

Figure S1: Phenotypic properties of grey colony variants.

**a.** Grey colony variants are easily distinguished by avirulent translucent colony types. A section of an agar plate viewed using a stereo microscope, illuminated from below with oblique lighting. Wild type *A. baumannii* are known to phase switch between virulent opaque and avirulent translucent colony types. These colony types, only discernible when viewed in this way, are notably different from grey colony variants that are easily identified with the naked eye.

**b.** Grey colony variants have reduced motility. The spread of colonies on soft agar plates was recorded photographically and the area of spread quantified. Results are the average of five biological replicates and error bars indicate standard deviation from the mean. Individual measurements are shown as discrete datapoints. A two-tailed student's t-test was used to determine P. Source data are provided as a Source Data file.

**c.** Grey colony variants more readily form biofilms. Cells forming biofilms on the surface of microfuge tubes were stained with crystal violet dye. After drying, the dye was solubilised the amount

present quantified by measuring the  $A_{585}$  signal as a function of the number of cells present adjudged by  $OD_{600}$  values. Results are the average of three biological replicates and error bars indicate standard deviation from the mean. Individual measurements are shown as discrete datapoints. A two-tailed student's t-test was used to determine P. Source data are provided as a Source Data file.

**d. Grey colony variants are defective for capsule production.** Cells separated by centrifugation in colloidal silica migrate according to the presence of capsule. Distances migrated were measured from the bottom of the microfuge tube containing the cell suspension. Results are the average of three biological replicates and error bars indicate standard deviation from the mean. Individual measurements are shown as discrete datapoints. A two-tailed student's t-test was used to determine P. Source data are provided as a Source Data file.





#### Figure S2: H-NS protects transcribed and essential genes from disruption by ISAba13.

**a.** A representative section of the *A. baumannii* chromosome showing increased transposition into essential and transcribed genes in the absence of H-NS. Genes are shown as arrows with essential genes coloured blue. The traces show read depths from RNA-seq, H-NS ChIP-seq and native Tn-seq experiments. In all cases positive and negative values indicate read depths for the top and bottom strand respectively. The region is centred approximately around position 1,589,000 of the genome.

**b.** Frequency of ISAba13 insertion in different classes of genes. The bar chart shows the total number of ISAba13 insertions per kb, across two biological replicates, in the presence and absence of H-NS, and for H-NS bound, unbound, essential or transcribed genes. P values were derived using the student's T-test. Source data are provided as a Source Data file.



Figure S3: Patterns of H-NS binding, and ISAba13 transposition, upstream of DNA regions used for *in vitro* DNA bridging assays.

**a.** H-NS binding and ISAba13 transposition patterns at the type six secretion system encoding locus. Genes are shown as red arrows. The traces show read depths from H-NS ChIP-seq and native Tn-seq experiments. In all cases positive and negative values indicate read depths for the top and bottom strand respectively. The DNA region used for *in vitro* DNA bridging assays is indicated by the black bar.

**b.** H-NS binding and ISAba13 transposition patterns at one of the existing chromosomal copies of ISAba13. As for above panel except that ISAba13 is shown in blue.

### а

b

E .	coli hns	MSEALKILNNIRTLRAQARECTLETLEEMLEKLEVVV NERREEESAAAAEVEERT RKLQQ
Α.	baumannii hns	MKPDISELSVEELKRLQEEAEALIASKKDQAIEDAYNQ ::.: * ::* *:: *: *:: ::: ::: : : : : :
Е. А.	coli hns baumannii hns	YREMLIADGIDPNELLNSLAAVKSGTKAKRAQRPAKYSYVDENGETKTWTGQGRTPAVIK         IIEIAENVGFSVEQLLEFGAQKRKKTTRKSVEPRYRNKNNAEETWTGRGKQPRWLV         *:       *::::::*::         *:       *:::::::         *:       *:::::::
Е. А.	coli hns baumannii hns	KAMDEQGKSLDDFLIKQ AEIEK-GAKLEDFLI ::: * .*:***



### Figure S4: Organisation of H-NS-39 and predicted interaction will full length H-NS.

**a.** Alignment of *E. coli* and *A. baumannii* H-NS. Residues that are identical (\*), conserved (:), or semi-conserved (.) are indicated. The region of *E. coli* H-NS highlighted red is the region used by van der Valk and co-workers<sup>1</sup>. The region of *A. baumannii* H-NS highlighted red corresponds to H-NS-39 used in this work.

**b.** Predicted interaction between *A. baumannii* H-NS and H-NS-39. The structural prediction was generated using AlphaFold 3<sup>96</sup>. Full length H-NS is green and H-NS-39 is red.





Figure S5: Disruption of local DNA folding by H-NS-39 in vivo.

**a.** Changes to 10 kb resolution contact frequencies in the presence of H-NS-39. The heatmap plots normalised 3C-seq contact frequencies, in cells without H-NS-39, divided by normalised contact frequencies from cells expressing H-NS-39. The contact ratios are grouped in 10 kb bins and axes indicate the genomic location of each bin in the pair.

**b.** Changes to 1 kb resolution contact frequencies in the presence of H-NS-39. As for the above panel except that values are binned at 1 kb resolution.

**c-f. Changes to local DNA folding patterns in the presence of H-NS-39.** In each panel, the heatmaps separately illustrate interaction frequencies between 1 kb sections of the *A. baumannii* chromosome, measured by 3C-seq, in the presence and absence of H-NS-39. An interaction pattern indicative of a loop is marked and signal in this region is lost in the presence of H-NS-39. The locations of genes (red arrows) are also shown alongside H-NS binding patterns determined by ChIP-seq with or without expression of H-NS-39.



b

#### Figure S6: Existing copies of ISAba13 do not interact with hot spots for ISAba13 transposition.

**a.** Existing copies of ISAba13 are in poorly interactive regions of the chromosome. The panel shows two heatmaps, each representing the *A. baumannii* chromosome divided into 1 kb sections. Sections are coloured according to the number of 3C-seq interactions and sorted on this basis, rather than by chromosomal position. Sections containing existing copies of ISAba13 are labelled.

**b.** Location and frequency of 3C-seq interactions involving ISAba13 at chromosomal positions **1.764 Mb** (copy 1) and 3.863 Mb (copy 2). The bar chart shows the frequency of interactions between each 1 kb chromosomal section and ISAba13 copy 1 (cyan) or copy 2 (purple). Each ISAba13 copy primarily interacts with neighbouring DNA regions but not sites elsewhere in the genome. Source data are provided as a Source Data file.

**c.** Location and frequency of ISAba13 insertions in the presence and absence of H-NS. The bar charts show the frequency of ISAba13 insertions, in each 1 kb chromosomal bin, in the presence and absence of H-NS. In wild type cells, there are many hotspots for transposition that are H-NS bound regions. Comparison with panel b shows that these transposition hotspots do not interact with either copy of ISAba13. In the absence of H-NS, the two regions of highest ISAba13 transposition surround copies 1 and 2 of the insertion sequence at their starting chromosomal loci. Source data are provided as a Source Data file.

a



Figure S7: Insertion sequence insH3 is targeted to H-NS bound DNA in E. coli.

**a.** Global patterns of H-NS binding and *insH3* transposition are correlated. The panel shows two heatmaps, each representing the *E. coli* MG1655 chromosome divided into 1 kb sections. Sections are coloured according to the H-NS ChIP-seq binding signal (top) or the number of *insH3* insertions detected using native Tn-seq for wild type (bottom). The heatmap expansions are provided to aid comparison of H-NS binding and insertion frequency. The Pearson correlation coefficient (r) of the two datasets is shown.

**b.** Examples of H-NS mediated *insH3* capture. Selected chromosomal regions with H-NS ChIP-seq and native Tn-seq data shown. In both cases, traces indicate read depths with positive and negative values corresponding to the top and bottom DNA strand respectively. Genes are shown as arrows.

**c. H-NS targets** *insH3* **to prophage in** *E. coli.* The panel shows the chromosomal region encompassing the CP4-57 prophage (marked by a solid black line). The phage genome contains two H-NS bound regions and both are targeted by *insH3*.



**Figure S8: Schematic representation of the native Tn-seq method.** Genomic DNA (gDNA) is sheared using treatment with dsDNA fragmentase. Following end repair and dA-tailing, adaptors are ligated on. This is followed by a PCR using a primer specific for the adaptor (blue arrow) and a primer complementary to the end of ISAba13 (green arrow). To increase specificity, a second hemi-nested PCR is done with the same adaptor primer and a primer complementary to IS*Aba*13 further downstream from the previous primer binding site. This is to ensure that only genuine IS*Aba*13::chromosome junctions are detected.

Locus	Name	Function	Log <sub>2</sub> fold change	P value <sup>1</sup>
		Up regulated get	nes	
ABUW_1703		hypothetical protein	2.41	9.21E-03
ABUW_2112		DUF2726 domain protein	2.41	2.29E-02
ABUW_1766	ISAba13	insertion sequence	2.14	1.14E-09
ABUW_3803	ISAba13	insertion sequence	2.07	3.78E-09
		Down regulated g	enes	
ABUW_2006		major capsid protein	-2.12	5.09E-06
ABUW_2017		major capsid protein	-2.25	1.87E-04
ABUW_2028		major capsid protein	-2.54	2.80E-07
ABUW_1769		PEGA domain protein	-2.80	2.37E-06
ABUW_3823	weeI	sugar transferase	-2.94	1.82E-11
ABUW_1641		hypothetical protein	-3.25	1.35E-05
ABUW_3822	weeH	acetyl transferase	-3.43	2.08E-13
ABUW_0304	pilA	pilin	-5.49	1.22E-31

Table S1: Changes in gene expression in grey colony derivatives compared to wild types cells

<sup>1</sup>Calculated using an exact test.

 Table S2: Mobile genetic elements containing transposition hotspots dependent on H-NS

Mobile element	Chromosomal position	Genes with H-NS dependent transposition hotspots	
	Chromosomal elements		
Aeromonas phage SW69-9	318756-329326	0	
Escherichia phage vB_EcoM_ECO1230-10	545886-581029	1	
Acinetobacter phage Bphi-B1251	736407-769903	3	
Acinetobacter phage Bphi-B1251	776101-793726	0	
Acinetobacter phage Bphi-B1251	1289765-1330967	6	
Acinetobacter phage Bphi-B1251	1314667-1338244	2	
Acinetobacter phage Ab105-2phi	1391199-1409865	0	
Acinetobacter phage Ab105-2phi	1393236-1416423	0	
Enterobacteria phage Ike	1985246-2029746	1	
Acinetobacter phage Ab105-1phi	2650307-2669540	7	
Moraxella phage Mcat16	3031838-3049068	1	
Ε	Extra chromosomal elements		
83.61 kb plasmid	N.A.	18	
8.73 kb plasmid	N.A.	2	
1.97 kb plasmid	N.A.	0	

Name	Description	Source		
A. baumannii strains				
AB5075	Highly virulent and drug resistant isolate from an osteomyelitis tibial infection.	(3)		
AB5075::gtr52::ISAba13	Naturally occurring "grey" AB5075 derivative with an insertion sequence disrupting the <i>gtr52</i> gene.	This work		
AB5075:: <i>ompW</i> ::IS <i>Aba</i> 13	Derivative of AB5075 with an insertion sequence disrupting the $ompW$ gene, generated by scarless genome editing.	This work		
AB5075 hns::T26	Derivative of AB5075 with a T26 transposon inserted at position 2110f <i>hns</i> . Tet <sup>R</sup> .	(4)		
	E. coli strains			
JCB387	Used for general plasmid DNA manipulation. $\Delta nir B \Delta lac$ .	(5)		
DH5a	Used for general plasmid DNA manipulation. $fhuA2\Delta(argF-lacZ)U169$ phoA glnV44 $\Phi$ 80 $\Delta(lacZ)M15$ gyrA96 recA1 relA1 endA1 thi-1 hsdR17.	NEB		
T7 Express	Used to overexpress A. baumannii H-NS from pJ414.	NEB		
MG1655	Used for native Tn-seq analysis of insH3.	(6)		
Plasmids				
pVRL1Z	High copy number plasmid, contains <i>parE2-paaA2</i> toxin-antitoxin system. Zeo <sup>R</sup> . Used to express H-NS-39 in <i>A. baumannii</i> .	(7)		
pVLR2Z	High copy number plasmid, contains $parE2$ - $paaA2$ toxin-antitoxin system. Zeo <sup>R</sup> . Has an arabinose inducible promoter.	(7)		
pMHL-2	Template for PCR used to make DNA fragments for genome editing. Contains <i>apra</i> R:: <i>sacB</i> counter selection and resistance cassette.	(8)		
pJ414	Used to overexpress A. baumannii H-NS in E. coli.	ATUM		

Name	Description	Sequence (5' to 3')	
	for generation	on of <i>ompW</i> ::ISAba13	
P5	To amplify <i>apraR</i> :: <i>sacB</i> cassette	cgactcactatagggcgaattgggccgctttccagtcgggaaacctg	
P6	To amplify <i>apraR</i> :: <i>sacB</i> cassette	catatgccaccgacccgagcaaaccccgccagggttttcccagtcacgac	
P62	To create fragment 1	cagcagtcacataatagatagc	
P63	To create fragment 1	ggcccaattcgccctatagtgagtcgattggcaagtaaaatttggg	
P64	To create fragment 2	gggtttgctcgggtcggtggcatatgggctttgttgcacaaagatttaaaag	
P65	To create fragment 2	attggcaagggctttgttgcacaaacctatctc	
P66	To create fragment 3	caacaaagcccttgccaattaccagca	
P71	To create fragment 3	cgttatgcgcaatgtccagt	
P70	To amplify Gibson assembly produ	ct taagccatcaagcaaagtgag	
P74	To amplify Gibson assembly produ and create fragment used in second	ct ctcagagctaataagtgactg	
P72	recombination For creating fragment used in second ccgtactaccttctacacggt recombination		
P157	For creating fragment used in secor recombination	nd acttgccaatggctttgttgcacaaagatttaaaagttaag	
P158	For creating fragment used in secor recombination	nd caacaaagccattggcaagtaaaatttggg	
	for generat	tion of <i>hns-</i> 3x-FLAG	
prSL1	To create fragments 1 and 5	gectattaattgetgageaagetttg	
prSL11	To create fragment 2	ggtgcaaaacttgaagatttcttaatcgctactgactacaaagaccatgac	
prSL12	To create fragment 2	gactgggaaaaccctggcgttacttgtcatcgtcatccttgtaatcg	
prSL13	To create fragment 1	caccetcategtctttgtagtcagtagcgattaagaaatcttcaagttttgcacc	
prSL14	To create fragment 3	cgattacaaggatgacgatgacaagtaacgccagggttttcccagtc	
prSL23	To create fragment 6	gattacaaggatgacgatgacaagtaattgtattgcctcttaaaaagccaagcg	
prSL24	To create fragment 5	cgcttggctttttaagaggcaatacaattacttgtcatcgtcatccttgtaatc	
prSL3	To create fragment 4	gtttcccgactggaaagcgttgtattgcctcttaaaaagccaagcgattc	
prSL4	To create framents 4 and 5	gtggacgttgatgattcaataaagcc	
prSL6	To create fragment 3	cgcttggctttttaagaggcaatacaacgctttccagtcgggaaacc	
prSL9	To amplify Gibson assembly produ	ct gcaactagccaacaactcaaaaaacc	
prSL10 To amplify Gibson assembly product gttgtatggtcatcacttgatcaccac		ct gttgtatggtcatcacttgatcaccac	
	for cloning A.	<i>baumannii hns</i> in pJ414	
P129	To amplify codon optimised AB507	75 gcaagc <u>catatg</u> aaaccggacattagc	
	nns for cloning in pJ414. Ndel		
D146	Te emplify as den entimized A D507	75	
r 140	<i>hns</i> for cloning in pJ414. <i>Xho</i> I restriction site underlined.	15 geaggi <u>eregag</u> itaaareaggaaare	
	for constructing hn	es-39 and cloning in pVRL1Z	
P134	To create fragment 1, <i>Xho</i> I site underlined	cccc <u>ctcgag</u> ataaatattaagaaaatatattacaattataattactaatg	
P135	To create fragment 1	tgatetttttteattaataataeteeagtettae	
P136	To create fragment 2	ttattaatgaaaaaagatcaagcaatcg	
P137	To create fragment 2, PstI underline	ed cgggctgcagttatgttgttttcttacgtttttg	
	for <i>in vitro</i>	DNA bridging assays	
P162	To create ISAba13 bait fragment	biotin-cttattaaatggctttgttgcac	
P163	To create ISAba13 bait fragment	taatttaataaggctttgttgcac	

P171	To create T6SS prey fragment	caacacaactttcattcc
P172	To create T6SS prey fragment	agggtatctatatcagcca

#### for native Tn-seq with A. baumannii

Staggered_3	For 2nd hemi-nested PCR of P5 end,	aatgatacggcgaccaccgagatctacactctttccctacacgacgctcttccgatc		
—	binding site to ISAba13 underlined.	tgatagaccacatacccgagttgtcac		
	TGATA in italic added for			
C 1.4	heterogeneity.			
Staggered_4	For 2nd hemi-nested PCR of P5 end,	aatgatacggcgaccaccgagatctacactctttccctacacgacgctcttccgatc		
	TATCTA in italic added for	<i>laicia</i> gaccacataccegagtigicac		
	heterogeneity.			
AP1 P7 tagged 1	For 2nd hemi-nested PCR of P7 end,	caagcagaagacggcatacgagatatcacggtgactggagttcagacgtgtgctctt		
00 _	binding site to adaptor underlined.	ccgatctgtcaatgatggccggtggatttgtg		
	Barcode: CGTGAT in italic.			
AP1_P7_tagged_2	For 2nd hemi-nested PCR of P7 end,	caagcagaagacggcatacgagatcgatgtgtgtgactggagttcagacgtgtgctctt		
	binding site to adaptor underlined.	ccgatctgtca <u>atgatggccggtggatttgtg</u>		
AP1 P7 tagged 3	Ear 2nd hemi-nested PCR of P7 end	caageagaagaagaagaagaagaagaagaagaagaagaaga		
AFI_F/_taggetu_5	binding site to adaptor underlined	ccoatctotcaatoacooccootooatttoto		
	Barcode: GCCTAA in italic.	oogaaa,gaa <u>algaaggaaggaalga</u>		
AP1_P7_tagged_4	For 2nd hemi-nested PCR of P7 end,	caag cag aag acg g cat acg a g at t g a c c a g t g a c t g g a g t t c a g a c g t g t c t t t a c a g t g a c t g g a g t t c a g a c g t g t g c t c t t t a c a g t g a c t g a c t g a		
	binding site to adaptor underlined.	ccgatctgtca <u>atgatggccggtggatttgtg</u>		
	Barcode: TGGTCA in italic.			
AP1_P7_tagged_5	For 2nd hemi-nested PCR of P7 end,	caagcagaagacggcatacgagat <i>acagtg</i> gtgactggagttcagacgtgtgctctt		
	Barcode: CACTGT in italic	ccgatctgtcaatgatggccggtggattigtg		
AP1 P7 tagged 6	For 2nd hemi-nested PCR of P7 end.	caagcagaagacggcatacgagatgccggtgtgactggagttcagacgtgtgctctt		
/III_I/_uggeu_0	binding site to adaptor underlined.	ccgatctgtcaatgatggccggtggatttgtg		
	Barcode: ATTGGC in italic.			
AP1_P7_tagged_7	For 2nd hemi-nested PCR of P7 end,	caagcagaagacggcatacgagatg <i>ctatg</i> gtgactggagttcagacgtgtgctctt		
	binding site to adaptor underlined.	ccgatctgtca <u>atgatggccggtggatttgtg</u>		
	Barcode: CATAGC in italic.			
AP1_P7_tagged_8	For 2nd hemi-nested PCR of P7 end,	caagcagaagacggcatacgagat <i>agctag</i> gtgactggagttcagacgtgtgctctt		
	binding site to adaptor underlined.	ccgatctgtca <u>atgatggccggtggatttgtg</u>		
AP1 P7 tagged 9	For 2nd hemi-nested PCR of P7 end	caageagaagacggcatacgagat <i>gtcgggg</i> tgactggagttcagacgtggctgt		
AI I_I /_tagged_)	binding site to adaptor underlined	ccoatctotcaatoatoaccootooatttoto		
	Barcode: TTCGAC in italic.	oogaaa,gaa <u>angaaggooggoggaango</u> g		
	AP1 P7 tagged 10 For 2nd hemi-nested PCR of P7 end, caagcagaagacggcatacgagatacgaggtgactggagttcagacgtgtgctctt			
AP1_P7_tagged 1	0 For 2nd hemi-nested PCR of P7 end			
AP1_P7_tagged_1	0 For 2nd hemi-nested PCR of P7 end binding site to adaptor underlined.	ccgatctgtcaatgatggccggtggattgtg		

*insH3*\_out For 1st PCR, binds near to the 5'end gataacgccttaaatggcgaagaaac of *insH3* 

Staggered_1	For 2nd hemi-nested PCR of P5 end,	$a atgata cggcga cca ccga gatcta ca ct cttt cccta ca cga cg ct ctt ccg at ct \underline{g}$
	binding site to <i>insH3</i> underlined.	<u>ggagaaaaaatcggctcaaacatg</u>
	T in italic added for heterogeneity.	
Staggered_2	For 2nd hemi-nested PCR of P5 end,	a at gata cggcgacca ccgagat cta cact cttt cccta cacga cgct ctt ccgat ctt
	binding site to <i>insH3</i> underlined.	gggagaaaaaatcggctcaaacatg
	Ts in italic added for heterogeneity.	
Staggered_3	For 2nd hemi-nested PCR of P5 end,	aatgatacggcgaccaccgagatctacactctttccctacacgacgctcttccgatc
	binding site to <i>insH3</i> underlined.	tgatagggagaaaaaatcggctcaaacatg
	TGATA in italic added for	
	heterogeneity.	
Staggered_4	For 2nd hemi-nested PCR of P5 end,	aatgatacggcgaccaccgagatctacactctttccctacacgacgctcttccgatc
	binding site to <i>insH3</i> underlined.	tatctagggagaaaaaatcggctcaaacatg
	TATCTA in italic added for	
	heterogeneity.	

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