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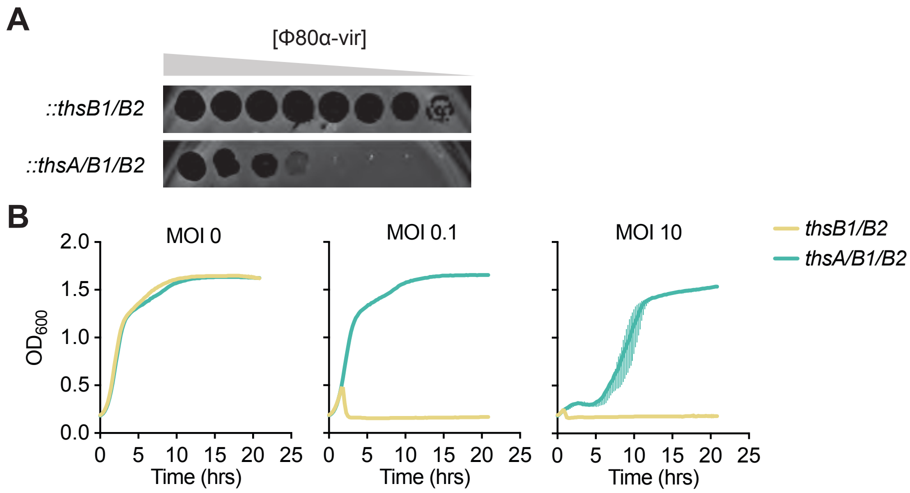

Figure S1. Roberts, Fishman *et al*.

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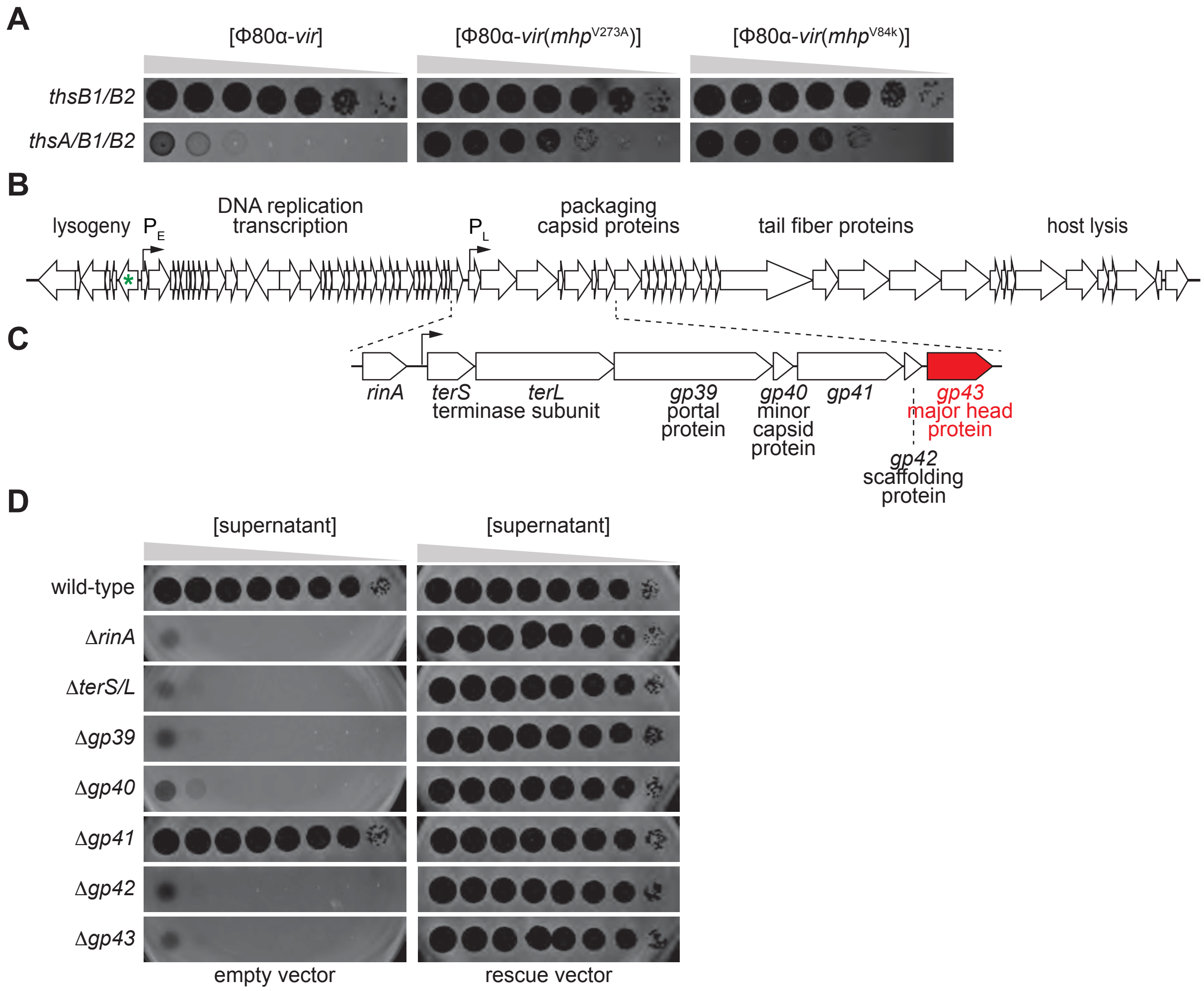

Figure S2. Roberts, Fishman *et al*.

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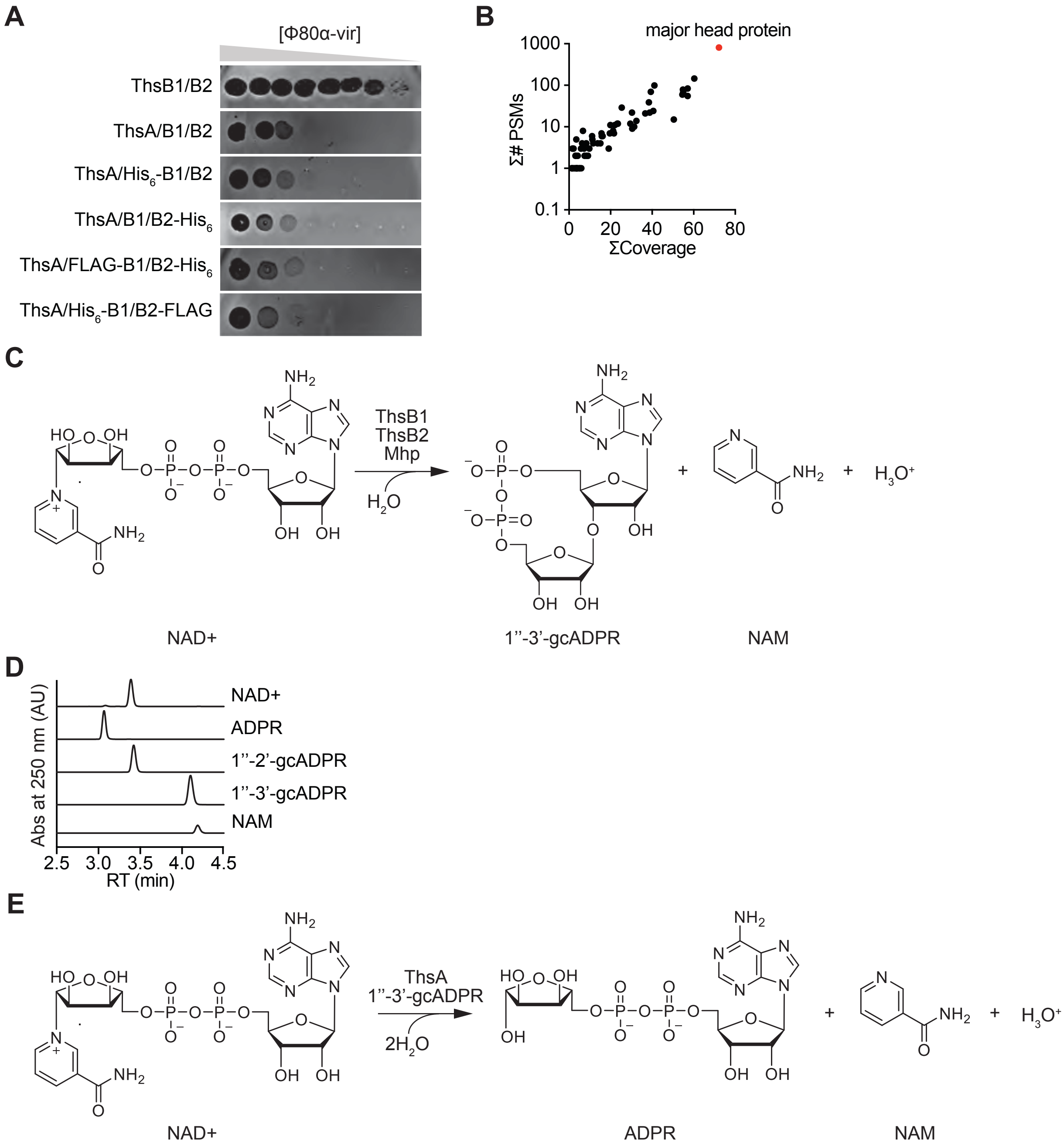

Figure S3. Roberts, Fishman *et al*.

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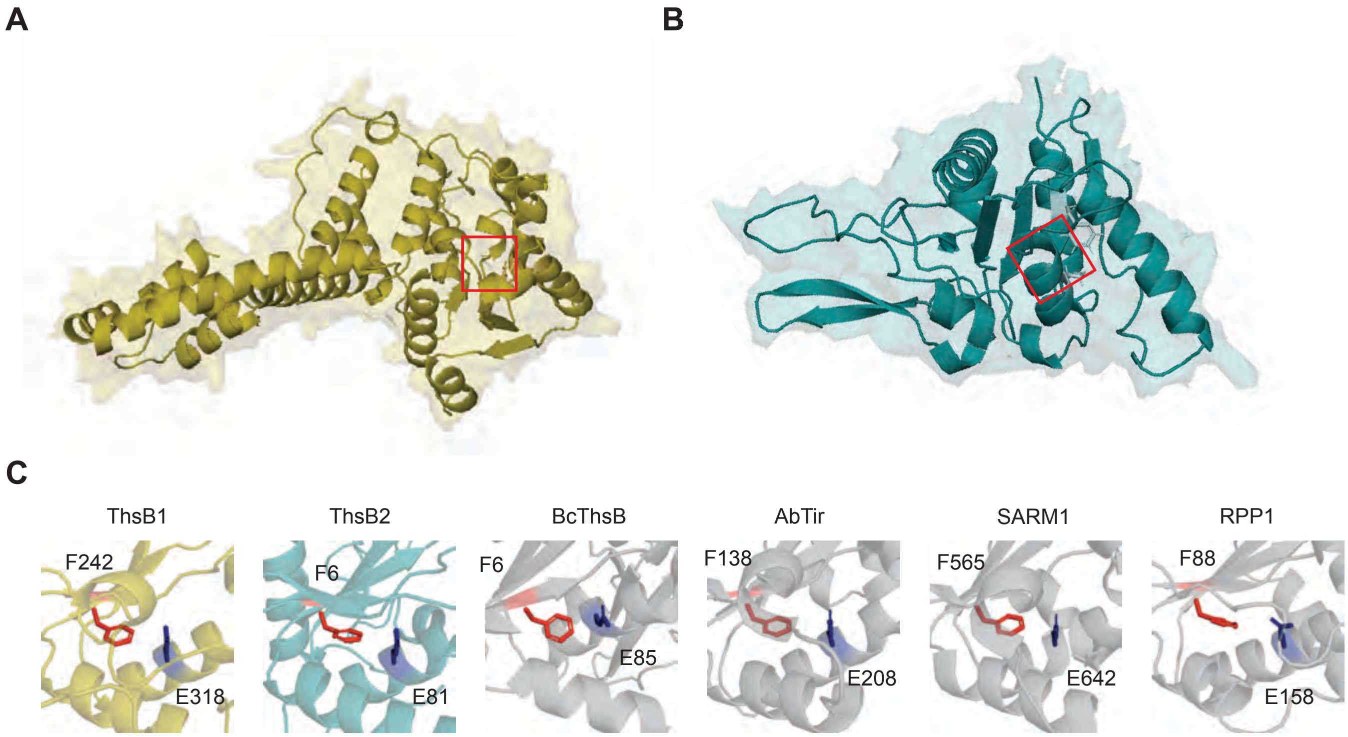

Figure S4. Roberts, Fishman *et al*.

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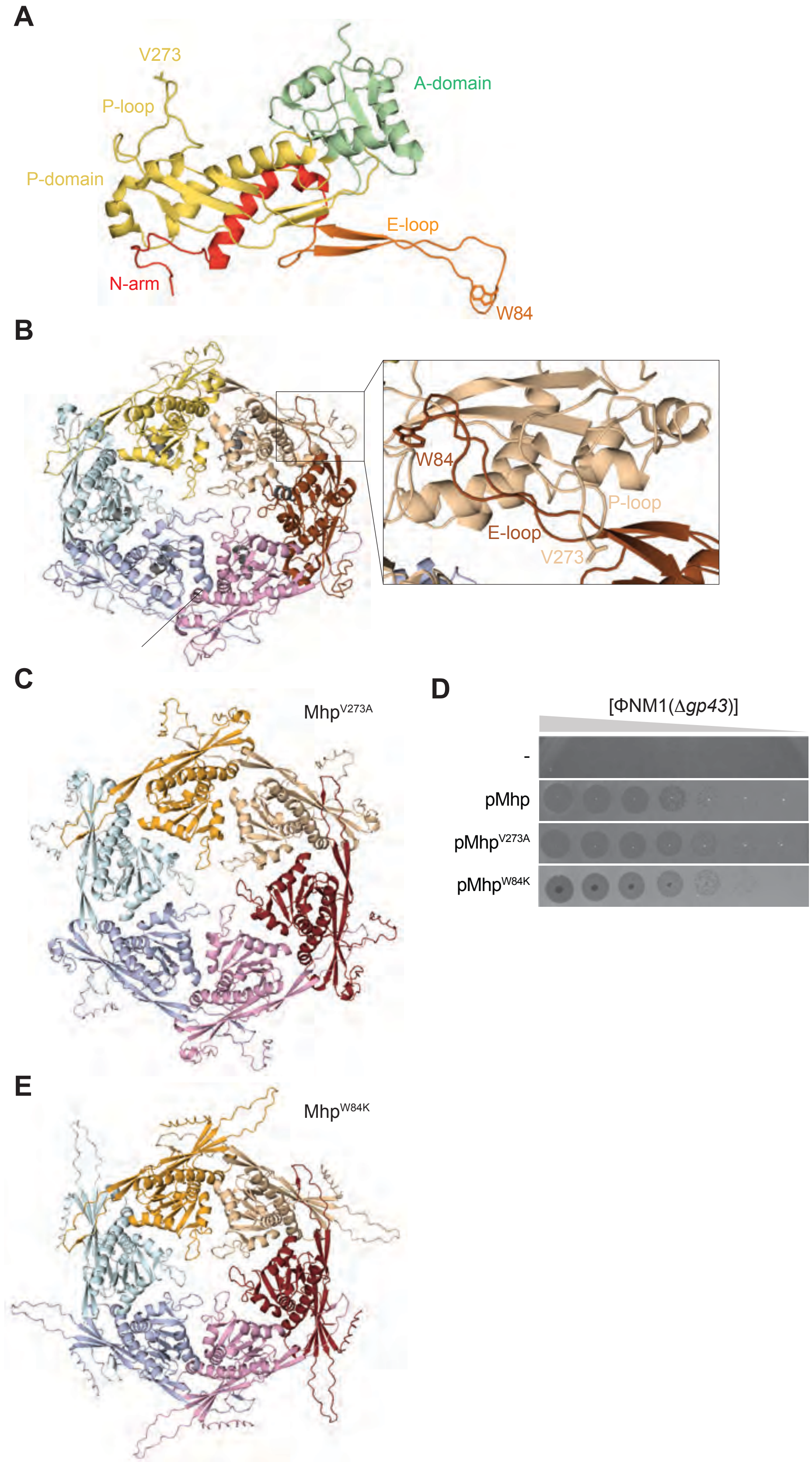

Figure S5. Roberts, Fishman *et al*.

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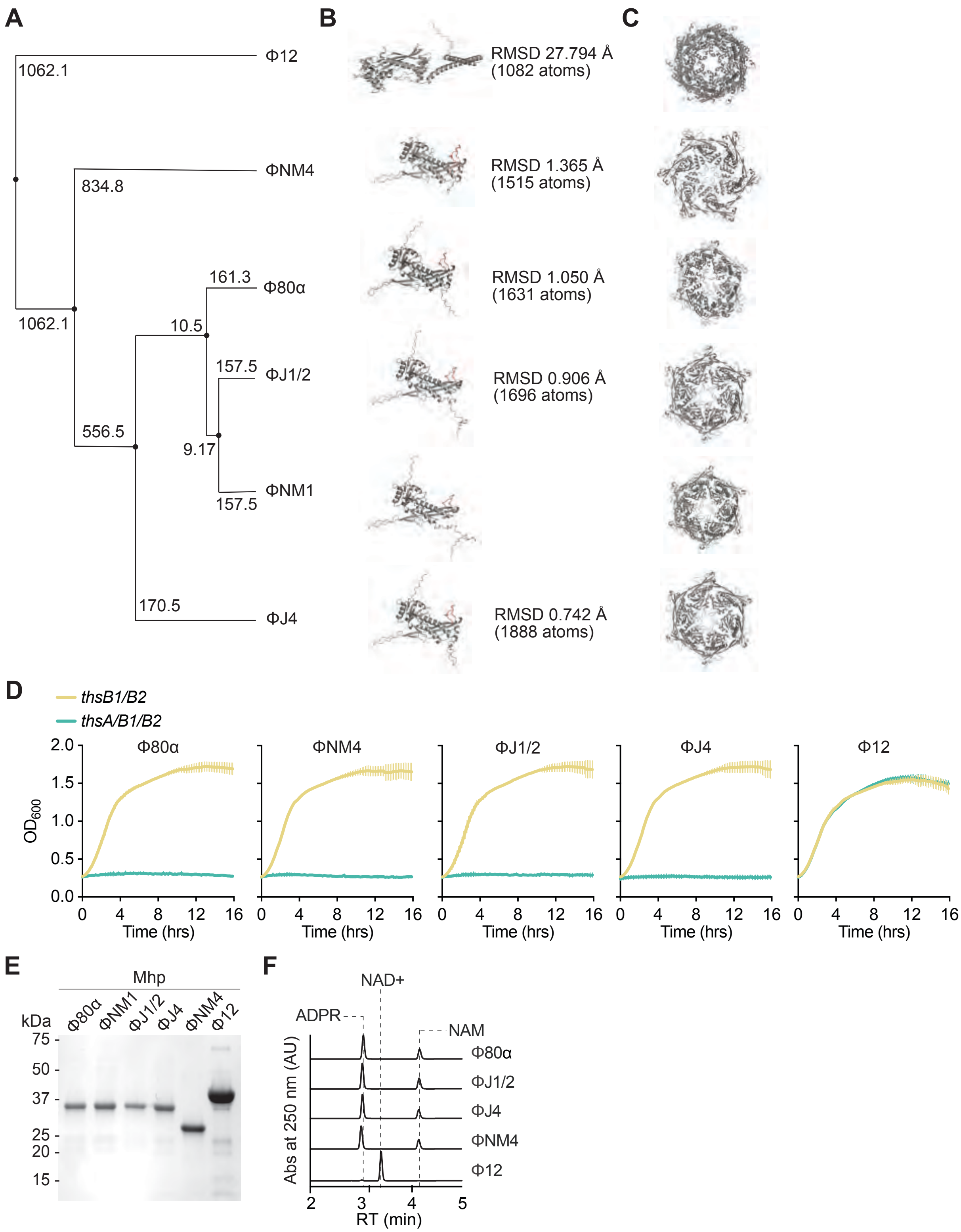

Figure S6. Roberts, Fishman *et al*.

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SUPPLEMENTARY METHODS TABLES.

Supplementary Methods Table 1. Bacterial strains used in this study.

Species	Strain	Genotype	Origin
S. aureus	RN4220	Wild type	Kreiswerth et al., Nature (1983)
S. aureus	RN4220	::ΦNM1	Goldberg et al., Nature (2014)
S. aureus	RN4220	::ΦNM1ΔDnaC	Cre-loxP Recombineering (see methods)
S. aureus	RN4220	::ΦNM1ΔRinA	Cre-loxP Recombineering (see methods)
S. aureus	RN4220	::ΦNM1ΔTerS	Cre-loxP Recombineering (see methods)
S. aureus	RN4220	::ΦNM1ΔTerL	Cre-loxP Recombineering (see methods)
S. aureus	RN4220	::ΦNM1ΔPortal	Cre-loxP Recombineering (see methods)
S. aureus	RN4220	::ΦNM1ΔGp40	Cre-loxP Recombineering (see methods)
S. aureus	RN4220	::ΦNM1ΔGp41	Cre-loxP Recombineering (see methods)
S. aureus	RN4220	::ΦNM1ΔGp42	Cre-loxP Recombineering (see methods)
S. aureus	RN4220	::ΦNM1ΔMajor Head	Cre-loxP Recombineering (see methods)
S. aureus	RN4220	::Φ80α ΔMajor Head	Cre-loxP Recombineering (see methods)
S. aureus	RN4220	::Sau-Thoeris-ermR	Chromosomal integration (see methods)
S. aureus	RN4220	::Sau-ThsB1-B2-ermR	Chromosomal integration (see methods)

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Supplementary Methods Table 2. Phages used in this study.

Phage	**Host**	**Genotype**	**Origin**
Φ80α-vir	*S. aureus*	Wild type	Banh and Roberts et al., Nature (2023)
Φ80α-vir^{GFP}	*S. aureus*	Wild type	Banh and Roberts et al., Nature (2023)
Φ80α-vir(gp47^{V273A})	*S. aureus*	Major head (gp47) V273>A (T818>C)	This study; isolated from screen for Sau-Thoeris escapers
Φ80α-vir(gp47^{W84K})	*S. aureus*	Major head (gp47) W84>K (TGG249-251>AAA)	This study; engineered by recombination using pCR186 and selected for using pCR187
ΦJ1	*S. aureus*	Wild type	Banh and Roberts et al., Nature (2023)
ΦJ2	*S. aureus*	Wild type	Banh and Roberts et al., Nature (2023)
ΦJ4	*S. aureus*	Wild type	Banh and Roberts et al., Nature (2023)
ΦNM1γ6	*S. aureus*	Wild type	Goldberg et al., Nature (2014)
ΦNM4γ4	*S. aureus*	Wild type	Heler et al., Nature (2015)
Φ12γ3	*S. aureus*	Wild type	Modell et al., Nature (2017)

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Supplementary Methods Table 3. Plasmids used in this study.

Plasmid	Description	Source	Construction Notes
pPM300	Recombineering genes from phage ϕ11 under the control of an IPTG-inducible promoter and cre-recombinase under the control of an aTc-inducible promoter	Banh et al., 2023	
pDVB223	Thoeris operon from S. aureus 08BA02176, IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson assembly: oDVB796+oDVB797 (S. aureus 08BA02176 template) oDVB_ + oDVB_ (pE194 template)
pCF8	ThsA+ThsB1, IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson assembly: oCF.36+oCF.37 (pDVB223 template)
pCF9	ThsA+ThsB2, IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson assembly: oCF.38+oCF.39 (pDVB223 template)
pCF10	ThsA, IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson assembly: oCF.40+oCF.41 (pDVB223 template)
pCF11	ThsB1+ThsB2 IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson assembly: oCF.42+oCF.43 (pDVB223 template)
pCF34	His6-ThsA+ThsB1+ThsB2, IPTG-inducible pE194-based vector for recombinant protein expression and purification of ThsA	This study	Gibson assembly: oCF.70+oCF.91 oCF.86+oCF.90 (pDVB223 template)
pCF35	ThsA+His6-ThsB1+ThsB2, IPTG-inducible pE194-based vector for recombinant protein expression and purification of ThsB1	This study	Gibson assembly: oCF.72+oCF.91 oCF.73+oCF.90 (pDVB223 template)
pCF41	gp43 (major head) from ΦNM1γ6 with escape mutation (V273A), IPTG-	This study	Gibson assembly: oCF.84+oCF.85 (pCR176 template)

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	inducible pC194-based vector for recombinant protein expression		
pCF45	N315 hypothetical protein from Φ12γ3, IPTG-inducible pC194-based vector for recombinant protein expression	This study	Gibson assembly: oCF.98+oCF.99 (Φ12γ3 template) oCF.97+oCF100 (pC194 template)
pCF46	His6-N315 hypothetical protein from Φ12γ3, IPTG-inducible pC194-based vector for recombinant protein expression	This study	Gibson assembly: oCF.86+oCF.101 (pCF.45 template)
pCF47	ThsB1(F242A)+ThsB2 IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson Assembly: oCF.102+oCF.103 (pCF.11 template)
pCF48	ThsB1(E318Q)+ThsB2 IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson Assembly: oCF.104+oCF.105 (pCF.11 template)
pCF49	ThsB1+ThsB2(F6A) IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson Assembly: oCF.106+oCF.107 (pCF.11 template)
pCF50	ThsB1+ThsB2(E81Q) IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson Assembly: oCF.108+oCF.109 (pCF.11 template)
pCF51	ThsA+ThsB1+ThsB2-His6, IPTG-inducible pE194-based vector for recombinant protein expression and purification of ThsB2	This study	Gibson Assembly: oCF.110+oCF.111 (pDVB223 template)
pCF52	His6-ThsB1+ThsB2-3xFlag, IPTG-inducible pE194-based vector for recombinant protein expression and purification of ThsB1 and ThsB2	This study	Gibson Assembly: oCF.112 + oCF.114 oCF.72 + oCF.113 oCF.86 + oCF.115 (pCF.11 template)
pCF53	3xFlag-ThsB1+ThsB2-His6, IPTG-inducible pE194-based vector for recombinant protein expression and	This study	oCF.112 + oCF.117 oCF.78 + oCF.113 oCF.87 + oCF.116 (pCF.11 template)

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	purification of ThsB1 and ThsB2		
pCF55	ThsA+ThsB1(F242A)+ThsB2 IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson Assembly: oCF.102+oCF.103 (pDVB223 template)
pCF56	ThsA+ThsB1(E318Q)+ThsB2 IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson Assembly: oCF.104+oCF.105 (pDVB223 template)
pCF57	ThsA+ThsB1+ThsB2(F6A) IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson Assembly: oCF.106+oCF.107 (pDVB223 template)
pCF58	ThsA+ThsB1+ThsB2(E81Q) IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson Assembly: oCF.108+oCF.109 (pDVB223 template)
pCF60	ThsB1+ThsB2 IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson assembly: oCF.110+oCF.111 (pCF.11 template)
pCF64	Gp43(W84K) (Major Head) of ΦNM1γ6, IPTG-inducible pC194-based vector for recombinant protein expression	This study	Gibson assembly: oCF.126+oCF.127 (pCR176 template)
pCF69	His-ThsB1 IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson Assembly: oCF.36+oCF.37 (pCF.52 template)
pCF70	ThsB2-His IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson Assembly: oCF.136+oCF.137 (pCF.53 template)
pCF80	ThsA+His6-ThsB1+ThsB2-3xFLAG, IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson Assembly oCF.114+oCF.115 (template pCF.35)
pCF81	ThsA+3xFLAG-ThsB1+ThsB2-His6, IPTG-inducible pE194-based vector for recombinant protein expression	This study	Gibson Assembly oCF.78+oCF.160 (template pCF.51)

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pCR173	terS-Gp43 (full packaging and structure operon) of ΦNM1γ6, IPTG-inducible pC194-based vector for recombinant protein expression	This study	Gibson Assembly: oCR499+oCR500 (ΦNM1γ6 template) oCR497+oCR498 (pC194 template)
pCR174	Portal-Gp43 of ΦNM1γ6, IPTG-inducible pC194-based vector for recombinant protein expression	This study	Gibson Assembly: oCR501+oCR500 (ΦNM1γ6 template) oCR497+oCR498 (pC194 template)
pCR175	Gp40-Gp43 of ΦNM1γ6, IPTG-inducible pC194-based vector for recombinant protein expression	This study	Gibson Assembly: oCR502+oCR500 (ΦNM1γ6 template) oCR497+oCR498 (pC194 template)
pCR176	Gp43 (Major Head) of ΦNM1γ6, IPTG-inducible pC194-based vector for recombinant protein expression	This study	Gibson Assembly: oCR503+oCR500 (ΦNM1γ6 template) oCR497+oCR498 (pC194 template)
pCR177	terL (large terminase subunit) of ΦNM1γ6, IPTG-inducible pC194-based vector for recombinant protein expression	This study	Gibson Assembly: oCR504+oCR505 (ΦNM1γ6 template) oCR497+oCR498 (pC194 template)
pCR178	terS-terL of ΦNM1γ6, IPTG-inducible pC194-based vector for recombinant protein expression	This study	Gibson Assembly: oCR499+oCR505 (ΦNM1γ6 template) oCR497+oCR498 (pC194 template)
pCR179	Major Head of ΦJ1/2, IPTG-inducible pC194-based vector for recombinant protein expression	This study	Gibson Assembly: oCR497+oCR498 (pCR176 template) oCR515+oCR516 (ΦJ1/2 template)
pCR180	Major Head of ΦJ4, IPTG-inducible pC194-based vector for recombinant protein expression	This study	Gibson Assembly: oCR497+oCR498 (pCR176 template) oCR517+oCR518 (ΦJ4 template)
pCR181	Major Head of Φ80α, IPTG-inducible pC194-based	This study	Gibson Assembly: oCR497+oCR498

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	vector for recombinant protein expression		(pCR176 template) oCR519+oCR520 (Φ80α template)
pCR184	Major Head of Φ80α with V273A, IPTG-inducible pC194-based vector for recombinant protein expression		Gibson assembly: oCF.84+oCF.85 (pCR181 template)
pCR185	Major Head of Φ80α with W84K, IPTG-inducible pC194-based vector for recombinant protein expression		Gibson assembly: oCF.126+oCF.127 (pCR181 template)
pCR182	Major Head of ΦNM4, IPTG-inducible pC194-based vector for recombinant protein expression	This study	Gibson Assembly: oCR497+oCR498 (pCR176 template) oCR521+oCR522 (ΦNM4 template)
pCR183	Major Head of Φ12, IPTG-inducible pC194-based vector for recombinant protein expression	This study	Gibson Assembly: oCR497+oCR498 (pCR176 template) oCR523+oCR524 (Φ12 template)
pCR186	Recombination plasmid harboring *mhp*^{W84K} gene with 500-nt upstream and downstream homology arms corresponding to Φ80α *gp46* and *gp48*, respectively	This study	Gibson Assembly: oCR589+oCR590 (pCR176 template) oCR591+oCR592 (Φ80α gDNA template) oCR593+oCR594 (pCF64 template) oCR595+oCR596 (Φ80α gDNA template)
pCR187	*S. aureus* M06/0171 type II-A CRISPR-Cas system with programmed spacer targeting wild-type Φ80α-vir	This study	Ligation of BsaI-digested pDVB47 (Banh et al., 2023) and annealed oCR597/oCR598

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	but not Φ80α-vir::*mhp*^{W84K} (mutation changes PAM)		

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Supplementary Methods Table 4. Oligonucleotide primers used in this study.

Primer	Sequence
oCR24	ATCAATCAAACGTTAATCCGTCTTTAAGAGATGCAACAGTCAAAAACTACAAGCCATAACTTCGTATAGCATACATTATACGAAGTTATAGTGACATTAG
oCR25	AGCCTTGTACGTACTCTATTGCTGTTTGTTTAGCGTGTACTTGTTTTTCATTTTGTATAACTTCGTATAATGTATGCTATACGAAGTTATTATATTTATG
oCR26	ATACAAATATAGGCGGGGAGTTTGTACCGTCTAATACATCAAAAACAGAAATGGCAGTAACATAACTTCGTATAGCATACATTATACGAAGTTATAGTGACATTAG
oCR27	CGTTCAATCGCACTCTTAAACTCAAGAATTTTACCTCTTCGTATACTACAAAGATAATTAATAACTTCGTATAATGTATGCTATACGAAGTTATTATATTTATG
oCR59	ATCTGCTTCTATTGCTAGAGGAGAACCTCAAGAGGCTTACAGTAAGAAATATGACCATTTATAACTTCGTATAGCATACATTATACGAAGTTATAGTGACATTAG
oCR60	TGACGCTCTTCAAAAGTTGGTGTGATTGTGTAAGTAACCTCTTTTTCCACTTCATCGTTTATAACTTCGTATAATGTATGCTATACGAAGTTATTATATTTATG
oCR63	TTAAGAACTGGAAGAAGAAACCAGGTAAGCCGTTAGACGTACAACTTGATGAATTAGCTGATAACTTCGTATAGCATACATTATACGAAGTTATAGTGACATTAG
oCR64	TTTATCTCTTCTGATGACACTCCTACTTGATTCGCAATACTCAATCCAAACGCCAACATGTATAACTTCGTATAATGTATGCTATACGAAGTTATTATATTTATG
oCR95	AAATAATCATCCTCCTAAGTACAAGCTTAATTGTTATCCGCTCACAATTCCACACATTAT
oCR96	GAGTGATCGTTAAATTTATACTGCAATCGGATGCGATTATTGAATAAAAGATATGAGAGA
oCR482	GGTGTTGAAACGCGATACTTTTCTAATAATGATAGCGAACTATTGAAGAGTCACATGTTTTATTGGAGTGTTTATGCATCCCTTAACTTACTTATTAAAT
oCR483	GCTAATTGACAAGGTCTCATAAATGACTCAGCAAACGATTGCAATGTATTGATACGGTTATTCTGTTTATTAAAGCATTAAAACCCCATGAATTATTTT
oCR484	GCTAATTGACAAGGTCTCATAAATGACTCAGCAAACGATTGCAATGTATTGATACGGTTATTCTGTTTATTTATTTTCTTCTACAGATATTATAATTCGTTGC
oCR485	ACGACAAAACTTAGAGTTGTTAGCAAATCGTAATCCAGCATATTACAAAATTTATGCGTTATAACTTCGTATAGCATACATTATACGAAGTTATAGTGACATTAG

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oCR486	TTTATTAAACGTTTTTCATACTTAGGGAAAACCAATTTGTCTAGTGTAGCAAATTCACCTATAACTTCGTATAATGTATGCTATACGAAGTTATTATATTTATG
oCR487	GTTACTTATTAAAGGTAATTTAAATTTAGATCCCGTAGAAGTTAGAAAACAAAAGGAAGCATAACTTCGTATAGCATACATTATACGAAGTTATAGTGACATTAG
oCR488	CCTTCTGTTTCTCTACCTTCGCTATCAGCATAAACAGTCGGTTCTAAAAACAACACGTTAATAACTTCGTATAATGTATGCTATACGAAGTTATTATATTTATG
oCR489	AATAATTGCTAATGTAGTTATTAGAGGTCGACATCCTAATGAATATGTTAAAGATATGCGATAACTTCGTATAGCATACATTATACGAAGTTATAGTGACATTAG
oCR490	AATGATTTAATTGCTGCGGTCTTTTGTCGTGCTGTGCCTTCGAATTTATTTAAGTGCTTGATAACTTCGTATAATGTATGCTATACGAAGTTATTATATTTATG
oCR491	TAGAGACATAGCAAGAGAGTTAAAAGGTATACGTAAAGAGTTACAAAAGCGAAACGAAACATAACTTCGTATAGCATACATTATACGAAGTTATAGTGACATTAG
oCR492	TTTTCTTTATCGGCTAATACTGCCGACCTTACGCTGTCTAAGTTTGCATCAATAATAACTATAACTTCGTATAATGTATGCTATACGAAGTTATTATATTTATG
oCR493	TAAAGAAGAATTAAGTCGTCGTATGAAGCAGAAAGAAAAAGAGAAACAAGAAGCTGTTGAATAACTTCGTATAGCATACATTATACGAAGTTATAGTGACATTAG
oCR494	TGTTCGCGTTCATATTCAGCGATTTGATCTTTGTTCATTTTTGCTAATCGTTTAGCTTCAATAACTTCGTATAATGTATGCTATACGAAGTTATTATATTTATG
oCR495	AGGTGAAGGTCAAAAAATCGAAACATCTAAAGCTACATGGGTTAATGCTACTATGAGAGCATAACTTCGTATAGCATACATTATACGAAGTTATAGTGACATTAG
oCR496	TGTGAATAAGTGTAATTCAAAAATTCTTTTGTTACAGGTAAGATAACCCCTAATTTAAACATAACTTCGTATAATGTATGCTATACGAAGTTATTATATTTATG
oCR497	AAATAATCATCCTCCTAAGTACAAGCTTAA
oCR498	GACGTGGTTTAACCCGGGTAACTAGTAACT
oCR499	TTAAGCTTGTACTTAGGAGGATGATTATTTATGAACGAAAAACAAAAGAGATTCGC
oCR500	AGTTACTAGTTACCCGGGTTAAACCACGTCTTAAACTTCTCCTGGTACTGAATCTGT
oCR501	TTAAGCTTGTACTTAGGAGGATGATTATTTATGTTAAAAGTAAACGAATTTGAAACAGAT
oCR502	TTAAGCTTGTACTTAGGAGGATGATTATTTTTGCCTAACAAAAACACTCAAGAATATTG
oCR503	TTAAGCTTGTACTTAGGAGGATGATTATTTATGGAACAAACACAAAAATTAAAATTAAAT

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oCR504	TTAAGCTTGTACTTAGGAGGATGATTATTTATGACGAAAGTTAAATTAAACTTTAACAAA
oCR505	AGTTACTAGTTACCCGGGTTAAACCACGTCCTATAATCCTAGAGATTTTATTGTGTCAAC
oCR515	TTAAGCTTGTACTTAGGAGGATGATTATTTATGGAACAAACACAAAAATTAAAATTAAAT
oCR516	AGTTACTAGTTACCCGGGTTAAACCACGTCTTAAACTTCTCCTGGTACTGAATC
oCR517	TTAAGCTTGTACTTAGGAGGATGATTATTTATGGAACAAACACAAAAATTAAAATTAAAT
oCR518	AGTTACTAGTTACCCGGGTTAAACCACGTCTTAAACTTCTCCTGGAACTGAAG
oCR519	TTAAGCTTGTACTTAGGAGGATGATTATTTATGGAACAAACACAAAAATTAAAATTAAAT
oCR520	AGTTACTAGTTACCCGGGTTAAACCACGTCTTAAACTTCTCCTGGAACTGAATCTG
oCR521	TTAAGCTTGTACTTAGGAGGATGATTATTTATGGCAACTCCAACATACAC
oCR522	AGTTACTAGTTACCCGGGTTAAACCACGTCCTATTCAGTTGGTTTAAGCGTTGC
oCR523	TTAAGCTTGTACTTAGGAGGATGATTATTTATGCGAAATTTTAAAAATGACAATGAATT
oCR524	AGTTACTAGTTACCCGGGTTAAACCACGTCTTAGCTGGGTAATGGACCTGTA
oCR589	ATTTTAAAAATATCCCACTTTATCCAATTTTCGT
oCR590	ATATATTTATGTTACAGTAATATTGACTTTTAAAAAAGG
oCR591	ACGAAAATTGGATAAAGTGGGATATTTTTAAAATCTGAAATAACCTTCACGCC
oCR592	ATTTAATTTTAATTTTTGTGTTTGTTCCATTTAAATGCCTCCGTTAATTTTTAATAATTC
oCR593	ATGGAACAAACACAAAAATTAAAATTAAAT
oCR594	TTAAACTTCTCCTGGTACTGAATCTGTTTT
oCR595	AAAACAGATTCAGTACCAGGAGAAGTTTAATAAACAATTAGGAGTGGTAACATGC
oCR596	CCTTTTTTAAAAGTCAATATTACTGTAACATAAATATATGTTGTAGCGTTTAACTGCAAC
oCR597	AAACACTTTTTGGGCTGATAAACCAGGTGCTTACG
oCR598	AAAACGTAAGCACCTGGTTTATCAGCCCAAAAAGT
oCF.36	GCTTTTTCAGATTAGGAGTGATCGTTAAATTTATACTGCAATCG
oCF.37	ATTTAACGATCACTCCTAATCTGAAAAAGCCTCTAATAATTCTTCAAG
oCF.38	GTTTATTTTAATAAAAGCATATATTAAAAATGGAGGGACTTAGAGTTGG
oCF.39	CCTCCATTTTTAATATATGCTTTTATTAAAATAAACTTCTTCGTGATCATG
oCF.40	CAAAATAATTCATGGGGGAGTGATCGTTAAATTTATACTGCAATCG

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oCF.41	CGATCACTCCCCCATGAATTATTTTGTTTTTTTTATTTCAATTAC
oCF.42	GGAGGATGATTATTTTTGAAGTACCCTATACGACAAGTAGC
oCF.43	GTATAGGGTACTTCAAAAATAATCATCCTCCTAAGTACAAGCTTAATTG
oCF.70	TCTCACCATCACCATCACCATGGTTCTTCTATGACTATAGATAAGAAAAAATTCATTGAAAAATATGTAAAAGCTTTAGAAAGTAATACA
oCF.72	TCTCACCATCACCATCACCATGGTTCTTCTTTGAAGTACCCTATACGACAAGTAGC
oCF.78	GATCATGATGGTGATTATAAGGATCATGATATCGACTACAAAGACGATGACGACAAGTTGAAGTACCCTATACGACAAGTAGC
oCF.84	CAATTATCTACAGCTAAAAACGAAGATGGCACACCTGT
oCF.85	CTTCGTTTTTAGCTGTAGATAATTGTGCAGTTTCATCGATTTTGTATTCAATTAATTGAG
oCF.86	CATGGTGATGGTGATGGTGAGAAGAACCCATAAATAATCATCCTCCTAAGTACAAGCTTAATTG
oCF.87	GTCTTTGTAGTCGATATCATGATCCTTATAATCACCATCATGATCCTTATAATCCATAAATAATCATCCTCCTAAGTACAAGCTTAATTG
oCF.90	GATAATGTCCAGAAGGTCGATAGAAAGCGTGAGAAACAG
oCF.91	CTTTCTATCGACCTTCTGGACATTATCCTGTACAACATC
oCF.97	CTTGAATGTTCATAAATAATCATCCTCCTAAGTACAAGCTTAATTG
oCF.98	ACTTAGGAGGATGATTATTTATGAACATTCAAGAAGCAACTAAGATAGC
oCF.99	TAAACCACGTCCTATAATTGCTTCAATAATTCCTGGTCTCTAG
oCF.100	ATTATTGAAGCAATTATAGGACGTGGTTTAACCCGGGTAA
oCF.101	TCTCACCATCACCATCACCATGGTTCTTCTATGAACATTCAAGAAGCAACTAAGATAGC
oCF.102	AAGTCTATGATATTGCTATTTCTCATAGTACAAAAGATAAGAAGACAGTTG
oCF.103	TTTTGTACTATGAGAAATAGCAATATCATAGACTTTTTGAGATTGAATATTCTTATT
oCF.104	GGGTTAGTTTTCAAATAGAATACTTTGAAAATCTAAAAAAACCTATATATATAGTAGAGTCTCTTGAAGAATT
oCF.105	GATTTTCAAAGTATTCTATTTGAAAACTAACCCAATCAGATTGAACTGAA
oCF.106	GCGTAAAACAGCAATTTCATATAAATACTCTGAAGCAAAAGATTTAAGA
oCF.107	AGAGTATTTATATGAAATTGCTGTTTTACGCGCCAACTCTAAG
oCF.108	TGGATTGATTGGCAAATAGAATACTCAGTTAAACAAATGAAAAGAGG
oCF.109	CTGAGTATTCTATTTGCCAATCAATCCAATTACTTTCTTTCATATTAGG
oCF.110	TCTCACCATCACCATCACCATGGTTCTTCTTAAGAGTGATCGTTAAATTTATACTGCAATCG
oCF.111	CATGGTGATGGTGATGGTGAGAAGAACCTTTTCTTCTACAGATATTATAATTCGTTGCTTTTT
oCF.112	GGACTTAGAGTTGGCGCGTAAAACATTTATTTCATATAAATAC
oCF.113	TACGCGCCAACTCTAAGTCCCTCCATTTTTAATATATCTAATCTG

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oCF.114	GTCTTTGTAGTCGATATCATGATCCTTATAATCACCATCATGATCCTTATAATCTTTTCTTCTACAGATATTATAATTCGTTGCTTTTT
oCF.115	GATCATGATGGTGATTATAAGGATCATGATATCGACTACAAAGACGATGACGACAAGTAAGAGTGATCGTTAAATTTATACTGCAATCG
oCF.116	TCTCACCATCACCATCACCATGGTTCTTCTTAAGAGTGATCGTTAAATTTATACTGCAATCG
oCF.117	CATGGTGATGGTGATGGTGAGAAGAACCTTTTCTTCTACAGATATTATAATTCGTTGCTTTTT
oCF.126	CAGGTGCTTACAAAGTAGGTGAAGGTCAAAAAATCGAAAC
OCF.127	CTTCACCTACTTTGTAAGCACCTGGTTTATCAGCC
oCF.136	TGTGAGCGGATAACAATTATATATTAAAAATGGAGGGACTTAGAGTTGG
oCF.137	CCATTTTTAATATATAATTGTTATCCGCTCACAATTCCAC
oCF.160	GTCTTTGTAGTCGATATCATGATCCTTATAATCACCATCATGATCCTTATAATCCATGCTTTTATTAAAATAAACTTCTTCGTGATCATG

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Supplementary Sequences 1. DNA sequences of *mhp* genes from escaper Φ80α-vir phages that avoid Sau-Thoeris immunity. The sequence of the codon for residue V273 is shown in red.

Escaper 1

ATGGAACAAACACAAAAATTAAAATTAAATTTGCAACATTTTGCGAGTAACAATGTTA
AACCGCAAGTATTTAACCCTGATAATGTAATGATGCACGAAAAGAAAGATGGCACG
TTGATGAATGAATTCACAACGCCCATCTTACAAGAGGTTATGGAAAACTCTAAAATT
ATGCAATTAGGTAAGTACGAACCAATGGAAGGTACTGAGAAGAAGTTTACTTTTTG
GGCTGATAAACCAGGTGCTTACTGGGTAGGTGAAGGTCAAAAAATCGAAACATCTA
AAGCTACATGGGTTAATGCTACTATGAGAGCGTTTAAATTAGGGGTTATCTTACCTG
TAACAAAAGAATTCTTGAATTATACTTATTCACAATTCTTTGAAGAAATGAAGCCTAT
GATTGCTGAAGCATTCTATAAAAAGTTTGATGAAGCGGGTATTTTGAATCAAGGTAA
CAATCCATTCGGTAAATCAATTGCGCAATCAATTGAAAAAACTAATAAGGTTATTAA
AGGTGACTTCACACAAGATAACATTATTGATTTAGAGGCATTACTTGAAGATGACGA
ATTAGAAGCAAATGCGTTTATCTCAAAAACACAAAACAGAAGCTTGTTACGTAAAAT
TGTAGATCCTGAAACGAAAGAACGTATTTATGACCGTAACAGTGATTCGTTAGACG
GTCTACCTGTGGTTAACCTTAAATCAAGCAACTTAAAACGTGGTGAATTAATCACTG
GTGACTTCGACAAATTGATTTATGGTATCCCTCAATTAATCGAATACAAAATCGATG
AAACTGCACAATTATCTACAGCTAAAAACGAAGATGGCACACCTGTAAACTTGTTTG
AACAAGACATGGTGGCATTACGTGCAACTATGCATGTAGCATTGCATATCGCTGAT
GATAAAGCGTTTGCTAAGTTAGTTCCTGCTGACAAAAGAACAGATTCAGTTCCAGG
AGAAGTTTAA

Escaper 2

ATGGAACAAACACAAAAATTAAAATTAAATTTGCAACATTTTGCGAGTAACAATGTTA
AACCGCAAGTATTTAACCCTGATAATGTAATGATGCACGAAAAGAAAGATGGCACG
TTGATGAATGAATTCACAACGCCCATCTTACAAGAGGTTATGGAAAACTCTAAAATT
ATGCAATTAGGTAAGTACGAACCAATGGAAGGTACTGAGAAGAAGTTTACTTTTTG
GGCTGATAAACCAGGTGCTTACTGGGTAGGTGAAGGTCAAAAAATCGAAACATCTA
AAGCTACATGGGTTAATGCTACTATGAGAGCGTTTAAATTAGGGGTTATCTTACCTG
TAACAAAAGAATTCTTGAATTATACTTATTCACAATTCTTTGAAGAAATGAAGCCTAT
GATTGCTGAAGCATTCTATAAAAAGTTTGATGAAGCGGGTATTTTGAATCAAGGTAA
CAATCCATTCGGTAAATCAATTGCGCAATCAATTGAAAAAACTAATAAGGTTATTAA
AGGTGACTTCACACAAGATAACATTATTGATTTAGAGGCATTACTTGAAGATGACGA
ATTAGAAGCAAATGCGTTTATCTCAAAAACACAAAACAGAAGCTTGTTACGTAAAAT
TGTAGATCCTGAAACGAAAGAACGTATTTATGACCGTAACAGTGATTCGTTAGACG
GTCTACCTGTGGTTAACCTTAAATCAAGCAACTTAAAACGTGGTGAATTAATCACTG
GTGACTTCGACAAATTGATTTATGGTATCCCTCAATTAATCGAATACAAAATCGATG
AAACTGCACAATTATCTACAGCTAAAAACGAAGATGGCACACCTGTAAACTTGTTTG
AACAAGACATGGTGGCATTACGTGCAACTATGCATGTAGCATTGCATATCGCTGAT
GATAAAGCGTTTGCTAAGTTAGTTCCTGCTGACAAAAGAACAGATTCAGTTCCAGG
AGAAGTTTAA

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Escaper 3
ATGGAACAAACACAAAAATTAAAATTAAATTTGCAACATTTTGCGAGTAACAATGTTA
AACCGCAAGTATTTAACCCTGATAATGTAATGATGCACGAAAAGAAAGATGGCACG
TTGATGAATGAATTCACAACGCCCATCTTACAAGAGGTTATGGAAAACTCTAAAATT
ATGCAATTAGGTAAGTACGAACCAATGGAAGGTACTGAGAAGAAGTTTACTTTTTG
GGCTGATAAACCAGGTGCTTACTGGGTAGGTGAAGGTCAAAAAATCGAAACATCTA
AAGCTACATGGGTTAATGCTACTATGAGAGCGTTTAAATTAGGGGTTATCTTACCTG
TAACAAAAGAATTCTTGAATTATACTTATTCACAATTCTTTGAAGAAATGAAGCCTAT
GATTGCTGAAGCATTCTATAAAAAGTTTGATGAAGCGGGTATTTTGAATCAAGGTAA
CAATCCATTCGGTAAATCAATTGCGCAATCAATTGAAAAAACTAATAAGGTTATTAA
AGGTGACTTCACACAAGATAACATTATTGATTTAGAGGCATTACTTGAAGATGACGA
ATTAGAAGCAAATGCGTTTATCTCAAAAACACAAAACAGAAGCTTGTTACGTAAAAT
TGTAGATCCTGAAACGAAAGAACGTATTTATGACCGTAACAGTGATTCGTTAGACG
GTCTACCTGTGGTTAACCTTAAATCAAGCAACTTAAAACGTGGTGAATTAATCACTG
GTGACTTCGACAAATTGATTTATGGTATCCCTCAATTAATCGAATACAAAATCGATG
AAACTGCACAATTATCTACAGCTAAAAACGAAGATGGCACACCTGTAAACTTGTTTG
AACAAGACATGGTGGCATTACGTGCAACTATGCATGTAGCATTGCATATCGCTGAT
GATAAAGCGTTTGCTAAGTTAGTTCCTGCTGACAAAAGAACAGATTCAGTTCCAGG
AGAAGTTTAA

Escaper 4

ATGGAACAAACACAAAAATTAAAATTAAATTTGCAACATTTTGCGAGTAACAATGTTA
AACCGCAAGTATTTAACCCTGATAATGTAATGATGCACGAAAAGAAAGATGGCACG
TTGATGAATGAATTCACAACGCCCATCTTACAAGAGGTTATGGAAAACTCTAAAATT
ATGCAATTAGGTAAGTACGAACCAATGGAAGGTACTGAGAAGAAGTTTACTTTTTG
GGCTGATAAACCAGGTGCTTACTGGGTAGGTGAAGGTCAAAAAATCGAAACATCTA
AAGCTACATGGGTTAATGCTACTATGAGAGCGTTTAAATTAGGGGTTATCTTACCTG
TAACAAAAGAATTCTTGAATTATACTTATTCACAATTCTTTGAAGAAATGAAGCCTAT
GATTGCTGAAGCATTCTATAAAAAGTTTGATGAAGCGGGTATTTTGAATCAAGGTAA
CAATCCATTCGGTAAATCAATTGCGCAATCAATTGAAAAAACTAATAAGGTTATTAA
AGGTGACTTCACACAAGATAACATTATTGATTTAGAGGCATTACTTGAAGATGACGA
ATTAGAAGCAAATGCGTTTATCTCAAAAACACAAAACAGAAGCTTGTTACGTAAAAT
TGTAGATCCTGAAACGAAAGAACGTATTTATGACCGTAACAGTGATTCGTTAGACG
GTCTACCTGTGGTTAACCTTAAATCAAGCAACTTAAAACGTGGTGAATTAATCACTG
GTGACTTCGACAAATTGATTTATGGTATCCCTCAATTAATCGAATACAAAATCGATG
AAACTGCACAATTATCTACAGCTAAAAACGAAGATGGCACACCTGTAAACTTGTTTG
AACAAGACATGGTGGCATTACGTGCAACTATGCATGTAGCATTGCATATCGCTGAT
GATAAAGCGTTTGCTAAGTTAGTTCCTGCTGACAAAAGAACAGATTCAGTTCCAGG
AGAAGTTTAA

Wild-type

ATGGAACAAACACAAAAATTAAAATTAAATTTGCAACATTTTGCGAGTAACAATGTTA
AACCGCAAGTATTTAACCCTGATAATGTAATGATGCACGAAAAGAAAGATGGCACG
TTGATGAATGAATTCACAACGCCCATCTTACAAGAGGTTATGGAAAACTCTAAAATT

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ATGCAATTAGGTAAGTACGAACCAATGGAAGGTACTGAGAAGAAGTTTACTTTTTG
GGCTGATAAACCAGGTGCTTACTGGGTAGGTGAAGGTCAAAAAATCGAAACATCTA
AAGCTACATGGGTTAATGCTACTATGAGAGCGTTTAAATTAGGGGTTATCTTACCTG
TAACAAAAGAATTCTTGAATTATACTTATTCACAATTCTTTGAAGAAATGAAGCCTAT
GATTGCTGAAGCATTCTATAAAAAGTTTGATGAAGCGGGTATTTTGAATCAAGGTAA
CAATCCATTCGGTAAATCAATTGCGCAATCAATTGAAAAAACTAATAAGGTTATTAA
AGGTGACTTCACACAAGATAACATTATTGATTTAGAGGCATTACTTGAAGATGACGA
ATTAGAAGCAAATGCGTTTATCTCAAAAACACAAAACAGAAGCTTGTTACGTAAAAT
TGTAGATCCTGAAACGAAAGAACGTATTTATGACCGTAACAGTGATTCGTTAGACG
GTCTACCTGTGGTTAACCTTAAATCAAGCAACTTAAAACGTGGTGAATTAATCACTG
GTGACTTCGACAAATTGATTTATGGTATCCCTCAATTAATCGAATACAAAATCGATG
AAACTGCACAATTATCTACAGTTAAAAACGAAGATGGCACACCTGTAAACTTGTTTG
AACAAGACATGGTGGCATTACGTGCAACTATGCATGTAGCATTGCATATCGCTGAT
GATAAAGCGTTTGCTAAGTTAGTTCCTGCTGACAAAAGAACAGATTCAGTTCCAGG
AGAAGTTTAA