

Supplementary Tables

Table 1: List of PV types included in our analyses

Host species	PV Type	PV Genus-Species	GenBank Accession Numbers
Human	HPV32	α -1	X74475
	HPV10	α -2	X74465
	HPV28	α -2	U31783
	HPV29	α -2	U31784
	HPV77	α -2	Y15175
	HPV94a	α -2	AJ620211
	HPV94a	α -2	AJ620211
	HPV61	α -3	U31793
	candHPV62	α -3	AY395706
	HPV72	α -3	X94164
	HPV83	α -3	AF151983
	HPV84	α -3	AF293960
	candHPV86	α -3	AF349909
	candHPV87	α -3	AJ400628
	candHPV89	α -3	AF436128
	HPV102	α -3	DQ080083
	HPV27	α -4	X74473
	HPV57	α -4	X55965
	HPV106	α -4	DQ080082
	HPV26	α -5	X74472
	HPV69	α -5	AB027020
	HPV82	α -5	AB027021
	HPV30	α -6	X74474
	HPV66	α -6	U31794
	HPV18	α -7	X05015
	HPV39	α -7	M62849
	HPV45	α -7	X74479
	HPV59	α -7	X77858
	HPV68a	α -7	DQ080079
	HPV70	α -7	U21941
	candHPV85	α -7	AF131950
	HPV97	α -7	DQ080080
	HPV7	α -8	X74463
	HPV40	α -8	X74478
	HPV43	α -8	AJ620205
	candHPV91	α -8	AF419318
	HPV16	α -9	K02718
	HPV31	α -9	J04353
	HPV33	α -9	M12732
	HPV35	α -9	M74117
	HPV52	α -9	X74481

Table 1
Continued

Host species	PV Type	PV Genus-Species	GenBank Accession Numbers
Human	HPV58	α -9	D90400
	HPV67	α -9	D21208
	HPV6	α -10	AF092932
	HPV6b	α -10	X00203
	HPV11	α -10	M14119
	HPV13	α -10	DQ344807
	HPV44	α -10	U31788
	HPV34	α -11	X74476
	HPV73	α -11	X94165
	HPV54	α -13	U37488
	HPV5	β -1	M17463
	HPV5b	β -1	D90252
	HPV12	β -1	X74466
	HPV19	β -1	X74470
	HPV20	β -1	U31778
	HPV21	β -1	U31779
	HPV24	β -1	U31782
	HPV25	β -1	X74471
	HPV36	β -1	U31785
	HPV93	β -1	AY382778
	RTRX7	β -1	U85660
	HPV9	β -2	X74464
	HPV15	β -2	X74468
	HPV17	β -2	X74469
	HPV22	β -2	U31780
	HPV23	β -2	U31781
	HPV37	β -2	U31786
	HPV38	β -2	U31787
	HPV80	β -2	Y15176
	HPV49	β -3	X74480
	HPV75	β -3	Y15173
	HPV76	β -3	Y15174
	candHPV92	β -4	AF531420
	candHPV96	β -5	AY382779
	HPV4	γ -1	X70827
	HPV65	γ -1	X70829
	HPV95	γ -1	AJ620210
	HPV48	γ -2	U31789
	HPV50	γ -3	U31790
	HPV60	γ -4	U31792
	HPV63	μ	X70828
	HPV41	ν	X56147

Table 1
Continued

Host species	PV Type	PV Genus-Species	GenBank Accession Numbers	
Pygmy chimpanzee (Bonobo)	PcPV	α -10	X62844	
Common Chimpanzee	CCPV1	α -10	AF020905	
Rhesus Monkey	RhPV1	α -12	M60184	
Micromys minutus (Muridae)	MmPV	π	DQ269468	
Mastomys coucha (Muridae)	McPV2	π	DQ664501	
Cotton tail Rabbit	CRPVb	κ	AJ243287	
European Rabbit (Domestic)	ROPV	κ	AF227240	
Porcupine	EdPV1	σ	AY684126	
Bovine	BPV1	ϵ	X02346	
	BPV2	ϵ	M20219	
	BPV3	ξ	AF486184	
	BPV5	δ	AJ620206	
	BPV7	unclassified	DQ217793	
	BPV8	δ	DQ098913	
	BPV9	ξ	AB331650	
	BPV10	ξ	AB331651	
	Deer	DPV	ϵ	M11910
	Reindeer	RPV	ϵ	AF443292
European Elk	EePV	ϵ	M15953	
Phocoena spinipinnis (porpoise)	PsPV	\omicron	AJ238373	
Tursiops truncatus (dolphin)	TtPV2	unclassified	AY956402	
Dog	CPV2	unclassified	AY722648	
	COPV	λ	D55633	
Raccoon	PIPV1	λ	AY763115	
Cat	FdPV	λ	AF480454	
Parrot	PePV	θ	AF502599	

Table 2: Harmonic mean and 95% confidence interval (CI) of corrected log likelihood (LL_{corr}) values from partitioned BEAST analysis measuring topological congruity of PV genes.

	LL_{corr} (gene topologies constrained)	LL_{corr} (gene topologies unconstrained)	ΔLL_{corr}
E1-E2	12.52 (11.43,19.23)	68.32 (67.21,73.89)	55.80
E1-L1	17.50 (16.41,26.11)	224.77 (223.74,227.58)	207.27
E1-L2	12.80 (11.71,22,22)	277.06 (275.96,284.81)	264.26
E2-L1	18.89 (17.85,22.15)	90.69 (89.60,99.44)	71.80
E2-L2	12.44 (11.35,18.10)	122.23 (121.13,136.33)	109.79
L1-L2	20.43 (19.33,29.50)	126.57 (125.47,136.67)	106.14
E6-E1	13.41 (12.41,18.34)	65.99 (65.18,68.70)	52.58
E6-E2	15.43 (14.34,22.69)	81.38 (80.47,83.48)	65.95
E6-E7	12.91 (12.22,14.28)	49.66 (48.57,59.20)	36.75
E6-L1	14.59 (13.63,17.42)	110.85 (109.75,119.76)	96.26
E6-L2	16.42 (15.39,19.45)	111.17 (110.07,126.93)	94.75
E7-E1	11.61 (10.80,14.78)	34.19 (33.28,42.49)	22.58
E7-E2	13.70 (12.76,21.68)	34.80 (33.71,44.49)	21.10
E7-L1	10.33 (9.24,17.03)	64.46 (63.36,71.74)	54.13
E7-L2	13.46 (12.51,16.58)	66.88 (65.78,79.15)	53.42

Table 3: Host speciation times used to sample PV divergence times

Super-order	Order	Host divergence	Host speciation time (mya)
Euarchontoglires	Primates	Chimp-Bonobo	3.4-5.5
		Human-(Chimp/Bonobo)	7.8-9.5
		Human-Monkey	19.0-31.8
	Glires	Muridae: M. coucha-M. minutus	25.9-31.9
		Cotton tail rabbit-European (Domestic) rabbit	19.0-31.8
	Primates-Glires ^a		90.0-93.8
Laurasiatheria	Carnivora	Cat-(Dog/Raccoon)	59.8-67.1
		Dog-Raccoon	53.2-59.8
	Cetacea	Dolphin-Porpoise	27.8-32.1
	Cervidae	Deer-(Elk/Roe deer)	14.7-18.5
		Elk-Roe deer	14.0-16.8
	Ruminantia	Cervidae-Bovine	24.3-31.9
	Cetartiodactyla ^b	Cetacea-Ruminantia	59.2-63.9
Carnivora-Cetartiodactyla		83-85.8	
Euarchontoglires-Laurasiatheria ^b			92.9-98.4

^a The Primates-Glires speciation time was applied to PV splits of human-rabbit, human-porcupine, human (γ)-Muridae.

^b The Cetartiodactyla speciation time was applied to the divergence of the Cetacean PVs and the ξ BPVs in the L1 tree only.

^c The Euarchontoglires-Laurasiatheria speciation time was applied to PV splits of human-rabbit-Carnivora, human (γ)-bovine, human (γ)-dog, Muridae-bovine, Muridae-dog, human (γ)-Muridae-bovine-dog, Primate-Cetacea (E1 only), human (β)-bovine (E1 only).

Table 4: Observed distribution of diversification mechanisms at PV divergences of the E1 and L1 genes from the biased sampling analyses run independently with likelihood penalties of $\ln(0.05)$ and $\ln(0.005)$ for violations of host-speciation times.

E1 gene PV divergence ($\ln(0.05)$)	Prior divergence	Co-speciation	Host switch
Chimp-Bonobo	0.60	99.22	0.18
Human-Chimp-Bonobo	5.66	93.77	0.57
Human-Monkey	100**	0	0
Dolphin-Porpoise	100**	0	0
Primate-Cetacea	24.30	74.98	0.72
Rabbit:Cotton tail-European	88.86**	11.14	0
Human-Rabbits	1.27	70.72	28.00
Cat-Dog	0.25	95.48	4.27
Cat-Raccoon	0.03	93.03	6.94
Dog-Raccoon	6.60	90.91	2.48
Human-Rabbits-Carnivora	10.38*	88.73	0.89
Human (beta)-Bovine	2.92	93.69	3.39
Muridae: <i>M.coucha-M.minutus</i>	91.31**	8.69	0
Human-Muridae	11.65	88.15	0.20
Human-Bovine	0.05	99.18	0.77
Human-Dog	0.05	99.18	0.77
Bovine-Dog	3.42	88.23	8.35
Bovine-Muridae	0	2.63	97.37
Dog-Muridae	0	2.79	97.21
Human-Porcupine	2.81	40.21	56.98
Elk-Roe deer	88.69**	11.30	0.01
Cervidae	100**	0	0
Cervidae-Bovidae	100**	0	0

E1 gene PV divergence ($\ln(0.005)$)	Prior divergence	Co-speciation	Host switch
Chimp-Bonobo	0.35	99.56	0.09
Human-Chimp-Bonobo	3.21	96.49	0.30
Human-Monkey	100**	0	0
Dolphin-Porpoise	100*	0	0
Primate-Cetacea	13.41	86.24	0.35
Rabbit:Cotton tail-European	64.52	35.48	0
Human-Rabbits	0.70	82.73	16.57
Cat-Dog	0.17	98.05	1.78
Cat-Raccoon	0.02*	96.80	3.18
Dog-Raccoon	3.76	94.82	1.42
Human-Rabbits-Carnivora	5.84*	93.68	0.48
Human (beta)-Bovine	1.45	96.62	1.92
Muridae: <i>M.coucha-M.minutus</i>	71.27**	28.73	0
Human-Muridae	8.05	91.27	0.69
Human-Bovine	0	99.60	0.40*
Human-Dog	0	99.60	0.40*
Bovine-Dog	2.00	93.46	4.55
Bovine-Muridae	0	22.48	77.52
Dog-Muridae	0	22.56	77.44
Human-Porcupine	2.02	62.58	35.40
Elk-Roe deer	60.33**	39.66	0.01
Cervidae	100**	0	0
Cervidae-Bovidae	100**	0	0

Table 4
Continued

L1 gene PV divergence (ln(0.05))	Prior divergence	Co-speciation	Host switch
Chimp-Bonobo	0.27	99.06	0.66
Human-Chimp-Bonobo	10.83	88.83	0.35
Human-Monkey	99.50**	0.50	0
Dolphin-Porpoise	100*	0	0
Rabbit:Cotton tail-European	95.75**	4.25	0
Human-Rabbit	2.61	75.84	21.56
Cat-Dog	0	0.44	99.56
Dog-Raccoon	33.12	64.09	2.79
Human,Rabbit-Carnivora	21.80*	77.42	0.78
Cetacea-Bovine	100**	0	0
Muridae: <i>M.coucha-M.minutus</i>	20.30	79.29	0.42
Human-Muridae	1.03	88.90	10.07
Human-Bovine	0	99.99	0.01
Human-Dog	0	99.96	0.04
Bovine-Dog	4.65	80.82	14.53
Bovine-Muridae	0	99.94	0.06
Dog-Muridae	0	99.99	0.01
Human-Porcupine	0	0	100*
Elk-Roe deer	97.42**	2.58	0
Cervidae	100**	0	0
Cervidae-Bovidae	100**	0	0

L1 gene PV divergence ln((0.005))	Prior divergence	Co-speciation	Host switch
Chimp-Bonobo	0.02	99.89**	0.09
Human-Chimp-Bonobo	0.10	98.97	0.04
Human-Monkey	85.43*	14.57	0
Dolphin-Porpoise	100**	0	0
Rabbit:Cotton tail-European	61.71**	38.29	0
Human-Rabbits	0.16	94.68	5.16
Cat-Dog	0	4.43	95.57
Dog-Raccoon	31.11	68.46	0.44
Human-Rabbits-Carnivora	2.68*	97.27	0.05
Cetacea-Bovine	100**	0	0
Muridae: <i>M.coucha-M.minutus</i>	2.14	97.79	0.07
Human-Muridae	0.09	98.50	1.42
Human-Bovine	0	100	0
Human-Dog	0	100	0
Bovine-Dog	0.50	97.81**	1.69
Bovine-Muridae	0	100	0
Dog-Muridae	0	100	0
Human-Porcupine	0	0	100*
Elk-Roe deer	70.38**	29.61	0.01
Cervidae	98.50**	1.50	0
Cervidae-Bovidae	98.31**	1.69	0

* indicates p-values < 0.05 obtained from the biased sampling analysis of simulated data generated under a model of co-speciation at each node. ** indicates p-values < 0.01 from this analysis.