

**Supplementary Table S1. Synthesized DNAs for generating plasmids encoding X protein**

X protein	Codon-optimized DNA sequence
HBV (genotype A) Accession # LC488828.1	<u>ATGT</u> ACCCTTACGATGTACCTGACTACGCGACCGGTGCCGCTCGACTT TATTGCCAACTTGATCCATCCCGCGACGTGTTGTGTCTCAGACCCGTT GGCGCCGAATCTCGAGGTCGCCCACTTTCAGGACCCCTTGGTACATTG AGTTCTCCATCTCCGAGCGCTGTACCGGCGGACCACGGGGCTCATTG AGTTTGAGGGGTCTCCCAGTGTGTGCTTTCAGCAGTGCCGGGCCCGTGC GCGCTTCGATTCACTTCAGCAAGATGTATGGCTACGACTGTCAATGCT CATCAAATCCTCCCAAAGGTCTCCACAAAAGAACGCTTGGGCTTCC GGCCATGTCTACTACTGATCTTGAGGCGTACTTCAAGGACTGCGTCTT TAAGGATTGGGAGGAATTGGGGGAGGAAATTCGCCTTAAAGTATTCTG TGCTGGGGGGTTCAGACACAACTTGTATGCGCTCCTGCCCCGTGC AACTTCTTCACTTCCGCAT <u>AA</u>
HBV (genotype D) Accession # YP_009173867.1	<u>ATGT</u> ACCCTTACGATGTACCTGACTACGCGACCGGTGCCGCACGCCTC TGTTGCCAACTTGATCCAGCACGGGATGTTCTGTGCCTTCGGCCAGTC GGCGCTGAAAGTTGTGGACGGCCGTTCTCCGGCTCCCTCGGAACGCT CTCCTCCCCCTCCCCCTCAGCCGTCCCTACAGATCATGGAGCTCACCT TTCTCTTCGCGGGCTTCCGGTATGCGCGTTTTCTTCTGCTGGACCTTGC GCGTTGCGCTTTACATCTGCTAGGAGAATGGAAACAACGGTTAACGC GCACCAGATACTCCCGAAGGTTTTGCACAAAAGGACCCTGGGTCTTA GTGCCATGAGCACTACTGATCTCGAGGCATACTTTAAGGACTGCTTGT TCAAGGATTGGGAGGAACTTGGGGAAGAGATCAGATTGAAGGTGTTCT GTCTTGGGGGGATGTCGGCATAAGCTCGTGTGTGCACCTGCACCCTG CAATTTCTTCACGTCTGCT <u>AG</u>
HBV (genotype G) Accession # BAD91282.1	<u>ATGT</u> ACCCTTACGATGTACCTGACTACGCGACCGGTGCAGCCCGGCT CTGTTGTCAGTTGGATCCCAGCCGAGACGTTCTCTGCTTGCGGCCAGT TAGCGCAGAGTCATCTGGACGCCCGCTGCCCGGACCTTTTGGTGCACCT CTCTCCTCCAAGTCCCTCTGCAGTCCCCGCAGATCATGGCGCTCACCT GTCATTGCGCGGTTTGCCAGTATGCGCCTTCTCCTCAGCAGGTCCGTG CGCGCTTCGATTCACGTACGACCGGTACATGGAAACGGCAATGAATA CGAGCCACCATCTCCCCGACAACCTTTACAAACGCACCCTCGGTCTTT TCGTTATGAGTACCACTGGTGTGAGAAAGTACTTTAAAGACTGTGTCT TCGCTGAATGGGAGGAGTTGGGCAACGAGAGCCGACTGATGACTTTC GTGCTGGGCGGATGCAGACATAAGCTCGTGTGTGCTCCGGCCCCCTG TAATTTCTTTACTTCAGCT <u>TAA</u>
HBV (genotype H) Accession # BAJ15483.1	<u>ATGT</u> ACCCTTACGATGTACCTGACTACGCGACCGGTGCCGCTAGGCT GTGCTGCCAACTTGATCCCGCCCGCGACGTGCTGTGTTTGCGGCCAGT AGGTGCTGAAAGCTGCGGTTCGGCCACTTTCCTGGTCCCTCGGGGCTTT GCCCCGTCATCACCTCCAACAGTTCTGCTGACGACGGATCTCACTT GAGTCTTCGGGGGTGCCCCGCGTGCAGCTTCACTTCCGCTGGTCCTTG TGCGTTGCGATTTACGAGTGCTAGGAGAATGGAAACGACTGTCAACG CTCCCTGGAACCTGCCACTACGCTGCACAAACGAACATTGGGTCTGT CTCCCCGCTCCACGACTTGATAGAAAGAGTACATTAAAGACTGTGTTT TCAAAGACTGGGAGGAAAGTGGGGAGGAACTTCGCCTGAAGGTGTTT GTGCTTGGCGGTTGTAGACACAACTCGTGTGTTCCCCGGCCCCCTGT AACTTCTTCACTAGCGCAT <u>AG</u>

DCH (KT-116) Accession # LC668427.1	<u>ATGTACCCTTACGATGTACCTGACTACGCGACCGGTGCAGCACGGCT</u> GCGCTGCGAACTCGATCCTTCTGGTCGGGTCCTGCGGTTGAGACCATT CATTAGTGAATCCAGCGGACGCGCGGTTAGCCGAACTGCACGCTTGC CAGACCTGAGCCCCCTCAGTTGCGGTTTCAGCGACACTGCGGGCCAGG GAATCTCTGAGGGGTATACCTGCCTGTCTCACGTCACCAGAGGGCCC TTGTGTTTTGAGATTTACCTGCGCTGATAGTAGACGGTGCATGGAAGC AGCAATGATTGGCTTGGTCCCAGCACTGCTTGCTCGCCAACTTGGCTT CGGGACTTGGCAGCCGGATGTATGGACGCTTCGGCTTCGCGATCTTTT GTTGGTCGAGTGGGAGGAAGAAGGACTGACGCCGCGGTTGTGTACTT ATCTTGTAACGGGGTGCGCTCATAAAACGCTTCACACTCGAT <u>AG</u>
DCH (Rara) Accession # LC685967.1	<u>ATGTACCCTTACGATGTACCTGACTACGCGACCGGTGCAGCCCCGCTC</u> AGATGTGATCTGGACTCATCTGGGCGAGTTCTTCGACTTCGCCCCGTT CATTCAGAGTCCTGTGGCAGGGCCGTCAGCAGGGGTTCTAGGTTGCC AGACGTGCCCCACTGCCGTTGCGGTGCCGAGTACACTTCGACCCTGTC AGTCTTTGCGAGGATTGCCAGCATGTCTCGCATCAAGCGCTGGCCCCCT GTGTGCTCCGTTTACTTGCGCCGACTGTAGGAGGTGTATGGAGACA GCCATGATCGGTCTTGTCCCCGCGCTTTTGGCCAGGCAACTTGGGAGT GGGACGTGGCAAACCTGATCTTTGGACACTCCGACTTCGGGAGTTGCT GCTTGCTGAATGGGAGGAGGAGGGACTTACACCGAGACTCTGTACTT ACCTTCTCTCTGGCTGTGCACATAAGACTCTCTATCCATGCT <u>GA</u>
DCH (Sydney) Accession # MH307930.1	<u>ATGTACCCTTACGATGTACCTGACTACGCGACCGGTGCGGCTCGGCTT</u> AGGTGCGAGCTTGACCCGTGGGGAAGGGTGTTGAGGCTGAGACCTTT TCATTTCAGAGTCCGGTGGAAGGGCGGTATCTAGGACTGCTCGACTCC CGGATCTTAGTACGTCCGTGGCTGTGTCCGCCACTCTCAGAGCCAGG GAATCTCTTCGAGGCATCCCTGCCTGTCTTACTAGTCCCGAAGGGCCG TGTGTTCTTCGGTTCACCTGCGCTGACTCCCGACGATGTATGGAGGCG GCAATGACTGGTCTCGTACCCGCTCTCCTTGCCAGACAACTGGGATTT GGGACCTGGCAACCCGATCTTTGGACCTTGCGGCTTCGGGACCTCCTG CTTGTAGAGTGGGAGGAAGAGGGGTTGACACCCAGGCTTTGCACTTA CCTGGTGACAGGATGTGCTCATAAGACACTTCATACGAGG <u>TGA</u>
DCH (TR-SV15) Accession # ON293153.1	<u>ATGTACCCTTACGATGTACCTGACTACGCGACCGGTGCTGCTAGATTG</u> AGATGTGAGTTGGATCCCTCTGGACGAGTGCTGCGGTTGAGACCATT CCATTCTGAGTCTTCCGGGCGGGCTGTCAGCAGAACTGCGCGGTTGC CGGACCTCTCAACTAGTGTAGCGGTAAGTGCTACACTCCGCGCAAGA GAGTCACTGCGAGGCATCCCAGCTTGTCTGACCTCTCCAGAAGGTCCT TGCGTTCTCAGATTCACATGCGCCGATTCTCGGCGGTGTATGGAGGCA GCAATGATAGGTCTTGTCCCAGCATTGCTGGCCAGGCAACTCGGATTT GGCATATGGCAACCTGAGCTTTGGACTCTTAGATTGCGCGACCTCCTC CTGGTCGAATGGGAAGAAGAAGGTCTGACTCCAAGACTGTGTACATA TCTGGTTACTGGCAGCGCTCACCAGACCCTGCACAATCGG <u>TGA</u>
WHV Accession # NC_004107.1	<u>ATGTACCCTTACGATGTACCTGACTACGCGACCGGTGCTGCTAGGCTC</u> TGCTGCCAGCTCGATTCTGCCCCGAGACGTGTTGCTGCTTCGACCGTTT GGACCTCAAAGCAGTGGACCTAGTTTTCCGAGACCGGCGGCAGGTTT AGCAGCCAGCAGCGCTTCATCACCAGTCCGAGTGACGAATCAGATT TGCCGCTCGGCAGACTCCCTGCATGTTTTGCTAGTGCGTCTGGACCCT GCTGCCTGGTTTTTACTTGTGCAGAATTGAGAACCATGGATTCCACGG TAAACTTCGTATCTTGGCATGCCAACCAGGCTGGGTATGCCGTCCA AAGATTTGTGGACGCCCTATATAAAGGATCAGCTCCTCACCAAATGG

	GAAGAAGGCTCTATCGACCCACGCCTGAGTATCTTCGTGTTGGGGGG TTGTCGCCATAAATGTATGCGATTGCTCTAA
Domestic donkey HBV Accession # QMV34684.1	ATGTACCCTTACGATGTACCTGACTACGCGACCGGTGCGGCTCGCCTG AGGTGTCAACTGGACCCAAGTGGCCGGGTACTCCACCTCCGACCCTTT ACTTCCGAATCTTGTAGAAGAACTTTGGCAGGTACTGCCGGGGCACC AGATCTCCCAGCAGCGGACCTCCTTCAAGCGGATCACCGGACTCATC TTAGGGTTCGACGCTTGCCTGCTTGCTGTTTCTCTTCTCGCGGTCCGTG TGTGCTTAGGTTACATGCGCGGACCTTAGCCGACGAATGGAAGCCC CGATGAACCTCGTTCAATATCTGGGGAAAAGGGCGCGGGGTCTTCAG CATCCGCCCCGGTGATTCTATTGCCAACATGAACTTTGGACACAATGG GAGGAGAATGGTTGGTCAGACAGAATCTATACTTACGTGTTGGGAGG ATGCAGACACAAATGGCTTTACCCACTTTAG
Asian grey shrew HBV Accession # YP_010796421.1	ATGTACCCTTACGATGTACCTGACTACGCGACCGGTGCTGCAAGAAT GCTCTTCGATCTCGACCCTGCTACAGGAGCTGTACGCCTTCGCCATT TCTCACTGAACCCCGCGGACGAGGGGAACAGACACCGCGCCCGACTT CCTCTCCGACAACGTCAGCCCTGTCTTCTTCTTCTTGGAAAGTCGGTCTT CCTGGCGGCGCTTGCCAAGCTGCGCCGACTCTCCATTTCGGCCCATGTA CTTTGCGGTTACGTTTCGAGAGCTGGGAAACTTGCAGACACCAATG AACTCAGTGACCTTCATCAGTTGTCGGTCAAGGGGAGCCCATCTGAA GTGCCGGAGGCAACAGAAGAATTGGACCTGGTATTTCTGGACACATC ATAATGCGAACAACACGCACCATTTGTGGCTTATGTGCTACGGAGGT TGTAGGCATAAATAG
Capuchin monkey HBV Accession # YP_009666527.1	ATGTACCCTTACGATGTACCTGACTACGCGACCGGTGCAGCCAGACT TTGTTGCCAACTGGACCCTGCCAGGGATGTTCTTTGTCTCCGACCTGT AACTGCCGAGCCATGTGGACGACCCTTCAGCGGTTCTGCTCGGACAT CCGCTCCGGCAGCTGCGGCAGCCCTGCCCTCTATTGATGGAGCATATC TGTCCTTCGAGGGGCTTCCTAGTTGCGCTTCTCATCCTCAGGGCCCT GCGCCTTGAGGTTTACAAGTGCGCGACGAATGGCTACACCGATGAAT AGTAGAGATCTGGTCCAACAACCTCTATAATCGGACGTTGGGTCTTGCT CCTCTCTCCACTGGGCAGTGGGAACGGCACTTTAAAGATCTTTTGTTT GAGGAATGGGAGGAACTCGGTGTTGAGTTCAGGTTGAAAGTATTCGT GCTGGGGGGTGTGCGCCATAAGCTCGTTTGCAGTGTGCAACCTTGCAT ATTCTTCACTAGTGCCTAA
Woolly monkey HBV Accession # YP_009175037.1	ATGTACCCTTACGATGTACCTGACTACGCGACCGGTGCAGCAAGACT GTGTTGCTACTTGGACCCTGAAAGAGATGTACTCTGTCTTCGCCCTCT CCAAGCAGAACCCTCCGGCCGGCCATTTTCTGGATTGTCTAGACCAG CAGAGACGGCTGCGGCAGCGGCCGTTCCAGCCTTCCACGGTGCACAT CTGTCTCTGAGAGGTCTTCCCAGTTGTGCGTTCTCATCAGCCGGCCCA TGTGCCTTGAGGTTTACATCTGCAACGTGGAGATGCATGGAAACCCC AATGAATTCTGTGACCTGCTTTCGAAAGAAGACTCTGGGACTGCGGA CTGCACCACCAACCGTGATGGAACAATACATTAAGGACTGTTTGTTC GAACAATGGGAGGAGCAAGGTGAGGAACACGACTGAAAGTATTC GTCCTTGGTGGGTGTCGGCACAAGCTCGTGGGGACGGCCTCACCGTG CATCTTTTCACTTCCGCATAG
Orangutan HBV	ATGTACCCTTACGATGTACCTGACTACGCGACCGGTGCTGCCCCGCTT TGTGTGTCAGTTGGACCCGGCTCGAGATGTCCTTTGCCTTCGGCCAGTG GGAGCTGAGAGTAGAGGAAGGCCGTTCCCAGGCAGTATTGGTGCTCT GCCCCACCATCTCTGAGCGCGGTACCGGCCGACCACGGAGCCCACC

Accession # AAF33122.1	TTAGCCTTCGGGGTTTGCCGGTATGCGCTTTTTCTTCAGCGGGGCCTT GTGCGTTGAGGTTACAGAGCGCCAGGTGCATGGAGACCACCGTAAAT GCGCCTAGAAATCTCCCTAAGGTCCTGCATAAGAGAACATTGGGCCT TTCCACTATGTCTACTACGCGAATCGAAACGTACTTTAAGGATTGTGT GTTTAAGGATTGGGAAGAACTTGGAGAGGAGATCCGGTTGAAGGTTT TTGTCTTGGGTGGATGTAGGCATAAATTGGTGTGTTCTCCCGCGCCTT GCAACTTTTTTACAAGTGCATGA
Horseshoe bat HBV Accession # YP_009045997.1	ATGTACCCTTACGATGTACCTGACTACGCGACCGGTGCCGCCCCGCTG CACTGTGAACTGGATGCTGCGAGGGATGTGCTGTTGCTGAGACCACT TGGCACTCAGCCCCGAGGGCGCAGTGTGCTAGGGCGGCTAGAGATC CAGCCGGGGCTGCGGCTGCTGCAGTTCACAGCGTCCATAGACCCCAT TTGCCAGTCAGAAGGTTGCCTGCGTGTGCCTTTACGCCCCGCGGCCCC TGTGTCTCCGCTTCACTTGTGCAGATCTTCAAAGACACATGGAGACG ACCATGAATTTTCGTACCGTGGCAGATGGCACGCCAACGGGGGCAGCT CATGAGAACTCTCTCATACTGGGATTGGTATTTCAAGCAATCCTTGAT GAACCAGTGGGAGGAGCAAGGCCTTGGTGAGAGATTGAACACCTAC GTGCTCGGAGGATGTAGGCATAAGTTGCGATGA
Tent-making bat HBV Accession # NC_024445.1	ATGTACCCTTACGATGTACCTGACTACGCGACCGGTGCAGCACGGAT GCTTTGCCACTATGACACCGCCCGCGATATTCTGCATCTTAGACCCCT TAGAGGCCAAAGTTCTGGCCCGGCACTCGCCGGGACACCCGCCGCAC AAGCAGCCAGTCCGCCCCCCCCCGGTTTCCCCAGATCATAGACCTGAT CTCTCACTCAGAGCTTTGCCAGCTTGTGCAACATCAGACGCAGGTCCA TGTGTATTGAGATTTACCTCCGCGGATCTCAGGCGGCTTGCTACGCCA GTAAACATCTGTCATAGCCTGACCAGACGCACCAGGGGGGCATCCATG GAACTGAACAATATGGACTCATGGACATGGCTGATGATTAACCGCG AGGTTGGTCCACGCATTGAGTATGTTCTTGTGCGCCGGCGGCTGCAGAC ACAACTGCAGTAA
Pomona bat HBV Accession # YP_009506648.1	ATGTACCCTTACGATGTACCTGACTACGCGACCGGTGCCGCCCCGTT GTACTGTGAACTGGACCCCTCTCGGGACGTATTGCTCCTGAGACCGTT TGGCGCACAACCAGGAGGGCGGCCAGTCAGTCGGTTTCCTGGCGATT CAAATGGTTCTACCGCATCTACCGTGCCACCCGTACACAGACAGGAT TTCGCCTTGAGGAGGCTCCCGGCTTGTGCTTACAGTAACGCAGGTCCG TGTGTGCTTCGGTTCACTTGTGCCGAAGCTGCAGTAAACATGGAGAC AACGATGACCAACTTTGTAACCTGGCATAACAGCCCGCCAGCGCGGGA CTGTAACCCAGACCCTCAATTCCTGGCAGTGGTATTTTGGTCAACTGT TGATGAACCAATGGGAAGAGACCGGTTGGGACGATCGCATTATCGCG TAT GACTTGGCGGTTGTGACACAAGCTGAGGTGA

**Supplementary Table S2. Primers used for generating plasmids encoding deletion mutant X proteins of HBV(A) and DCH (KT-116)**

X protein	Deletion region	Direction	Sequence (5'-3')
HBV (genotype A) Accession # LC488828.1	52-148	Forward	TGACTACGCGACCGGTGCCGCTCGA
		Reverse	AAAAAGATCTGCTAGCTTATGCGGAAGTGAAGAAGT TAGCCCCGTGGTCCGCCGGTACAGCG
	120-140	Forward	TGACTACGCGACCGGTGCCGCTCGA
		Reverse (120-140R)	ATCCTTAAAGACGCAGTCCT
		Forward (120-140F)	TGCGTCTTTAAGGATCTTGTATGCGCTCCTGCCCC
		Reverse	AAAAAGATCTGCTAGCTTATGCGGA
	1-50	Forward	TGACTACGCGACCGGTGCTCATTGAGTTTGAGGGG
		Reverse	AAAAAGATCTGCTAGCTTATGCGGA
	45-140	Forward	TGACTACGCGACCGGTGCCGCTCGA
		Reverse (45-140R)	AGCGCTCGGAGATGGAGAAC
		Forward (45-140F)	CCATCTCCGAGCGCTCTTGTATGCGCTCCTGCCCC
		Reverse	AAAAAGATCTGCTAGCTTATGCGGA
	88-100	Forward	TGACTACGCGACCGGTGCCGCTCGA
		Reverse (88-100R)	TTGATGAGCATTGACAGTCG
		Forward (88-100F)	GTCAATGCTCATCAACCGGCCATGTCTACTACTGA
		Reverse	AAAAAGATCTGCTAGCTTATGCGGA
DCH (KT-116) Accession # LC668427.1	52-145	Forward	TGACTACGCGACCGGTGCAGCACGG
		Reverse	AAAAAGATCTGCTAGCCTAGGCCCGCAGTGTGCTG
	120-140	Forward	TGACTACGCGACCGGTGCAGCACGG
		Reverse	AAAAAGATCTGCTAGCCTATCGAGTGTGAAGCGTCT CGACCAACAAAAGATCGC

	1-50	Forward	TGACTACGCGACCGGTGCCAGGGAATCTCTGAGGGG
		Reverse	AAAAAGATCTGCTAGC <u>CT</u> ATCGAGT
	45-140	Forward	TGACTACGCGACCGGTGCAGCACGG
		Reverse	AAAAAGATCTGCTAGC <u>CT</u> ATCGAGTGTGAAGCGTCG CAACTGAGGGGCTCAGGT
	88-100	Forward	TGACTACGCGACCGGTGCAGCACGG
		Reverse (88-100R)	GCCAATCATTGCTGCTTCCA
		Forward (88-100F)	GCAGCAATGATTGGCGGGACTTGGCAGCCGGATGT
		Reverse	AAAAAGATCTGCTAGC <u>CT</u> ATCGAGT

**Supplementary Table S3. Primers used for generating a plasmid encoding Myc-tagged TRIF protein**

Direction	Sequence (5'-3')
Forward	TTTGGCAAAGAATTCGCCACCATG GCCTGCACAGGCCCATCACTTC
Reverse	AAAAAGATCTGCTAGCTTACAAATCTTCTTCGGAGATCAACTTCTGCTCTTCTGCCTCCTGCGTCTTGTC

**Supplementary Table S4. Primers used for generating plasmids encoding chimeric DCH X protein**

X protein	Chimeric region	Direction	Sequence (5'-3')
DCH (Sydney) and DCH (TR-SV15)	Sydney (1-100)/ TR-SV15 (101-145)	Forward	TTTGGCAAAGAATTCGCCACCATG
		Reverse (Sydney 100R)	TGCCATATGCCAAATCCCAGTTGTCTGGCA
		Forward (TR-SV15 100F)	ATTGGCATATGGCAACCTGAG
		Reverse	AAAAAGATCTGCTAGCTCACC
	TR-SV15 (1-100)/ Sydney (101-145)	Forward	TTTGGCAAAGAATTCGCCACCATG
		Reverse (TR-SV15 100R)	TGCCAGGTCCCAAATCCGAGTTGCCTGGCC
		Forward (Sydney 100F)	ATTGGGACCTGGCAACCCGAT
		Reverse	AAAAAGATCTGCTAGCTCACC