0.09	0.05	1	4	10	1	18	1098	100.00	
NUP160	0.07	0.05	1	8	6	5	14	1436	100.00	
CSPG4	0.20	0.05	4	13	21	7	47	2046	94.29	
ST14	0.12	0.05	1	2	6	1	23	852	99.65	Gibbon
SERINC4	0.00	0.05	0	1	4	0	9	487	94.02	
TNS2	0.07	0.05	1	4	4	0	24	1361	100.00	
BOC	0.09	0.05	1	7	5	1	19	1111	99.64	
TXLNG	0.00	0.05	0	6	1	0	7	514	98.09	
NCAPD3	0.13	0.05	2	10	15	3	22	1492	99.60	
GIGYF2	0.00	0.05	0	1	7	0	6	1217	94.41	
CDC42BPG	0.14	0.05	2	8	14	2	25	1442	98.03	
PLCB2	0.09	0.05	1	2	8	1	20	1083	100.00	
FUK	0.10	0.05	1	6	6	1	18	1004	94.10	
TNRC6C	0.05	0.05	1	2	11	0	18	1865	97.75	
TTLL4	0.20	0.05	2	3	13	3	29	1015	94.07	
PLEKHG2	0.14	0.05	2	8	9	2	29	1383	99.78	
INCENP	0.11	0.06	1	2	7	2	19	903	100.00	
TNS3	0.07	0.06	1	2	4	1	23	1359	96.93	
CEP135	0.09	0.06	1	6	4	1	19	1140	100.00	
SNAP47	0.00	0.06	0	2	4	1	6	463	99.78	
LRRC45	0.00	0.06	0	1	5	0	7	659	99.10	
PCNX1	0.04	0.06	1	7	4	1	18	2251	97.03	
IGF2R	0.12	0.06	3	7	7	4	45	2440	99.27	
FGD5	0.16	0.06	2	3	7	2	34	1241	96.20	Gibbon
SETX	0.28	0.06	7	23	20	1	84	2511	97.48	Gibbon
TDRD1	0.17	0.06	2	4	7	3	31	1149	99.65	Gibbon
GPR179	0.30	0.06	7	11	21	3	89	2347	99.75	Gibbon
EGFLAM	0.11	0.06	1	2	5	0	21	911	94.90	

TTF2	0.17	0.06	2	6	6	4	28	1161	100.00	
FHDC1	0.18	0.06	2	7	11	3	23	1120	99.82	
CFAP61	0.16	0.06	2	6	15	1	22	1236	99.92	Gorilla
GAK	0.09	0.06	1	3	6	3	16	1072	87.87	
ABCA12	0.08	0.06	2	11	10	1	22	2547	99.88	
WDR64	0.19	0.06	2	8	7	4	24	1049	99.71	
MST1R	0.15	0.06	2	4	10	5	24	1312	100.00	
MPDZ	0.10	0.06	2	6	14	3	20	2048	98.27	
MASTL	0.11	0.06	1	5	4	1	17	877	99.89	
HEPHL1	0.09	0.06	1	3	5	0	19	1153	100.00	
POLG	0.08	0.06	1	2	7	2	16	1225	99.59	
ANKAR	0.07	0.06	1	4	5	0	18	1434	100.00	
UHRF1BP1	0.07	0.06	1	3	6	3	15	1440	100.00	
CCDC18	0.21	0.06	3	6	11	2	38	1453	100.00	Gibbon
AXDND1	0.20	0.06	2	6	5	4	26	1009	99.80	
C5	0.13	0.06	2	5	6	2	28	1586	96.35	
RIN1	0.13	0.06	1	5	5	2	14	782	100.00	
MYOM2	0.10	0.06	1	3	7	1	15	1028	80.50	
THADA	0.23	0.06	4	8	9	1	52	1772	94.56	Gibbon
TACC1	0.13	0.06	1	2	6	1	16	759	97.18	
WDHD1	0.09	0.06	1	2	5	0	18	1068	97.09	
RUBCN	0.11	0.06	1	8	2	0	15	932	96.48	
NLRX1	0.11	0.06	1	4	3	4	14	900	99.89	
CNTRL	0.17	0.06	4	8	15	5	40	2305	99.27	
PTPRQ	0.20	0.07	4	9	13	3	42	2011	93.75	
AP5B1	0.12	0.07	1	3	4	0	17	839	96.22	
MTR	0.08	0.07	1	1	4	0	19	1232	98.56	
SEC24A	0.09	0.07	1	5	2	0	17	1093	100.00	
LRIG3	0.09	0.07	1	3	5	1	15	1119	100.00	
TRANK1	0.07	0.07	2	6	6	3	23	2886	98.67	
CASP8AP2	0.21	0.07	4	8	8	5	44	1941	98.48	
LRIG1	0.19	0.07	2	3	5	1	28	1073	98.53	Gibbon
TTC21A	0.16	0.07	2	4	9	1	23	1285	97.35	
NPAT	0.22	0.07	3	4	10	2	34	1371	97.86	Gibbon
KNDC1	0.19	0.07	2	9	3	1	23	1038	73.46	
GPR158	0.16	0.07	2	3	7	3	23	1214	100.00	
COL12A1	0.07	0.07	2	4	4	3	25	3033	99.97	
RP1	0.30	0.07	6	17	18	3	50	2026	99.22	
CARMIL2	0.16	0.07	2	5	6	1	23	1265	93.29	
RGS3	0.17	0.07	2	3	5	3	23	1160	97.81	
IQGAP3	0.13	0.07	2	4	8	1	21	1496	94.15	
TTC28	0.09	0.07	2	4	3	1	26	2116	92.20	
BOD1L1	0.30	0.07	9	14	22	5	80	3048	100.00	Gibbon
FAM135B	0.14	0.07	2	5	5	0	23	1398	99.43	
ZFYVE26	0.16	0.08	4	6	9	1	39	2471	98.33	
MAP2	0.16	0.08	3	6	8	3	26	1827	100.00	
PDZD2	0.32	0.08	8	15	16	1	68	2523	97.11	Gibbon
ZBED9	0.23	0.08	3	4	5	2	31	1325	100.00	
ATP10B	0.21	0.08	3	3	11	3	24	1460	100.00	
MAP1A	0.26	0.08	8	10	12	9	65	3037	99.90	
NOTCH4	0.21	0.08	4	5	7	3	36	1861	97.28	
GOLGA4	0.24	0.08	5	15	9	2	36	2112	98.00	
LAMA3	0.27	0.08	8	13	16	10	55	3005	95.34	
VWF	0.25	0.08	5	8	10	5	38	1974	98.06	
REV3L	0.17	0.08	5	6	16	4	35	2893	99.97	
ZNF292	0.15	0.08	4	4	11	3	32	2653	98.48	
DNAH1	0.30	0.09	12	15	35	10	67	4060	96.90	

S3 Table: Lower than expected substitution rate on the chimpanzee branch

Gene	Chimp % subs per site	Chimp norm branch length	Human subs	Chimp subs	Gorilla subs	#1# subs	Gibbon subs	Align overlap	Align Sat	Higher in
CYLC1	0.00	0.02	1	0	7	5	35	630	97.83	Gibbon
NSD1	0.00	0.02	8	0	5	1	29	2618	99.47	
TROAP	0.00	0.02	3	0	4	2	31	771	97.10	Gibbon
SDK2	0.00	0.02	3	0	5	1	31	1893	94.65	
LTN1	0.00	0.02	6	0	6	3	21	1763	100.00	
C1orf87	0.00	0.03	2	0	5	0	27	546	100.00	Gibbon
ADGRG7	0.00	0.03	2	0	3	4	25	797	100.00	Gibbon
CD3EAP	0.00	0.03	4	0	8	1	20	501	98.43	
KCTD19	0.00	0.03	2	0	5	2	23	734	95.82	Gibbon
FGD3	0.00	0.03	2	0	5	3	20	678	100.00	Gibbon
CDKL2	0.00	0.03	3	0	7	2	17	505	100.00	
BICDL2	0.00	0.03	5	0	10	2	12	507	100.00	Gorilla
ADAR	0.00	0.03	5	0	5	1	18	1171	99.24	
SPAG1	0.00	0.03	2	0	8	1	17	847	97.13	
PLEKHA6	0.00	0.03	2	0	5	2	19	1133	97.67	
ARAP3	0.00	0.03	6	0	6	0	16	1490	97.32	
BFSP1	0.00	0.03	1	0	5	2	19	650	99.54	Gibbon
TCIRG1	0.00	0.03	2	0	5	5	15	830	100.00	
PER1	0.00	0.03	3	0	4	0	20	1262	99.53	
EFHC1	0.00	0.03	2	0	4	1	18	641	100.00	Gibbon
SSH3	0.00	0.03	6	0	4	0	15	598	97.71	
CC2D1B	0.00	0.03	1	0	4	2	18	771	99.87	
CHD9	0.00	0.03	2	0	9	1	13	2606	99.96	
ZNHIT6	0.00	0.03	2	0	7	0	15	467	99.79	
NUB1	0.00	0.03	3	0	4	0	17	621	97.18	Gibbon
RPAP2	0.00	0.03	2	0	5	1	16	612	100.00	
LCOR	0.06	0.03	6	1	7	2	37	1554	99.87	Gibbon
PLD2	0.00	0.03	6	0	3	0	15	933	100.00	
TMEM108	0.00	0.04	3	0	4	0	16	518	100.00	Gibbon
POLQ	0.14	0.04	10	3	18	9	67	2215	90.19	Gibbon
NOX1	0.00	0.04	1	0	7	0	15	564	100.00	
PPEF1	0.00	0.04	2	0	4	2	15	596	97.07	
HHIPL2	0.00	0.04	4	0	4	0	15	720	99.45	
CARF	0.00	0.04	8	0	5	1	9	592	100.00	Human
LLGL2	0.00	0.04	3	0	6	1	13	922	93.51	
LRRIQ4	0.00	0.04	3	0	4	0	15	560	100.00	
LETM1	0.00	0.04	3	0	7	0	12	670	94.23	
SON	0.04	0.04	9	1	8	0	31	2355	97.84	
ADGRA2	0.00	0.04	3	0	10	0	9	1028	91.13	
PLBD1	0.00	0.04	4	0	1	0	16	553	100.00	Gibbon
ZNF333	0.00	0.04	4	0	1	0	16	605	91.95	
FGD2	0.00	0.04	2	0	4	0	15	647	99.85	
CLGN	0.00	0.04	1	0	5	3	12	537	90.10	
SHQ1	0.00	0.04	1	0	6	4	10	577	100.00	
ZNF341	0.00	0.04	2	0	4	1	14	792	100.00	
MAP3K14	0.00	0.04	4	0	3	0	14	933	99.36	
ASAP3	0.00	0.04	2	0	4	2	13	902	99.89	
TMC2	0.00	0.04	6	0	3	0	12	898	99.45	
AGBL3	0.00	0.04	3	0	6	0	12	919	99.89	
CLCN1	0.00	0.04	5	0	4	0	12	976	98.79	
ALS2	0.00	0.04	3	0	5	1	12	1527	93.80	
C10orf71	0.16	0.04	12	2	7	3	47	1252	97.13	Gibbon
ACSL6	0.00	0.04	5	0	2	0	13	668	95.43	
RPUSD2	0.00	0.04	3	0	6	1	10	536	98.35	
LMTK2	0.07	0.04	5	1	9	4	26	1431	95.34	
CFAP58	0.00	0.04	1	0	6	1	12	869	100.00	
RFX7	0.00	0.04	2	0	4	1	13	1294	94.94	
KIAA1211L	0.12	0.04	4	1	5	3	31	814	96.67	Gibbon
CORIN	0.10	0.04	7	1	6	0	29	1042	100.00	Gibbon
TCTN3	0.00	0.04	2	0	7	2	8	524	96.86	
SLC5A9	0.00	0.04	3	0	5	1	10	701	99.29	
ATP6V0A2	0.00	0.04	1	0	9	0	9	856	100.00	
ATP9B	0.00	0.04	1	0	5	1	12	1034	92.40	
HEPH	0.00	0.04	2	0	4	2	11	1154	95.37	
BICRA	0.00	0.04	6	0	5	0	8	1080	78.49	
TRIP11	0.05	0.04	6	1	7	6	22	1963	99.95	
MAP3K21	0.11	0.04	4	1	9	2	25	884	99.66	
LRRC71	0.00	0.04	1	0	4	0	13	507	100.00	
TRIM66	0.08	0.04	4	1	10	1	25	1233	100.00	
BEST3	0.00	0.04	1	0	4	1	12	659	98.65	
MTA1	0.00	0.04	3	0	6	0	9	553	78.00	
TMC4	0.00	0.04	3	0	5	0	10	587	98.99	
ABI3BP	0.06	0.04	9	1	5	0	26	1651	95.88	
TIGD7	0.00	0.04	2	0	6	3	7	549	100.00	

TSC1	0.00	0.04	4	0	3	1	10	1164	100.00	
STK31	0.13	0.05	5	1	5	7	21	762	90.39	
XIRP1	0.09	0.05	5	1	8	0	25	1104	98.48	
FAM83F	0.00	0.05	4	0	1	1	11	488	97.60	
PPP2R3A	0.09	0.05	4	1	9	1	24	1150	100.00	
TMEM62	0.00	0.05	1	0	9	0	7	539	92.45	Gorilla
SLC45A4	0.00	0.05	4	0	1	0	12	744	99.73	
UNC5CL	0.00	0.05	1	0	3	4	9	518	100.00	
TSR1	0.00	0.05	1	0	4	0	12	748	99.73	
MINDY1	0.00	0.05	6	0	2	1	8	513	99.23	
NCF2	0.00	0.05	5	0	4	0	8	526	100.00	
NTN4	0.00	0.05	3	0	4	0	10	620	99.52	
RFWD3	0.00	0.05	3	0	4	2	8	728	97.33	
PLCL1	0.00	0.05	1	0	4	3	9	1095	100.00	
ZC3H13	0.00	0.05	2	0	6	1	8	1665	99.94	
LAMA5	0.12	0.05	10	2	14	1	33	1635	74.22	
GPR156	0.12	0.05	3	1	8	3	23	801	98.52	
CNTROB	0.12	0.05	3	1	9	2	23	829	95.95	
SPIDR	0.11	0.05	2	1	8	3	24	904	99.12	Gibbon
ABCG2	0.00	0.05	4	0	1	3	8	655	100.00	
ALDH1L2	0.00	0.05	3	0	4	0	9	853	96.06	
SORL1	0.05	0.05	9	1	8	0	19	2101	96.64	
KMT2E	0.00	0.05	1	0	5	1	9	1630	100.00	
FASTKD1	0.12	0.05	2	1	4	3	26	810	100.00	Gibbon
SSFA2	0.08	0.05	5	1	5	2	23	1243	100.00	
HEATR1	0.09	0.05	6	2	13	4	31	2143	100.00	
MOCOS	0.11	0.05	4	1	5	1	24	886	99.77	Gibbon
ECT2L	0.11	0.05	3	1	13	2	16	903	100.00	Gorilla
PUM3	0.00	0.05	4	0	1	0	10	647	100.00	
CD2AP	0.00	0.05	4	0	2	0	9	639	100.00	
LRRC40	0.00	0.05	3	0	6	0	6	602	100.00	
SEMA4C	0.00	0.05	1	0	4	0	10	833	100.00	
ACTN3	0.00	0.05	5	0	3	0	7	902	97.83	
SKIV2L	0.00	0.05	4	0	3	0	8	1190	97.94	
TAOK2	0.00	0.05	1	0	5	1	8	1234	99.92	
RAB3GAP2	0.00	0.05	2	0	4	0	9	1364	98.13	
CTAGE5	0.14	0.05	5	2	12	1	34	1409	99.79	Gibbon
EXO1	0.12	0.05	7	1	2	0	23	813	96.79	Gibbon
FKBP15	0.09	0.05	7	1	4	1	20	1129	92.62	
HCLS1	0.00	0.05	4	0	3	0	7	474	99.58	
PTPN7	0.00	0.05	2	0	4	1	7	465	100.00	
RFTN1	0.00	0.05	1	0	6	2	5	479	100.00	
TMEM266	0.00	0.05	1	0	4	2	7	507	97.69	
GOLGA5	0.00	0.05	4	0	2	1	7	619	91.70	
TYRO3	0.00	0.05	2	0	5	1	6	734	96.58	
FAM193B	0.00	0.05	2	0	5	1	6	751	99.87	
BBX	0.00	0.05	4	0	4	0	6	940	100.00	
TBC1D4	0.00	0.05	4	0	3	0	7	1298	100.00	
TRIO	0.00	0.05	1	0	4	0	9	2787	97.21	
PCM1	0.10	0.05	10	2	7	3	29	1945	98.93	
TXNDC11	0.11	0.05	4	1	10	1	16	881	99.77	
PLCH2	0.15	0.05	4	2	7	2	35	1293	95.07	Gibbon
IL17RA	0.12	0.06	3	1	7	1	19	809	99.02	
IMPG2	0.09	0.06	2	1	6	1	21	1165	98.73	
CEP104	0.11	0.06	4	1	8	4	14	886	99.89	
TOPBP1	0.07	0.06	5	1	5	2	18	1522	100.00	
NLRC4	0.12	0.06	2	1	4	0	23	861	99.88	Gibbon
DHX37	0.10	0.06	4	1	5	0	20	979	91.92	
HPS5	0.09	0.06	3	1	5	0	21	1100	97.43	
PMS1	0.11	0.06	2	1	6	2	18	929	99.89	
MEGF8	0.08	0.06	4	2	5	2	33	2426	94.25	
CSMD1	0.11	0.06	10	4	13	4	49	3536	100.00	
ARAP1	0.08	0.06	3	1	6	2	17	1260	91.04	
CDK12	0.07	0.06	2	1	7	2	17	1441	98.16	
ANKEF1	0.13	0.06	2	1	6	0	19	776	100.00	
PKD2L1	0.13	0.06	3	1	6	3	15	790	98.75	
ZNF628	0.10	0.06	5	1	7	0	15	994	94.58	
ERBIN	0.07	0.06	2	1	6	0	19	1415	99.79	
INTS1	0.05	0.06	3	1	4	1	19	2053	96.25	
ARFGEF3	0.05	0.06	2	1	4	2	19	2177	100.00	
ECPAS	0.05	0.06	7	1	4	0	16	1916	98.86	
CUL7	0.06	0.06	6	1	9	1	11	1660	95.95	
KIF24	0.22	0.06	5	3	8	0	44	1348	98.54	Gibbon
MICAL1	0.18	0.06	7	2	7	0	27	1085	99.91	Gibbon
TTBK2	0.19	0.06	6	3	12	1	37	1541	98.53	
THSD4	0.10	0.06	2	1	4	0	20	1016	99.90	
SALL3	0.08	0.06	3	1	5	0	18	1244	96.43	
HMGXB3	0.08	0.06	4	1	5	1	16	1292	100.00	

ZNF687	0.08	0.06	3	1	5	3	15	1235	100.00	
NUP210	0.16	0.06	13	3	8	2	32	1845	97.77	
CHD6	0.08	0.06	3	2	5	2	30	2661	98.70	
CILP	0.09	0.06	4	1	4	0	17	1130	97.67	
SALL4	0.09	0.06	5	1	3	1	16	1053	100.00	
CUX2	0.08	0.06	5	1	4	1	15	1200	94.27	
ARHGAP6	0.10	0.06	4	1	7	4	10	973	100.00	
DHX57	0.07	0.06	3	1	3	5	14	1386	100.00	
CSPP1	0.19	0.06	5	2	8	1	25	1052	94.69	
HELB	0.18	0.07	4	2	5	4	25	1087	100.00	
PIWIL3	0.11	0.07	3	1	4	1	16	872	98.87	
TRPA1	0.09	0.07	2	1	5	0	17	1080	98.72	
ACIN1	0.08	0.07	3	1	4	0	17	1293	99.31	
TUT1	0.11	0.07	4	1	6	1	13	912	100.00	
NBEAL2	0.15	0.07	12	4	10	5	38	2591	97.11	
AKAP13	0.30	0.07	13	8	23	9	74	2711	98.19	Gibbon
ARHGEF11	0.13	0.07	6	2	5	4	22	1557	100.00	
ABCC10	0.15	0.07	5	2	10	4	18	1371	96.21	
ARHGAP11A	0.20	0.07	4	2	3	1	27	1023	100.00	Gibbon
ASXL2	0.14	0.07	6	2	6	0	23	1387	99.86	
GREB1	0.12	0.07	7	2	6	4	18	1624	93.76	
TNKS1BP1	0.23	0.07	10	4	14	7	29	1728	100.00	
GLI2	0.20	0.07	5	3	12	1	29	1505	97.92	
DISP3	0.14	0.07	3	2	9	3	19	1392	100.00	
URB1	0.27	0.07	9	6	12	7	56	2231	98.33	Gibbon
TG	0.33	0.07	28	9	25	1	67	2693	98.11	Human
NUP153	0.20	0.07	9	3	9	0	28	1505	99.93	
SVIL	0.16	0.08	7	3	7	6	24	1844	94.61	
TNC	0.18	0.08	12	4	8	1	33	2192	99.59	
DNAH8	0.16	0.08	11	7	21	3	47	4500	97.72	
LRRK2	0.24	0.09	9	6	13	1	47	2527	100.00	
SYNE1	0.16	0.09	34	14	24	7	88	8735	99.44	
FRAS1	0.30	0.10	20	12	21	7	70	3948	99.37	

S4 Table: Lower than expected substitution rate on the gorilla branch

Gene	Gorilla % subs per site	Gorilla norm branch length	Human subs	Chimp subs	Gorilla subs	#1# subs	Gibbon subs	Align overlap	Align Sat	Higher in
TUBGCP6	0.00	0.02	2	18	0	1	18	690	47.85	Chimpanzee
MASP1	0.00	0.02	1	32	0	0	5	518	74.11	Chimpanzee
PSD3	0.00	0.03	5	3	0	0	20	911	96.00	
LTBP4	0.00	0.03	3	6	0	0	19	1483	94.22	
GPR50	0.00	0.03	4	7	0	0	16	617	100.00	
SENP6	0.00	0.03	2	4	0	1	19	1112	100.00	
LRP1	0.00	0.03	6	2	0	0	17	3937	93.32	
TMEM131	0.00	0.04	4	4	0	2	13	1882	99.95	
LMLN2	0.00	0.04	6	1	0	1	14	725	92.24	
SMC5	0.00	0.04	4	1	0	0	17	1061	98.61	
SOWAHC	0.00	0.04	8	2	0	1	10	508	99.61	Human
NUP98	0.00	0.04	3	4	0	0	14	1486	98.87	
ADAM12	0.22	0.04	3	5	2	3	57	906	99.67	Gibbon
CCDC102B	0.00	0.04	4	5	0	0	11	513	100.00	
TXNDC16	0.00	0.04	4	2	0	2	12	791	99.87	
SLC12A7	0.00	0.04	5	2	0	1	12	1028	97.16	
SUGP2	0.00	0.04	4	3	0	1	12	1020	93.41	
PLEKHS1	0.00	0.04	2	4	0	0	13	462	99.57	
AK7	0.00	0.04	4	3	0	0	12	687	99.71	
KL	0.00	0.04	2	4	0	1	12	739	100.00	
EPHA1	0.00	0.04	4	2	0	1	12	975	100.00	
MTHFSD	0.00	0.04	1	5	0	0	12	383	100.00	
PLIN2	0.00	0.04	3	4	0	0	11	405	92.68	
NR1I2	0.00	0.04	4	3	0	0	11	469	99.15	
VRK3	0.00	0.04	2	6	0	0	10	474	100.00	
ALKBH8	0.00	0.04	5	5	0	1	7	661	99.55	
ANKFY1	0.00	0.05	2	5	0	1	9	1101	97.69	
FBF1	0.13	0.05	5	3	1	1	28	777	83.01	Gibbon
ABAT	0.00	0.05	4	2	0	0	10	456	88.54	
MKKS	0.00	0.05	1	5	0	0	10	570	100.00	
ATF6B	0.00	0.05	3	5	0	0	8	703	100.00	
COL10A1	0.00	0.05	7	3	0	1	5	680	100.00	
RRBP1	0.08	0.05	6	7	1	1	21	1201	87.09	
SLC7A10	0.00	0.05	3	5	0	0	7	511	99.03	
ERMAP	0.00	0.05	3	1	0	4	7	475	100.00	
DAG1	0.00	0.05	4	1	0	0	10	894	100.00	
WIZ	0.00	0.05	7	1	0	1	6	702	80.05	
PGAP1	0.00	0.05	5	4	0	0	6	922	100.00	
ATR	0.04	0.05	7	4	1	4	19	2612	99.69	
MYO6	0.00	0.05	5	1	0	1	8	1267	98.22	
KIAA0408	0.14	0.05	5	2	1	1	25	694	100.00	Gibbon
KIAA0825	0.16	0.05	14	8	2	0	29	1232	97.70	Human
MCF2L2	0.09	0.05	8	5	1	2	17	1089	98.64	
SORBS2	0.08	0.05	6	9	1	0	17	1193	99.42	
DHX38	0.00	0.05	1	4	0	0	9	1218	99.27	
ZNF629	0.00	0.05	5	3	0	1	5	866	99.65	
SCAF1	0.00	0.05	4	2	0	1	7	1042	88.23	
HECW2	0.00	0.05	2	5	0	0	7	1572	100.00	
MMRN1	0.16	0.05	5	13	2	0	31	1228	100.00	
USPL1	0.18	0.05	9	3	2	0	36	1091	99.91	Gibbon
METTL4	0.00	0.06	4	0	0	0	9	423	100.00	
PRF1	0.00	0.06	0	4	0	1	8	491	95.71	
CNPPD1	0.00	0.06	5	3	0	0	5	396	96.59	
ITGB4	0.07	0.06	6	3	1	0	21	1521	87.11	
TTC38	0.00	0.06	4	3	0	1	5	411	92.57	
DHX35	0.00	0.06	6	3	0	0	4	675	97.40	
LARP1	0.00	0.06	2	7	0	0	4	907	90.07	
PRDM10	0.00	0.06	6	1	0	0	6	1158	100.00	
CRB2	0.22	0.06	5	6	2	1	34	926	87.28	Gibbon
PCSK5	0.11	0.06	5	10	2	0	31	1825	100.00	
AOAH	0.15	0.06	4	4	1	1	20	671	98.24	Gibbon
TLR3	0.11	0.06	2	8	1	0	19	904	100.00	
ARHGEF2	0.10	0.06	5	5	1	0	19	1030	99.90	
ZNF598	0.12	0.06	8	4	1	2	14	829	100.00	
FBLN7	0.00	0.06	4	2	0	0	6	439	100.00	
MAP3K11	0.00	0.06	4	1	0	1	6	847	100.00	
JARID2	0.00	0.06	5	1	0	0	6	1177	96.08	
MN1	0.00	0.06	4	2	0	0	6	1104	99.37	
SEPT4	0.20	0.06	8	3	2	3	29	991	99.50	Gibbon
TDRD15	0.25	0.06	11	8	4	1	54	1604	99.75	Gibbon
TTC3	0.21	0.06	13	11	4	4	46	1946	97.79	Gibbon
FRMD7	0.14	0.06	2	4	1	3	18	713	100.00	
TMEM132A	0.10	0.06	7	3	1	1	16	994	97.26	
APAF1	0.08	0.06	4	3	1	2	18	1248	100.00	

ARID2	0.06	0.06	4	2	1	0	21	1742	97.76	
SLC7A9	0.00	0.06	4	0	0	0	7	458	94.05	
ZFP64	0.00	0.06	4	0	0	0	7	623	94.97	
NEMP1	0.00	0.06	1	1	0	4	5	443	99.77	
SLC7A13	0.00	0.06	1	4	0	1	5	470	100.00	
PACS2	0.00	0.06	2	4	0	0	5	665	81.80	
RBL1	0.00	0.06	4	0	0	0	7	1066	100.00	
ADAM22	0.00	0.06	4	1	0	0	6	906	100.00	
SDCCAG8	0.14	0.06	4	2	1	1	18	704	98.74	
CGN	0.09	0.06	4	4	1	1	16	1072	98.35	
KIFC2	0.13	0.07	7	2	1	0	15	784	99.37	
UBA7	0.11	0.07	4	2	1	3	15	893	92.16	
ABCA2	0.10	0.07	3	8	2	1	26	2023	85.58	
LTBP1	0.06	0.07	8	5	1	2	9	1689	99.47	
CTC1	0.20	0.07	5	4	2	2	26	1019	87.92	Gibbon
ARHGAP29	0.16	0.07	4	4	2	1	28	1261	100.00	
PBXIP1	0.15	0.07	5	3	1	0	15	685	96.61	
CCDC146	0.10	0.07	4	1	1	2	16	955	100.00	
NBAS	0.13	0.07	7	15	3	0	28	2353	99.58	
CACNA1A	0.05	0.07	2	2	1	9	10	1994	83.12	
HEATR5A	0.10	0.07	7	5	2	0	24	2046	100.00	
THEMIS	0.15	0.07	5	2	1	1	14	680	100.00	
AP4E1	0.09	0.07	1	4	1	0	17	1056	99.44	
ESYT3	0.11	0.07	2	5	1	0	15	877	99.89	
NHS	0.07	0.07	4	3	1	2	13	1441	97.76	
MIA3	0.32	0.07	11	13	6	2	59	1880	98.58	Gibbon
PPRC1	0.18	0.07	5	8	3	3	31	1638	98.44	
CACNA1G	0.09	0.07	2	5	2	0	26	2234	96.42	
TEP1	0.28	0.07	13	16	7	2	63	2502	98.00	Gibbon
EPG5	0.12	0.08	4	6	3	3	32	2558	99.73	
KIF14	0.24	0.08	7	5	4	2	42	1648	100.00	Gibbon
OLFML2A	0.15	0.08	4	2	1	0	14	651	100.00	
PPFIBP1	0.10	0.08	2	4	1	1	13	956	95.41	
ANKFN1	0.17	0.08	7	7	2	2	16	1144	99.65	
ARAP2	0.18	0.08	4	10	3	0	28	1704	100.00	
TCF3	0.15	0.08	4	3	1	1	11	651	96.73	
BIRC6	0.04	0.08	9	4	2	0	17	4836	99.57	
PPL	0.30	0.08	7	11	5	0	45	1683	98.13	Gibbon
CACNA1B	0.11	0.08	2	14	2	1	12	1833	87.20	
CASKIN1	0.18	0.09	2	5	2	3	18	1124	89.42	
WWC2	0.18	0.09	4	6	2	1	17	1128	98.34	
TET3	0.12	0.09	6	7	2	0	15	1735	98.58	
ADGRG6	0.16	0.09	4	2	2	0	21	1223	99.92	
ADGRD1	0.23	0.09	4	5	2	1	17	869	100.00	
AFF1	0.26	0.09	4	6	3	0	27	1172	98.90	
HTT	0.13	0.09	9	6	4	2	30	2976	97.64	
TANGO6	0.28	0.09	4	4	3	0	28	1082	98.90	Gibbon
WNK1	0.18	0.09	10	8	5	1	37	2785	99.96	
FHOD3	0.19	0.09	4	4	3	0	27	1567	100.00	
PLCH1	0.18	0.09	7	7	3	2	19	1693	100.00	
C2CD3	0.31	0.09	9	8	7	3	53	2243	97.61	Gibbon
COL22A1	0.30	0.09	11	6	4	2	25	1342	85.86	
PFAS	0.28	0.09	5	6	3	1	22	1078	97.29	
HIVEP1	0.30	0.10	18	10	8	4	49	2688	99.37	
CEP152	0.35	0.10	11	9	6	3	36	1709	99.94	
ZNF646	0.28	0.10	4	6	5	0	39	1802	99.78	
ADAMTSL3	0.30	0.10	11	7	5	0	31	1684	100.00	
DCHS1	0.15	0.10	5	11	5	1	32	3297	100.00	
VPS13C	0.19	0.10	15	16	7	1	34	3636	99.32	
LYST	0.24	0.10	15	16	9	0	52	3736	98.58	
HYDIN	0.46	0.11	21	24	23	5	139	5005	98.48	Gibbon
DNAH9	0.35	0.11	15	18	15	5	84	4247	96.24	
FAT1	0.36	0.11	30	21	16	2	74	4401	97.56	

S5 Table: Higher than expected substitution rate on the human branch

Gene	Human % subs per site	Human norm branch length	Human subs	Chimp subs	Gorilla subs	#1# subs	Gibbon subs	Align overlap	Align Sat	Lower in
ADCYAP1	7.60	0.74	13	0	0	0	1	171	97.16	
BIRC5	4.40	0.42	4	0	1	1	1	91	100.00	
DACT3	3.89	0.67	7	0	0	0	0	180	99.45	Gibbon
PVALEF	3.76	0.40	5	0	0	0	5	133	99.25	
PGLYRP1	3.57	0.33	7	1	5	0	6	196	100.00	
PSORS1C2	2.94	0.42	4	1	1	0	1	136	100.00	
BTNL2	2.88	0.37	7	2	2	1	5	243	89.67	
DMKN	2.59	0.29	9	1	3	0	16	347	74.62	
TMED3	2.48	0.55	5	0	0	0	1	202	93.09	
DCXR	2.46	0.41	6	0	1	0	5	244	100.00	
DHDH	2.40	0.48	8	2	0	0	4	333	99.70	
BLVRB	2.22	0.50	4	0	1	0	0	180	87.38	Gibbon
CD37	2.16	0.35	6	3	2	0	4	278	98.93	
TMBIM4	2.12	0.50	6	0	0	0	3	283	100.00	
ODF1	2.00	0.46	5	0	1	0	2	250	100.00	
NACAD	1.86	0.23	19	11	8	0	45	1019	95.06	
VWA2	1.77	0.26	10	3	4	4	17	566	86.94	
EPCAM	1.71	0.43	5	1	0	0	3	292	91.25	
MRPL39	1.70	0.32	6	2	2	1	6	352	99.72	
FAM118A	1.68	0.37	6	2	0	0	6	357	100.00	
CA6	1.62	0.33	5	2	2	1	3	309	99.04	
KIF26B	1.58	0.31	24	8	6	2	35	1518	98.64	
SOWAHC	1.57	0.35	8	2	0	1	10	508	99.61	Gorilla
EDA2R	1.57	0.43	5	1	1	0	2	318	100.00	
MAP7D1	1.56	0.33	10	1	1	0	16	640	87.19	
COL25A1	1.53	0.36	10	4	3	1	8	653	99.85	
RBM44	1.52	0.29	16	6	7	0	25	1050	99.81	
SLC7A2	1.49	0.31	10	5	2	0	13	671	96.41	
PGM1	1.48	0.67	7	0	0	0	0	474	81.72	Gibbon
IQCA1L	1.40	0.27	10	8	4	0	14	715	99.58	
CARF	1.35	0.32	8	0	5	1	9	592	100.00	Chimpanzee
NOM1	1.34	0.24	11	6	8	3	16	822	95.80	
ALDH16A1	1.24	0.29	8	2	4	4	8	647	97.29	
SLC15A5	1.22	0.31	7	3	3	0	8	575	99.48	
BRCA1	1.19	0.24	21	6	12	0	47	1771	97.09	
SMG6	1.16	0.41	16	3	3	2	13	1383	98.93	
KIAA0825	1.14	0.26	14	8	2	0	29	1232	97.70	Gorilla
RET	1.09	0.36	12	7	3	0	9	1097	98.47	Gibbon
GRIP2	1.06	0.33	12	6	7	0	10	1132	99.30	Gibbon
TG	1.04	0.21	28	9	25	1	67	2693	98.11	Chimpanzee
MYO18B	0.99	0.24	22	13	10	4	41	2217	96.94	
MYOM1	0.98	0.44	13	3	2	1	8	1333	97.16	Gibbon

S6 Table: Higher than expected substitution rate on the chimpanzee branch

Gene	Chimp % subs per site	Chimp norm branch length	Human subs	Chimp subs	Gorilla subs	#1# subs	Gibbon subs	Align overlap	Align Sat	Lower in
SCART1	7.85	0.55	11	52	6	0	23	662	72.51	
ASIC1	6.51	0.84	0	20	0	0	0	307	64.09	Gibbon
CALU	6.25	0.84	0	20	0	0	0	320	99.07	Gibbon
MASP1	6.18	0.77	1	32	0	0	5	518	74.11	Gorilla
COL23A1	6.09	0.52	0	14	1	0	9	230	56.10	
SCML1	5.21	0.36	5	17	5	2	16	326	99.09	
SRI	4.14	0.58	0	7	1	0	1	169	85.35	
SLC22A31	3.65	0.35	4	5	1	0	2	137	40.53	
CXorf67	3.11	0.29	1	12	4	3	20	386	97.97	
CARD19	2.99	0.50	0	5	0	0	2	167	91.26	
C11orf74	2.92	0.33	1	5	1	0	6	171	87.24	
UPRT	2.90	0.56	0	4	0	0	0	138	79.77	Gibbon
NCS1	2.84	0.56	0	4	0	0	0	141	81.98	
LYAR	2.65	0.38	2	10	4	0	8	378	100.00	
PIMREG	2.61	0.38	1	7	1	0	7	268	98.17	
TUBGCP6	2.61	0.43	2	18	0	1	18	690	47.85	Gorilla
SPDYE4	2.53	0.32	0	6	1	0	10	237	100.00	
PEX11G	2.49	0.41	1	6	2	0	3	241	100.00	
RNF168	2.48	0.30	2	9	2	0	15	363	77.23	
HM13	2.48	0.72	0	9	0	0	0	363	85.21	Gibbon
DFFA	2.44	0.32	2	8	2	0	11	328	100.00	
ANKLE2	2.22	0.33	3	5	3	1	1	225	76.53	
DDX47	2.14	0.53	0	9	1	0	4	420	92.31	
FAM53B	2.03	0.50	0	6	1	0	2	296	86.55	
MTG1	2.02	0.35	1	5	1	0	5	248	82.67	
DERL3	1.93	0.39	0	4	3	0	1	207	88.09	
PCBP3	1.92	0.55	0	5	0	0	1	260	78.31	Gibbon
COX10	1.90	0.35	0	6	2	0	7	316	79.40	
NIPAL3	1.86	0.50	0	6	1	0	2	322	87.50	
ULK1	1.86	0.50	2	12	2	0	5	646	76.00	Gibbon
ZNF280C	1.68	0.30	3	12	8	4	12	715	99.86	
DNAJC9	1.66	0.46	0	4	1	0	1	241	97.57	Gibbon
ARHGAP40	1.63	0.29	1	9	2	0	17	553	100.00	
QRFPR	1.62	0.35	0	7	3	0	8	431	100.00	
SPG7	1.61	0.38	3	10	3	1	7	621	80.34	
CYP24A1	1.61	0.35	1	7	2	1	7	436	97.32	
ABR	1.59	0.69	0	10	0	0	1	628	74.76	
ADAMTS10	1.57	0.58	3	13	0	0	3	828	78.78	
TAF6L	1.52	0.47	0	6	0	0	4	395	68.34	
NMUR2	1.50	0.32	4	6	1	0	6	401	99.50	
CAPS2	1.50	0.35	3	7	2	0	6	468	97.91	
CPNE7	1.47	0.37	2	6	1	0	5	408	77.57	
CARS2	1.42	0.27	1	8	4	1	14	564	100.00	
EHMT1	1.40	0.59	1	12	0	0	4	857	77.91	
GMPS	1.38	0.57	0	7	1	0	1	506	86.20	Gibbon
NEURL1	1.35	0.64	0	6	0	0	0	446	82.14	Gibbon
ACOX3	1.29	0.38	2	8	2	0	7	620	89.86	
CFAP54	1.25	0.31	2	7	2	1	9	558	85.71	
DDIAS	1.21	0.26	4	12	4	0	25	995	99.70	
BLM	0.93	0.24	6	13	10	1	24	1394	99.64	

S7 Table: Higher than expected substitution rate on the gorilla branch

Gene	Gorilla % subs per site	Gorilla norm branch length	Human subs	Chimp subs	Gorilla subs	#1# subs	Gibbon subs	Align overlap	Align Sat	Lower in
PPDPF	10.91	0.65	0	0	6	0	0	55	50.00	
RNF128	7.26	0.76	1	0	23	0	3	317	78.86	
TRIM14	6.85	0.40	0	1	5	0	4	73	66.36	
PRAC2	5.15	0.36	1	0	7	1	8	136	97.14	
KCTD18	4.52	0.54	1	2	16	1	7	354	88.06	
ZDHHC3	4.38	0.73	0	0	12	1	0	274	82.28	Gibbon
SNAP25	4.37	0.72	0	0	9	0	0	206	100.00	Gibbon
CARD8	3.67	0.31	8	3	13	0	16	354	87.19	
RCC1	3.37	0.52	1	0	12	1	6	356	84.16	
WDR38	3.30	0.41	4	0	10	0	8	303	98.70	
NOX4	3.23	0.62	0	0	12	0	4	371	85.48	
MKRN1	3.17	0.60	1	1	15	1	4	473	98.13	
PALM3	3.15	0.31	1	5	19	4	31	604	92.35	
APOOL	3.00	0.54	0	0	6	0	2	200	86.58	
RFPL2	2.97	0.30	5	3	10	4	10	337	99.41	
R3HDML	2.92	0.37	2	0	7	2	6	240	100.00	
PLAUR	2.90	0.39	1	1	6	0	5	207	79.31	
SAPCD2	2.90	0.48	1	1	10	0	6	345	96.64	
HGFAC	2.88	0.45	1	7	18	0	11	625	96.60	
SPATA32	2.88	0.33	3	1	11	3	13	382	100.00	
NSMCE4A	2.83	0.45	0	1	7	0	5	247	75.30	
QRICH2	2.66	0.27	15	14	40	10	69	1502	88.46	
AMACR	2.65	0.36	3	3	10	1	9	377	98.69	
ANAPC11	2.59	0.40	1	1	5	0	3	193	99.48	
THEGL	2.59	0.34	1	5	12	1	14	464	100.00	
RITA1	2.56	0.40	2	1	5	1	1	195	98.48	
FGF11	2.54	0.50	0	0	5	1	1	197	100.00	
ANO8	2.47	0.58	0	0	10	0	4	405	69.71	
IQCD	2.45	0.36	1	2	11	2	12	449	100.00	
DYTN	2.45	0.27	4	3	13	1	25	531	99.62	
TBXA2R	2.44	0.57	1	0	8	0	2	328	95.63	Gibbon
DRD4	2.40	0.50	0	1	8	0	4	334	86.53	
SLC25A24	2.29	0.65	0	0	10	0	2	436	95.20	Gibbon
FAM161B	2.29	0.34	4	2	16	3	20	700	99.43	
ITPKA	2.24	0.67	0	0	7	0	0	312	75.54	Gibbon
SRF	2.23	0.65	0	1	8	0	0	358	75.69	Gibbon
CCDC112	2.18	0.55	3	0	11	0	3	505	98.44	
MRPL46	2.15	0.35	2	2	6	1	4	279	100.00	
HMGCLL1	2.09	0.46	0	0	5	0	3	239	78.88	
FBXW8	2.09	0.60	0	0	11	1	3	527	98.69	
GRIN3B	2.07	0.29	7	3	15	3	22	726	75.39	
TYSND1	2.05	0.32	4	6	11	0	11	536	99.26	
RNASEH1	2.05	0.40	0	0	5	0	5	244	99.19	
BICDL2	1.97	0.32	5	0	10	2	12	507	100.00	Chimpanzee
MVD	1.97	0.42	1	0	7	0	6	356	93.93	
IRF7	1.94	0.32	1	1	9	4	11	465	90.12	
LAMP2	1.92	0.36	3	0	7	0	7	364	92.86	
SGCB	1.90	0.50	1	0	6	0	2	316	99.68	
GABRD	1.88	0.64	0	0	6	0	0	319	70.42	Gibbon
DALRD3	1.86	0.45	1	0	7	1	4	376	100.00	
SLC17A9	1.86	0.39	2	0	6	0	5	323	77.64	
RNF39	1.85	0.42	2	0	7	0	5	379	100.00	
METTL11B	1.84	0.46	1	1	5	0	1	272	97.84	Gibbon
HADH	1.81	0.35	2	2	7	0	7	387	99.23	
SNAPC2	1.80	0.37	2	1	6	0	5	334	100.00	
CEP68	1.75	0.32	0	2	10	2	15	573	98.79	Human
SLC15A3	1.71	0.35	2	2	7	1	6	409	81.64	
CACUL1	1.70	0.50	1	1	6	0	1	352	95.65	Gibbon
IGFN1	1.69	0.29	8	9	19	2	27	1126	90.51	
SNX32	1.68	0.50	0	0	5	0	2	297	90.83	
TMEM62	1.67	0.46	1	0	9	0	7	539	92.45	Chimpanzee
EFCAB6	1.67	0.28	6	9	25	4	45	1501	100.00	
PAICS	1.66	0.45	3	2	7	0	1	421	98.14	Gibbon
MEX3A	1.65	0.57	0	0	7	0	2	424	94.64	Gibbon
NRROS	1.64	0.29	4	3	11	1	18	670	99.41	
OTOP1	1.64	0.29	1	1	10	4	17	611	100.00	
OTUD4	1.56	0.49	1	3	16	1	9	1027	97.07	
SH2B2	1.52	0.36	1	0	7	0	9	460	80.99	
ZCCHC8	1.46	0.44	0	2	9	2	5	617	91.54	
RPS6KL1	1.46	0.35	0	2	8	2	9	549	100.00	Human
ITIH6	1.45	0.32	5	4	15	0	21	1031	98.10	
CLMN	1.44	0.33	2	4	14	2	18	972	100.00	
ECT2L	1.44	0.35	3	1	13	2	16	903	100.00	Chimpanzee
CAPN15	1.42	0.43	0	1	8	0	7	565	80.48	Human

NOX3	1.41	0.32	0	4	8	0	11	568	100.00	Human
CWF19L2	1.41	0.34	5	4	12	0	12	854	98.96	
IQCH	1.37	0.31	5	5	14	1	19	1024	99.71	
ZWILCH	1.36	0.36	0	1	7	0	9	513	92.93	Human
MAPKBP1	1.34	0.36	1	7	20	2	24	1497	98.88	Human
RASA3	1.32	0.41	0	5	8	0	4	608	82.16	
EVPL	1.30	0.34	9	8	25	0	30	1920	97.96	
CHD1L	1.28	0.36	2	3	11	1	11	859	95.76	
ITGA8	1.24	0.36	4	4	13	0	13	1045	99.71	
KTN1	1.23	0.37	3	5	14	0	14	1136	93.57	
ANO6	1.22	0.50	0	1	11	0	7	901	97.83	Human
CFAP61	1.21	0.31	2	6	15	1	22	1236	99.92	Human
PXDNL	1.16	0.26	10	6	17	1	30	1463	100.00	
CFAP65	1.14	0.25	14	10	21	1	36	1838	97.09	
CEP192	1.10	0.26	14	11	28	6	49	2537	100.00	
CUBN	1.04	0.25	15	17	34	3	66	3280	95.99	

S8 Table: Higher than expected substitution rate on the gibbon branch

Gene	Gibbon % subs per site	Gibbon norm branch length	Human subs	Chimp subs	Gorilla subs	#1# subs	Gibbon subs	Align overlap	Align Sat	Lower in
RBMXL3	11.97	0.64	9	19	18	9	99	827	91.89	
MRPL4	10.80	0.70	1	0	4	0	19	176	61.54	
MUC13	9.70	0.72	4	1	9	1	46	474	95.76	
FAM71E2	9.48	0.68	13	8	14	1	79	833	95.42	
CD58	8.91	0.71	1	1	4	0	22	247	98.80	
BEND2	8.77	0.64	7	8	9	10	64	730	96.43	
MISP	8.45	0.72	7	4	6	2	56	663	98.51	
FAM53A	8.44	0.63	5	5	6	1	33	391	98.24	
CD72	8.38	0.70	2	2	4	2	30	358	99.72	
PODXL	8.16	0.72	0	4	7	1	39	478	85.97	Human
AC025287.4	8.14	0.66	3	4	6	0	31	381	100.00	
TEX13A	8.09	0.64	0	5	8	2	31	383	96.72	
PLA2G4C	8.04	0.78	1	1	5	0	37	460	88.63	
PASD1	7.98	0.60	9	13	8	5	56	702	92.01	
TAF7L	7.88	0.68	4	4	2	2	32	406	95.75	
C16orf71	7.84	0.67	5	3	9	0	40	510	98.27	
CXorf66	7.80	0.64	1	6	5	1	28	359	99.72	
C7orf61	7.73	0.62	0	1	4	1	15	194	97.49	
MROH9	7.60	0.69	4	12	6	4	65	855	99.53	
RIPK3	7.58	0.79	2	4	1	0	38	501	99.01	
C4orf50	7.57	0.67	10	11	18	8	100	1321	94.02	
ZBP1	7.51	0.68	2	5	5	0	32	426	99.30	
RNF213	7.15	0.74	37	42	36	12	358	5006	95.28	
C16orf46	7.14	0.64	5	2	4	1	27	378	97.42	
GP1BA	7.02	0.73	2	2	9	0	44	627	96.17	
A3GALT2	6.97	0.62	3	2	5	1	23	330	97.06	
CEP295NL	6.96	0.63	0	5	9	7	41	589	98.66	Human
DSPP	6.89	0.58	7	20	19	6	73	1059	83.72	
FRMD1	6.80	0.66	3	4	2	0	23	338	99.12	
C2orf78	6.72	0.62	6	11	14	1	55	819	98.67	
NLRP1	6.51	0.76	8	5	10	3	93	1428	97.14	
ICOSLG	6.37	0.61	2	3	4	3	23	361	87.83	
ADAM12	6.29	0.78	3	5	2	3	57	906	99.67	Gorilla
C19orf57	6.29	0.69	4	3	8	0	40	636	99.84	
ZNF853	6.25	0.70	2	4	3	0	29	464	83.30	
MUC1	6.17	0.70	0	3	6	0	29	470	97.31	Human
C2orf81	6.15	0.65	0	4	9	2	33	537	99.63	Human
MUM1	6.11	0.69	5	2	7	1	40	655	92.12	
CEP72	6.10	0.65	7	1	7	2	37	607	99.51	
PTPRH	6.00	0.71	6	5	5	2	51	850	87.81	
TESMIN	5.96	0.66	3	4	3	0	26	436	92.37	
C1orf127	5.95	0.61	5	8	9	0	39	655	84.41	
NUTM1	5.89	0.61	3	4	8	0	28	475	99.37	
ZNF114	5.85	0.64	3	4	2	1	23	393	98.99	
SELPLG	5.76	0.59	1	3	9	1	24	417	97.66	
RP1L1	5.71	0.56	17	19	25	6	86	1507	79.61	
JHY	5.69	0.67	4	5	9	1	44	773	99.74	
DTX3L	5.68	0.77	1	3	5	0	42	740	100.00	
ZNF683	5.63	0.68	2	2	5	1	28	497	96.69	
SBSN	5.62	0.68	1	0	5	2	24	427	77.08	
CFAP157	5.62	0.67	4	2	3	0	25	445	99.78	
MUC4	5.59	0.61	7	10	9	3	49	877	85.56	
SPOCD1	5.56	0.64	10	6	15	4	66	1186	99.41	
CYLC1	5.56	0.68	1	0	7	5	35	630	97.83	Chimpanzee
ANKK1	5.55	0.57	9	8	4	2	34	613	88.97	
ZNF557	5.52	0.67	1	0	4	0	17	308	83.70	
TULP2	5.47	0.61	3	1	4	0	17	311	67.61	
C12orf50	5.42	0.62	1	3	4	1	20	369	89.13	
HSF5	5.40	0.68	0	3	7	2	32	593	99.50	Human
ZNF473	5.40	0.69	4	8	5	1	47	871	100.00	
CDHR5	5.38	0.58	9	7	5	3	37	688	98.43	
POLRMT	5.28	0.71	3	4	7	3	50	947	93.12	
SPERT	5.28	0.62	3	3	5	0	23	436	97.98	
ERICH6B	5.27	0.60	5	3	7	5	34	645	96.85	
PABPC3	5.26	0.61	6	3	6	3	33	627	99.37	
C1orf94	5.21	0.58	5	11	4	0	31	595	99.50	
CFAP100	5.18	0.65	2	4	4	4	31	599	98.04	
TEX28	5.12	0.67	0	1	5	1	21	410	100.00	
MEFV	5.12	0.61	5	7	5	6	40	781	100.00	
UNC93A	5.10	0.64	0	0	4	1	15	294	79.67	
TFB2M	5.10	0.70	1	0	4	0	20	392	99.75	
CCDC129	5.07	0.56	6	13	14	4	51	1006	95.45	
HJURP	5.07	0.56	10	11	5	1	37	730	98.38	

MKI67	5.05	0.61	24	24	40	14	158	3127	96.13	
CAGE1	5.01	0.65	1	6	13	0	42	839	100.00	Human
SHROOM1	4.99	0.61	5	3	11	4	40	802	94.35	
RHAG	4.98	0.66	1	2	4	0	20	402	98.29	
ADPRHL1	4.96	0.61	14	17	13	3	76	1532	91.57	
SFI1	4.95	0.62	6	7	12	5	53	1071	92.33	
CTU2	4.95	0.63	2	4	2	3	24	485	94.36	
C1orf87	4.95	0.72	2	0	5	0	27	546	100.00	Chimpanzee
CCDC15	4.94	0.74	4	2	3	3	44	890	95.19	
TTC6	4.94	0.63	16	15	10	1	75	1518	92.50	
LRRC66	4.89	0.60	6	3	15	2	43	880	100.00	
PARP9	4.88	0.65	3	7	8	1	40	819	100.00	
CCNB3	4.88	0.66	6	6	16	4	68	1393	100.00	
AC099489.1	4.88	0.62	27	25	23	8	137	2810	88.20	
PLEKHG4B	4.85	0.62	9	13	15	6	75	1547	98.54	
HTRA4	4.83	0.65	1	2	4	2	23	476	100.00	
KIAA0391	4.83	0.68	3	1	4	2	28	580	99.49	
ZAN	4.83	0.52	23	16	35	10	94	1948	81.54	
ZFR2	4.82	0.56	3	11	13	5	44	913	98.28	
PMFBP1	4.80	0.66	5	4	7	3	43	895	90.68	
FBXW12	4.79	0.63	0	2	7	0	21	438	94.60	
ZNF831	4.78	0.60	9	9	30	4	80	1674	99.94	
ZBBX	4.76	0.55	11	6	11	0	38	799	99.88	
CCDC33	4.72	0.57	7	9	5	0	31	657	91.50	
CD5	4.70	0.67	1	1	4	2	23	489	98.79	
TOGARAM2	4.67	0.54	18	7	10	1	46	984	97.23	
OVCH1	4.67	0.64	4	7	12	2	49	1049	96.33	
CCDC110	4.62	0.59	8	6	6	1	35	757	94.39	
ZMYND15	4.60	0.59	2	3	12	3	33	718	97.29	
C19orf44	4.59	0.58	2	2	10	5	30	653	99.39	
CCDC116	4.59	0.57	5	6	7	0	28	610	99.51	
BRCA2	4.57	0.78	12	12	17	1	156	3411	99.85	
C3orf20	4.57	0.65	1	3	11	3	39	853	99.53	Human
SLC9C1	4.57	0.63	12	6	8	3	53	1160	98.98	
C2orf16	4.57	0.62	43	37	43	17	228	4994	94.08	
SYCP2L	4.56	0.65	3	3	9	2	37	812	100.00	
RAB44	4.53	0.69	4	4	6	1	41	905	97.42	
RECQL4	4.52	0.58	8	5	10	9	47	1039	91.38	
PPP1R15A	4.52	0.62	7	3	4	1	30	664	98.52	
AJM1	4.50	0.66	2	1	6	1	26	578	85.50	
RAD51AP2	4.49	0.55	7	14	15	4	52	1158	100.00	
LEKR1	4.48	0.75	0	1	6	0	31	692	100.00	Human
ALPK2	4.47	0.61	15	16	14	13	93	2079	99.71	
RIPK1	4.47	0.73	0	4	2	2	30	671	100.00	Human
UMODL1	4.47	0.57	20	13	8	2	61	1365	95.19	
SH3D21	4.41	0.58	7	6	5	2	31	703	98.18	
TMEM44	4.39	0.60	2	5	1	0	17	387	89.38	
KIAA1210	4.39	0.60	8	7	22	7	70	1594	96.14	
CROCC2	4.33	0.53	10	12	25	7	64	1479	94.14	
PTPRC	4.32	0.77	2	5	3	3	55	1273	97.62	
R3HCC1L	4.30	0.56	10	5	8	1	34	790	99.75	
KIAA1614	4.30	0.55	13	7	15	1	47	1093	91.85	
CCDC40	4.30	0.62	7	9	10	0	48	1117	98.24	
FAM83C	4.29	0.58	4	3	10	3	32	746	100.00	
R3HCC1	4.29	0.61	1	2	5	1	19	443	95.27	
DNAI1	4.28	0.70	2	4	3	0	29	677	96.85	
CATSPERE	4.28	0.61	3	11	4	4	39	911	97.75	
LRRC53	4.27	0.64	13	5	7	2	53	1240	99.60	
NINL	4.27	0.58	10	9	17	1	54	1264	92.06	
ZNF195	4.27	0.72	5	1	1	0	27	633	100.00	
AKAP4	4.26	0.65	2	3	8	3	36	845	100.00	
ENAM	4.26	0.65	6	7	5	1	41	963	99.90	
PARP4	4.25	0.62	8	8	14	3	59	1387	92.28	
STARD9	4.25	0.60	27	26	59	18	194	4564	99.33	
SCARF1	4.23	0.65	3	4	6	1	32	756	95.09	
PTCD3	4.23	0.64	0	5	6	2	29	686	99.56	Human
RCSD1	4.21	0.67	0	1	4	0	17	404	97.82	
TACC3	4.18	0.61	5	2	10	1	33	789	97.77	
IQCC	4.13	0.62	2	2	4	1	20	484	98.78	
CDCA2	4.12	0.61	6	6	7	4	40	971	99.08	
COL18A1	4.11	0.64	11	6	7	1	49	1192	83.01	
PKD1L3	4.11	0.55	17	11	16	11	69	1679	98.76	
KIAA1551	4.09	0.64	10	7	19	2	71	1734	99.31	
CSF2RB	4.09	0.59	5	3	10	4	36	881	97.56	
MDC1	4.08	0.62	7	16	21	3	80	1961	95.85	
ERICH3	4.08	0.57	15	10	18	2	62	1521	99.93	
MARCO	4.05	0.60	5	2	3	1	21	518	99.62	
March10	4.05	0.61	7	2	7	1	31	765	99.61	

EFCC1	4.04	0.60	4	2	3	0	18	445	89.54	
LRRIQ1	4.03	0.61	9	7	21	4	68	1688	99.76	
TROAP	4.02	0.71	3	0	4	2	31	771	97.10	Chimpanzee
L1TD1	4.02	0.58	5	7	5	5	34	846	97.92	
KIAA1755	4.01	0.65	7	6	7	1	45	1121	94.52	
GGT6	4.01	0.62	2	2	4	1	20	499	100.00	
CLEC20A	4.00	0.61	3	0	4	0	16	400	100.00	
SLC9C2	3.99	0.68	3	5	9	1	44	1103	99.73	
MYO15B	3.98	0.56	17	15	34	6	96	2411	92.41	
ADCY10	3.97	0.63	7	9	14	3	60	1510	99.47	
TEX11	3.97	0.57	1	10	11	2	36	906	99.34	Human
MORC1	3.97	0.63	5	7	6	2	39	982	99.80	
MRPS5	3.96	0.60	1	0	5	2	17	429	99.77	
BDP1	3.93	0.65	16	16	18	0	97	2468	95.44	
MAMDC4	3.92	0.63	6	6	9	4	47	1199	99.67	
AHNAK2	3.91	0.64	6	3	5	0	31	793	100.00	
C10orf90	3.91	0.59	4	5	6	1	27	691	100.00	
LRMP	3.91	0.62	9	9	10	3	56	1434	99.93	
WDR60	3.89	0.60	3	5	9	3	35	899	95.33	
IRAK1	3.88	0.62	3	2	4	0	20	515	76.52	
NOL8	3.88	0.60	7	7	8	1	39	1006	93.06	
WDR97	3.88	0.53	18	12	18	2	59	1522	97.25	
DENND3	3.87	0.56	9	11	10	4	47	1215	98.46	
PKD1L1	3.86	0.58	19	27	22	7	105	2719	96.35	
CCDC57	3.85	0.60	8	4	4	2	31	805	97.58	
SGO1	3.85	0.60	5	3	2	0	20	520	98.67	
LINS1	3.85	0.58	6	2	8	2	29	754	99.60	
CEP164	3.84	0.75	6	3	4	2	54	1405	98.25	
KANK4	3.82	0.58	8	6	11	0	38	995	100.00	
CASS4	3.82	0.60	4	10	3	0	30	786	100.00	
KIAA1211L	3.81	0.66	4	1	5	3	31	814	96.67	Chimpanzee
GPR179	3.79	0.67	7	11	21	3	89	2347	99.75	Human
FANCA	3.79	0.55	9	9	12	9	50	1319	93.15	
PPP1R15B	3.79	0.59	6	3	5	2	27	713	100.00	
TSEN2	3.79	0.60	1	2	5	0	17	449	98.90	
NWD1	3.78	0.59	13	9	12	2	55	1454	94.42	
FAM208B	3.78	0.58	29	19	14	0	90	2382	98.96	
RAB11FIP1	3.77	0.60	8	4	10	0	38	1008	86.97	
ZNF408	3.76	0.67	3	2	5	0	27	718	100.00	
C10orf71	3.75	0.64	12	2	7	3	47	1252	97.13	Chimpanzee
ALMS1	3.72	0.58	31	36	33	3	147	3947	97.41	
MICALL2	3.71	0.58	7	6	7	0	32	862	96.96	
CENPC	3.71	0.67	1	5	7	1	35	943	100.00	Human
CEP295	3.71	0.58	19	15	26	7	95	2561	98.69	
PTPRJ	3.68	0.67	4	5	8	2	45	1222	95.32	
ADAD2	3.68	0.65	3	4	1	0	21	571	100.00	
CRB2	3.67	0.66	5	6	2	1	34	926	87.28	Gorilla
HASPIN	3.67	0.63	2	7	5	0	29	790	100.00	
SLC6A16	3.67	0.63	4	4	4	1	27	736	100.00	
MEIOC	3.66	0.64	5	4	6	1	34	929	99.68	
RNASEL	3.66	0.61	2	9	3	0	27	738	99.60	
ENTHD1	3.64	0.59	2	3	5	2	22	604	99.67	
CCDC175	3.64	0.61	6	6	3	0	28	770	97.10	
DRC1	3.62	0.67	4	1	4	0	25	690	99.42	
ABCC3	3.61	0.69	6	4	5	0	40	1109	84.53	
FBF1	3.60	0.68	5	3	1	1	28	777	83.01	Gorilla
KIAA0408	3.60	0.67	5	2	1	1	25	694	100.00	Gorilla
SOX30	3.60	0.61	3	2	6	3	27	750	99.60	
CCDC158	3.60	0.76	2	2	5	0	40	1112	100.00	
JMJD4	3.59	0.63	4	1	1	0	16	446	99.78	
PPP1R3A	3.57	0.60	7	4	7	6	40	1120	100.00	
SGO2	3.57	0.64	5	6	8	2	42	1176	99.32	
PARP10	3.55	0.56	8	10	5	3	36	1014	98.93	
CRYBG3	3.55	0.58	23	12	27	10	102	2873	98.22	
MEGF6	3.54	0.57	15	5	5	3	41	1159	83.38	
CCDC180	3.54	0.58	10	9	15	4	57	1612	96.93	
ZNF519	3.53	0.61	4	1	1	3	19	539	100.00	
CARD14	3.50	0.61	2	6	8	0	30	856	91.94	
CHFR	3.50	0.63	0	2	5	1	19	543	85.92	Human
RTN3	3.50	0.64	4	5	7	1	36	1029	99.71	
NLRP12	3.49	0.64	5	7	6	0	37	1059	99.91	
WDR90	3.49	0.61	8	5	15	3	53	1518	94.64	
NEK4	3.48	0.65	4	3	4	0	27	775	95.68	
ERVMER34-1	3.48	0.65	1	4	2	0	19	546	100.00	
TTC31	3.47	0.64	4	2	1	0	18	518	99.81	
CIITA	3.47	0.60	6	3	11	2	38	1096	96.91	
OBSCN	3.45	0.54	33	49	92	37	250	7241	89.73	
CC2D2B	3.45	0.62	2	6	5	6	36	1043	98.58	Human

ZNF205	3.44	0.61	3	2	4	0	19	552	100.00	
RGSL1	3.44	0.61	6	5	7	3	37	1075	99.91	
AKAP1	3.44	0.56	5	8	6	2	31	901	99.89	
FHAD1	3.44	0.59	5	7	10	4	42	1221	91.05	
PLB1	3.43	0.69	1	3	10	4	47	1369	96.54	
TDRD12	3.41	0.60	5	7	4	5	36	1057	92.64	
IFT81	3.40	0.73	0	1	4	0	23	676	100.00	Human
TEX15	3.40	0.57	23	12	33	9	107	3147	99.37	
ELAC2	3.39	0.65	5	2	4	0	27	797	98.03	
DHX58	3.38	0.59	4	2	4	1	20	591	91.91	
CCDC142	3.38	0.64	1	4	4	2	25	739	99.46	
TDRD6	3.38	0.65	5	5	20	4	70	2071	98.90	
ALPK3	3.37	0.60	9	7	15	2	53	1572	96.09	
BTBD18	3.37	0.64	4	1	3	2	24	712	100.00	
TDRD15	3.37	0.67	11	8	4	1	54	1604	99.75	Gorilla
DCLRE1A	3.37	0.58	5	7	9	1	35	1040	100.00	
FSIP2	3.36	0.59	36	36	58	20	219	6513	97.79	
GNAS	3.35	0.68	2	2	6	2	33	984	99.90	
SOWAHB	3.35	0.61	4	3	5	0	24	716	95.34	
SETX	3.35	0.61	7	23	20	1	84	2511	97.48	Human
TMEM8A	3.34	0.64	2	2	4	1	22	658	96.06	
KANK3	3.33	0.57	4	6	6	2	28	840	100.00	
AKNA	3.32	0.59	7	7	11	2	43	1295	92.83	
KIAA1671	3.31	0.61	8	10	11	0	49	1479	91.86	
BHMG1	3.31	0.61	2	4	4	0	21	634	99.37	
PRR14L	3.31	0.58	12	11	16	9	71	2144	99.72	
CRYBG2	3.31	0.59	6	4	14	4	45	1360	99.85	
ZNF541	3.31	0.68	4	4	5	1	36	1089	95.28	
USPL1	3.30	0.68	9	3	2	0	36	1091	99.91	Gorilla
BRDT	3.28	0.59	4	6	8	1	31	944	99.89	
VWA3A	3.28	0.60	4	9	7	2	38	1159	97.89	
TBCD	3.28	0.73	6	1	2	0	34	1037	88.48	
MIS18BP1	3.27	0.57	9	5	8	3	37	1132	100.00	
ADGRG4	3.27	0.57	18	15	28	12	99	3031	99.38	
EXPH5	3.27	0.59	8	15	13	5	64	1960	98.94	
KIF24	3.26	0.70	5	3	8	0	44	1348	98.54	Chimpanzee
ADAMTS13	3.25	0.56	6	7	8	8	41	1260	92.72	
DLEC1	3.25	0.59	11	7	10	2	47	1447	94.14	
MYCBPAP	3.24	0.62	6	2	5	2	29	896	94.42	
FASTKD1	3.21	0.66	2	1	4	3	26	810	100.00	Chimpanzee
CDK5RAP2	3.21	0.65	7	7	13	1	58	1809	95.56	
CEP89	3.20	0.60	4	3	5	0	23	718	99.86	
WDR87	3.20	0.56	16	19	21	14	92	2879	99.14	
TAS1R1	3.19	0.62	3	5	3	0	23	722	94.26	
CMYA5	3.16	0.57	21	24	34	10	123	3892	97.74	
TCOF1	3.15	0.61	6	12	5	0	41	1301	89.85	
HAUS6	3.14	0.57	4	7	7	2	30	954	100.00	
MIA3	3.14	0.63	11	13	6	2	59	1880	98.58	Gorilla
ADGRG7	3.14	0.67	2	0	3	4	25	797	100.00	Chimpanzee
SLC26A11	3.14	0.65	1	4	2	0	19	606	100.00	
KCTD19	3.13	0.65	2	0	5	2	23	734	95.82	Chimpanzee
PALB2	3.12	0.57	6	5	12	2	37	1186	100.00	
ABCA13	3.11	0.55	40	33	40	10	152	4882	98.65	
SHCBP1L	3.11	0.68	6	0	0	0	20	643	100.00	
HELZ2	3.11	0.63	11	13	13	7	79	2542	97.32	
KNL1	3.10	0.58	12	18	16	3	71	2294	98.41	
TMEM108	3.09	0.61	3	0	4	0	16	518	100.00	Chimpanzee
LRGUK	3.09	0.66	1	1	4	0	18	583	73.15	
B4GALNT3	3.08	0.68	2	2	4	1	26	844	89.50	
FANCM	3.08	0.62	11	10	15	0	63	2046	99.90	
SYNM	3.07	0.60	7	12	7	1	45	1465	98.59	
CCDC14	3.07	0.64	2	5	3	0	24	783	86.81	
NSUN7	3.06	0.59	5	3	4	0	22	718	100.00	
CCIN	3.06	0.64	1	1	4	1	18	588	100.00	
SEC16A	3.06	0.57	18	13	15	1	65	2127	94.24	
VWCE	3.06	0.60	4	3	5	2	26	851	97.70	
COL20A1	3.05	0.58	7	12	6	0	39	1277	99.22	
SEL1L2	3.05	0.61	0	5	4	1	21	688	100.00	Human
MYLK3	3.05	0.62	2	1	6	0	20	656	100.00	
PCSK9	3.04	0.60	3	3	5	0	21	690	100.00	
EHBP1L1	3.04	0.56	9	9	9	4	43	1414	95.54	
POLQ	3.02	0.61	10	3	18	9	67	2215	90.19	Chimpanzee
SYTL2	3.02	0.58	12	13	13	8	67	2219	99.95	
PKDREJ	3.02	0.60	8	11	18	2	64	2120	98.15	
QSOX1	3.02	0.61	6	3	2	0	22	729	98.65	
RRP1B	3.02	0.66	0	5	1	2	22	729	100.00	
LCA5	3.01	0.65	4	1	2	1	21	697	100.00	
CTDP1	3.01	0.62	3	3	6	2	28	930	97.79	

UNC13B	3.01	0.56	20	19	38	19	123	4091	96.99	
ESCO2	3.00	0.60	2	2	5	0	18	600	100.00	
CCDC39	3.00	0.66	1	4	5	0	26	867	100.00	Human
NEFH	3.00	0.62	1	4	4	3	25	834	96.08	Human
LAMC3	2.99	0.57	10	4	17	1	46	1536	99.10	
AKAP12	2.99	0.60	8	9	13	3	53	1771	99.55	
CSF3R	2.99	0.58	6	3	6	0	25	836	100.00	
TONSL	2.98	0.61	5	5	11	2	40	1341	97.31	
AOAH	2.98	0.60	4	4	1	1	20	671	98.24	Gorilla
ALPK1	2.98	0.56	7	9	7	3	36	1208	97.34	
SIGLEC1	2.96	0.62	10	5	8	1	44	1485	92.75	
EYS	2.96	0.55	19	21	25	8	93	3142	99.94	
CEP126	2.95	0.56	3	9	9	2	33	1117	100.00	
FGD3	2.95	0.60	2	0	5	3	20	678	100.00	Chimpanzee
WDPCP	2.95	0.66	2	1	5	0	22	746	100.00	
MYBBP1A	2.95	0.62	4	5	5	2	31	1052	94.43	
SPAG17	2.94	0.58	11	14	15	3	63	2141	99.35	
STOX1	2.94	0.58	3	4	7	2	26	885	99.77	
ANPEP	2.94	0.59	5	2	7	0	25	851	99.77	
THADA	2.93	0.67	4	8	9	1	52	1772	94.56	Human
COBLL1	2.93	0.66	5	5	4	1	36	1230	99.76	
SEPT4	2.93	0.60	8	3	2	3	29	991	99.50	Gorilla
BFSP1	2.92	0.63	1	0	5	2	19	650	99.54	Chimpanzee
KIAA0586	2.91	0.57	5	7	13	6	44	1513	95.46	
ADAMTS20	2.90	0.61	9	7	10	5	52	1793	98.09	
COL11A2	2.90	0.76	1	2	4	0	34	1173	87.67	
NLRC5	2.90	0.60	9	7	10	2	47	1622	90.97	
ZKSCAN2	2.90	0.65	2	2	7	1	28	967	100.00	
PLBD1	2.89	0.66	4	0	1	0	16	553	100.00	Chimpanzee
CC2D1A	2.89	0.60	6	2	5	0	24	830	92.02	
CHTF18	2.89	0.64	3	1	4	0	20	692	74.89	
PTPN22	2.89	0.62	2	1	4	2	20	693	100.00	
CEP250	2.88	0.71	4	6	10	5	69	2395	98.89	
ZGRF1	2.88	0.60	8	8	15	0	51	1772	96.67	
HEG1	2.88	0.62	5	4	7	2	34	1182	98.99	
C5orf42	2.87	0.56	13	17	27	10	87	3028	98.12	
COL24A1	2.87	0.58	10	7	11	4	49	1706	99.82	
ACSL5	2.84	0.60	4	2	4	1	21	739	100.00	
TOPAZ1	2.83	0.60	9	7	12	0	47	1658	99.64	
MMP17	2.83	0.60	2	2	4	0	17	600	99.50	
ATF7IP2	2.83	0.65	0	3	4	0	19	671	99.70	Human
EXO1	2.83	0.63	7	1	2	0	23	813	96.79	Chimpanzee
EFHC1	2.81	0.64	2	0	4	1	18	641	100.00	Chimpanzee
CCDC171	2.81	0.59	8	7	6	2	37	1318	99.40	
DGKK	2.80	0.66	2	2	6	3	31	1109	88.44	
CORIN	2.78	0.63	7	1	6	0	29	1042	100.00	Chimpanzee
MMP9	2.78	0.65	1	1	5	0	19	683	98.70	
HYDIN	2.78	0.65	21	24	23	5	139	5005	98.48	Gorilla
RIF1	2.77	0.62	9	9	11	5	59	2130	93.38	
SMC1B	2.76	0.70	1	6	4	0	33	1197	98.76	Human
MTIF2	2.75	0.62	5	1	2	1	20	727	100.00	
CDHR2	2.75	0.63	4	4	4	2	29	1056	99.91	
FGD5	2.74	0.66	2	3	7	2	34	1241	96.20	Human
PIEZO1	2.74	0.57	8	8	20	3	56	2045	87.69	
NUB1	2.74	0.62	3	0	4	0	17	621	97.18	Chimpanzee
AKAP13	2.73	0.57	13	8	23	9	74	2711	98.19	Chimpanzee
EGF	2.72	0.58	8	5	6	1	32	1176	99.41	
PKHD1	2.72	0.57	22	15	34	6	105	3859	97.70	
RNF17	2.72	0.61	5	5	10	5	44	1618	99.88	
KIF26A	2.71	0.57	9	9	7	5	43	1586	91.73	
MOCOS	2.71	0.63	4	1	5	1	24	886	99.77	Chimpanzee
PLCH2	2.71	0.66	4	2	7	2	35	1293	95.07	Chimpanzee
ANO7	2.71	0.59	2	4	3	3	22	813	96.10	
USP45	2.70	0.61	5	3	2	1	22	814	100.00	
NOL6	2.70	0.68	1	3	5	2	30	1111	96.95	Human
ST14	2.70	0.63	1	2	6	1	23	852	99.65	Human
TDRD1	2.70	0.62	2	4	7	3	31	1149	99.65	Human
PDZD2	2.70	0.61	8	15	16	1	68	2523	97.11	Human
DUSP27	2.68	0.58	6	9	4	0	31	1158	100.00	
NCKAP5	2.67	0.56	12	9	11	4	49	1832	95.97	
HR	2.67	0.61	7	3	5	0	28	1047	93.07	
PPL	2.67	0.63	7	11	5	0	45	1683	98.13	Gorilla
DTHD1	2.67	0.60	1	9	2	1	24	898	99.56	
ZNF407	2.67	0.57	5	11	11	5	46	1722	99.54	
NLRC4	2.67	0.69	2	1	4	0	23	861	99.88	Chimpanzee
CRYBG1	2.67	0.59	8	14	11	1	53	1986	99.75	
PLEKHG6	2.66	0.63	1	1	6	1	21	790	100.00	
SPIDR	2.65	0.58	2	1	8	3	24	904	99.12	Chimpanzee

CEP162	2.64	0.68	2	2	8	2	37	1400	100.00	
ARHGAP11A	2.64	0.67	4	2	3	1	27	1023	100.00	Chimpanzee
ANKRD24	2.64	0.58	5	3	6	3	28	1062	94.74	
MMRN2	2.63	0.61	4	3	3	1	22	838	100.00	
BOD1L1	2.62	0.60	9	14	22	5	80	3048	100.00	Human
CCDC18	2.62	0.60	3	6	11	2	38	1453	100.00	Human
MAP4	2.61	0.59	3	4	3	4	25	957	92.46	
LRIG1	2.61	0.66	2	3	5	1	28	1073	98.53	Human
TANGO6	2.59	0.66	4	4	3	0	28	1082	98.90	Gorilla
KIF20B	2.59	0.57	7	7	11	8	47	1818	99.89	
ELP1	2.57	0.61	5	8	6	0	34	1322	99.55	
JCAD	2.55	0.58	2	10	8	2	34	1332	98.38	Human
CTC1	2.55	0.62	5	4	2	2	26	1019	87.92	Gorilla
KIF14	2.55	0.66	7	5	4	2	42	1648	100.00	Gorilla
SI	2.54	0.71	1	6	6	2	46	1814	99.40	
TEP1	2.52	0.61	13	16	7	2	63	2502	98.00	Gorilla
URB1	2.51	0.60	9	6	12	7	56	2231	98.33	Chimpanzee
MICAL1	2.49	0.59	7	2	7	0	27	1085	99.91	Chimpanzee
NPAT	2.48	0.61	3	4	10	2	34	1371	97.86	Human
HMCN2	2.45	0.60	19	17	29	3	105	4290	93.98	
FREM3	2.43	0.55	11	9	16	4	52	2137	99.95	
BAHCC1	2.43	0.61	7	6	11	3	47	1932	84.92	
CENPF	2.43	0.53	18	17	24	3	74	3044	99.57	
CTAGE5	2.41	0.60	5	2	12	1	34	1409	99.79	Chimpanzee
FREM1	2.40	0.54	10	8	20	4	52	2167	99.59	
FASN	2.39	0.56	9	8	17	6	55	2304	95.32	
LCOR	2.38	0.66	6	1	7	2	37	1554	99.87	Chimpanzee
TTC3	2.36	0.57	13	11	4	4	46	1946	97.79	Gorilla
C2CD3	2.36	0.64	9	8	7	3	53	2243	97.61	Gorilla
APOB	2.36	0.51	27	28	37	9	107	4534	99.45	
ICE1	2.35	0.53	13	7	17	6	52	2217	99.86	
ZDBF2	2.34	0.56	14	11	12	3	55	2349	100.00	
F5	2.32	0.58	8	7	11	7	50	2155	99.31	
SYNE2	2.19	0.56	38	30	42	3	146	6678	98.31	

S9 Table: Higher than expected substitution rate on the #1# branch

Gene	#1# % subs per site	#1# norm branch length	Human subs	Chimp subs	Gorilla subs	#1# subs	Gibbon subs	Align overlap	Align Sat	Lower in
SLC39A14	3.51	0.62	2	0	1	17	4	485	98.98	
SUMO3	3.20	0.39	0	0	1	4	3	125	89.29	
IL9	2.78	0.33	0	0	0	4	6	144	100.00	
C16orf78	2.27	0.22	1	1	3	6	16	264	100.00	
CCDC78	1.82	0.24	0	2	5	6	11	330	89.19	
TMEM231	1.50	0.33	1	0	2	4	3	266	83.91	
NDUFAF6	1.50	0.43	0	1	2	5	1	333	100.00	Gibbon
ZNF778	1.34	0.20	5	5	3	8	18	598	98.36	

S10 Table: Evidence for rapidly diverging human genes

Gene	Tissue-specific expression	Phenotype	Biological Process
ADCYAP1	Biased expression in appendix and 12 other tissues	Schizophrenia	Ovarian follicle development, Behavioral fear response, and Inflammatory response
PVALEF	Low expression overall, highest in fat	-	-
PGLYRP1	Restricted expression toward bone marrow	Blood protein levels	Immune response to bacterium
PSORS1C2	Restricted expression toward skin	Autism spectrum disorder or schizophrenia	-
BTNL2	Low expression	Sarcoidosis, Autism spectrum disorder or schizophrenia, Asthma, Blood pressure	Positive regulation of T cell proliferation and interleukin-2 secretion