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      *          20          *          40          *          60          *
Rh-USP1      : -----MYKKERPKLSVTALYGSAGPAASWPTRPLQPPDVSPPGIRAAPGLNGGASNGVS
Rh-USP3      : -----ATQ.....T...
A. americanum-USP : -----ATQ.....T...
I. scapularis-USP1 : .....GVGP---.PSPS.WGAP.GAAAPSA...SPS...
I. scapularis-USP3 : .....GVGP---.PSPS.WGAP.GAAAPSA...SPS...
O. moubata-USP : .....X.....S..P---APVWTSVVT.LSPTYHGS.GSVN.G.TA...
B. mori-USP : -----MSSA..D..T.....NRAWPMT-----SPOQQQQ.VPSTQHSNLFQPMATP
D. rerio-USP : MLLSAFLPTDCTGQVTSSPSSPTSH.GMHPS..SP.SLGP-----SGS.HS.ISTLSSP..L.SPFS.I
D. melanogaster-USP : -----DNCDDQDASFRLSH.K-----EE.K.DISQLNDSN.SSFSPKAE.
H. sapiens-RXR : -----MAAPS.HP-SLGPPI-G-----GQ.HS.ISTLSSP..M.PPFS.I
M. musculus-RXR : MDTKHFLPLDFSTQVNSSNSPTGRGSMVPSHP-SLGPPI-G.PLGS.GQ.HS.ISTLSSP..M.PPFS.I

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      80          *          100          *          120          *          140          *
Rh-USP1      : SSLPPQPSF---LLSGYGAPSAASRPLDGRQLNNGP---PAAPQQQQAATRYPPNHPISGSKHLCSICGDRA
Rh-USP3      : .....LPAER.RRAL.SI.VG.PAAQQ.SSG.TA---T..AATSHH.LSTK---
A. americanum-USP : .....LPAER.RRAL.SI.VG.PAAQQ.SSG.TA---T..AATSHH.LSTK---
I. scapularis-USP1 : ..AQPSFL---.G...GGGGGGGAPSSVSQRGD.RALVD.GPAFA.GGS...
I. scapularis-USP3 : ..AQPSFL---.G...GGGGGGGAPSS-----GGG...
O. moubata-USP : ..Q..S..---PGLL.TSAYAP.GQQQQ.QSG-----G.LSGG...
B. mori-USP : ..T.NVELDIQWLN.ESGFMSPM.PPE.KPDTAMLDG---FRDDSTPPPPFKN.
D. rerio-USP : ..PMGPH.MAS---PGVGYG..I.PQLNSPMNSVSSSEDIKP.LGLNGVMKVPAQ.SGT..L...A...S
D. melanogaster-USP : PVPFM.AMSMVHV.PGSNS.S.NNN.AG.AQMAQAPN---SAGGSAAAAVQQQ...
H. sapiens-RXR : ..PMGPH.MSVPTTP.LGFS-.G.PQLSSPMNPVSSSEDIKP.LGLNGVLKVPAH.SGNMA.F...A...S
M. musculus-RXR : ..PMGPH.MSVPTTP.LGFG-.G.PQLNSPMNPVSSSEDIKP.LGLNGVLKVPAH.SGNMA.F...A...S

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      160          *          180          *          200          *          220
Rh-USP1      : SGKHYGVYSCGCKGFFKRTVRKDLTYACREERNQVIDKQRQNRQCQYQKCLSCGMKREAVQEERQRTKDRAD
Rh-USP3      : .....T.....A.....
A. americanum-USP : .....T.....A.....
I. scapularis-USP1 : .....T.....A.....
I. scapularis-USP3 : .....T.....A.....
O. moubata-USP : .....D.....E..GE
B. mori-USP : .....D.....A.....AARGTE
D. rerio-USP : .....T..DN.....AM.....A..E..SE
D. melanogaster-USP : .....T..N.....AM.....GARN.A
H. sapiens-RXR : .....T..DN.....AM.....G...NE
M. musculus-RXR : .....T..DN.....AM.....G...NE

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      *          240          *          260          *          280          *          300
Rh-USP1      : SEVESTSGGAP-----PEMPLERILEAEIRVEPHTG-----
Rh-USP3      : .....SQ.....K-----
A. americanum-USP : .....SQ.....K-----
I. scapularis-USP1 : N.....A.....K-----
I. scapularis-USP3 : N.....A.....K-----
O. moubata-USP : N.....S.Q.....A..D.....KAEDLEVNA
B. mori-USP : DAHP.....VQ..S.....L.AL.ADSAEELQILR
D. rerio-USP : N.....SAN-----ED.....A..K.ETYIETN
D. melanogaster-USP : GR.SA.G..SSGPGSVGGSSSGGGGGGGVSGMGSGNGSDDFMTNSVSRDFS.....Q.A.TQC.DRALTF
H. sapiens-RXR : N.....SAN-----ED.....A..K.ETYVEAN
M. musculus-RXR : N.....SAN-----ED.....A..K.ETYVEAN

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      *          320          *          340          *          360          *

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		*	540										*	560																										
Rh-USP1	:	GLK	C	L	E	H	L	F	F	F	K	L	I	G	D	T	P	I	D	N	F	L	I	T	M	L	E	T	P	S	D	A	-----							
Rh-USP3	:																															-----								
<i>A. americanum</i> -USP	:																											A			P	-----								
<i>I. scapularis</i> -USP1	:																											A				-----								
<i>I. scapularis</i> -USP3	:																											A				-----								
<i>O. moubata</i> -USP	:																											A			S	-----								
<i>B. mori</i> -USP	:	S			S	F					L	H			A	E	G	S	S	S			R	D	A	C	N	H	A	P	P	I	D	T	N	I	M	-----		
<i>D. rerio</i> -USP	:																		T				E			A				H	Q	M	T	-----						
<i>D. melanogaster</i> -USP	:	S				Q	D				L				T	S		R		E	E	L	F		E	Q		A		P	P	P	G	L	A	M	K	L	E	-----
<i>H. sapiens</i> -RXR	:																		T				E			A				H	Q	M	T	-----						
<i>M. musculus</i> -RXR	:																		T				E			A				H	Q		T	-----						

Additional files1 Figure S2: Alignment of the deduced amino acid sequences of *Rhipicephalus haemaphysaloides* USP; *Amblyomma americanum*-USP; *Ixodes scapularis*-USP; *Ornithodoros moubata*-USP; *Bombyx mori*-USP; *Drosophila melanogaster*-USP; *Danio rerio*-USP; *Homo sapiens*-RXR; *Mus musculus*-RXR. Invertebrate and vertebrate ha also had a DBD domain and a LBD domain as EcR. Moreover, the DBD domain of USP was highly conserved not only in invertebrate but also in vertebrate, which was different from EcR.