

Table S1 Primers used in this study

Primers	Sequences (5'-3')
N-Δ7 up	CTTTAAGAAGGAGATATACATATGGTGGTGCCCGACATCACCACC
N-Δ7 down	GCGGGTGGTGTATGTCGGGCACCACCATATGTATATCTCCTTCTTA
N-Δ8 up	CTTTAAGAAGGAGATATACATATGGTGGTGCCCGACATCACCACCCGC
N-Δ8 down	CTTGCGGGTGGTGTATGTCGGGCACCATATGTATATCTCCTTCTTA
N-Δ9 up	CTTTAAGAAGGAGATATACATATGCCCGACATCACCACCCGCAAG
N-Δ9 down	ATTCTTGCGGGTGGTGTATGTCGGGCATATGTATATCTCCTTCTTA
N-Δ10 up	ACTTTAAGAAGGAGATATACATATGGACATCACCACCCGCAAGAATG
N-Δ10 down	GACATTCTTGCGGGTGGTGTATGTCCATATGTATATCTCCTTCTTA
A24P up	CGGACTGAGCCACGAC <u>CCCA</u> ACGACTTCACC
A24P down	CGGCTGCGGCAAGGTGAAGTCGTT <u>GGGG</u> TCGTGGC
I102P up	CCGGGCCTG <u>CCCC</u> CGACGACGTG
I102P down	CGTCGTGCGGG <u>GGC</u> CAGGCCCGGCACCGCGACG
H126P up	CCTGGTGGCTGCGCGAGCCG <u>CCCC</u> AGCTCGACTACC
H126P down	CGTCCGGCTCCTGCAGGTAGTCGAGCT <u>GGGG</u> CGGCTCGCGC
A168P up	TGAAGGCGAAG <u>CCG</u> CTGGGCGCGCT
A168P down	AGCGCGCCAG <u>CGG</u> CTTCGCCTTCA
A215P up	TGCCTGGACAG <u>CCC</u> AGCCCCAACCGC
A215P down	GCGGTTGGGGCT <u>GGG</u> GCTGTCCAGGCA
T236P up	GAACACGCGCTACCGGATCGAC <u>CCCT</u> TCCAGAAAACC
T236P down	GCTGTGATGACGAAGTAGGTTTTCTGGA <u>AGGGG</u> TCGATCCGG
D267P up	CGCTCCGCTATACTTGCAGCTGG <u>CCCC</u> CGCGCAACCG
D267P down	CGCCGGCGCCCCACGGTTGCGCG <u>GGGG</u> GCCAGCTGC

Note: The mutated nucleotides are underlined.

Table S2 Screening of CvPAH variants with enhanced catalytic ability

Cell lysate	Activity	Thermostability
Wild type	++	++
N-Δ7	+++	++
N-Δ8	+++	++
N-Δ9	+++	++
N-Δ10	+++	++
A24P	+	++
I102P	+	+
H126P	+	+
A168P	+	+
A215P	+	+
T236P	+	+
D267P	++	++++

Note: The activity and thermostability of cell lysates of CvPAH and its variants were measured and compared with the wild type. The thermal stability was determined after samples were treated at 50°C for 15 min.