

1 **SUPPLEMENTAL INFORMATION**

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4 **A single residue unique to DinB-like proteins limits formation of the Pol IV multi-**  
5 **protein complex in *Escherichia coli***

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15 **Running title: Isolation of a key DinB residue and MPC binding order**

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17 Key words: DinB, multi-protein complex (MPC), RecA, UmuD, protein-protein  
18 interaction, Y-family DNA polymerase, *E. coli*

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24 **Supplemental Table S1. List of all organisms represented in the multiple**  
 25 **sequence alignment (MSA) of DinB-like sequences.** The number of sequences per  
 26 organism is also provided. Each sequence was identified by a unique accession  
 27 number.

Organism name	Number of sequences included in MSA
<i>Acaryochloris marina</i>	1
<i>Acetobacter pomorum</i>	1
<i>Acidithiobacillus ferrooxidans</i>	1
<i>Acinetobacter haemolyticus</i>	1
<i>Aeromonas hydrophilia</i> subsp. <i>hydrophilia</i>	1
<i>Aggregatibacter segnis</i>	1
<i>Agrobacterium tumefaciens</i>	1
<i>Aliivibrio salmonicida</i>	1
<i>Bacteriovorax marinus</i>	1
<i>Bacteroides fragilis</i>	2
<i>Bordatella avium</i>	1
<i>Bradyrhizobium</i> sp.	1
<i>Burkholderia mallei</i>	10
<i>Burkholderia multivorans</i>	3
<i>Burkholderia pseudomallei</i>	13
<i>Caenorhabditis brenneri</i>	1
<i>Caenorhabditis briggsae</i>	1
<i>Candida dubliniensis</i>	1
<i>Capnocytophaga canimorsus</i>	1
<i>Capnocytophaga ochracea</i>	1
<i>Capnocytophaga</i> sp. oral taxon	1
<i>Carboxydotherrnus hydrogenoformans</i>	1
<i>Cardiobacterium hominis</i>	1
<i>Carnobacterium</i> sp.	1
<i>Caulobacter crescentus</i>	1
<i>Caulobacter segnis</i>	1
<i>Chryseobacterium gleum</i>	1
<i>Clostridium difficile</i>	4
<i>Clostridium hiranonsis</i>	1
<i>Clostridium perfringens</i>	7
<i>Corynebacterium glucuronolyticum</i>	1
<i>Corynebacterium psuedotuberculosis</i>	6
<i>Cronobacter turicensis</i>	1
<i>Cupriavidus necator</i>	1
<i>Cupriavidus taiwanensis</i>	1
<i>Deinococcus ficus</i>	1

<i>Dickeya dadantii</i>	1
<i>Dinoroseobacter shibae</i>	1
<i>Edwardsiella tarda</i>	1
<i>Enhydrobacter aerosaccus</i>	1
<i>Enterobacter hormaechei</i>	1
<i>Erwinia amylovora</i>	1
<i>Escherichia coli</i>	55
<i>Escherichia fergusonii</i>	3
<i>Flavobacterium branchiophilum</i>	1
<i>Francisella tularensis subsp. holarctica</i>	1
gamma proteobacterium	2
<i>Gluconacetobacter diazotrophicus</i>	1
<i>Gordonia alkanivorans</i>	1
<i>Gramella forsetii</i>	1
<i>Haemophilus parainfluenzae</i>	1
<i>Heliobacterium modesticaldum</i>	1
<i>Homo sapiens</i>	2
<i>Hyphomicrobium sp.</i>	1
<i>Ketogulonicigenium vulgare</i>	1
<i>Ketogulonigenium vulgare</i>	1
<i>Kingella denitrificans</i>	1
<i>Kingella kingae</i>	1
<i>Kitasatospora setae</i>	1
<i>Klebsiella pneumoniae</i>	4
<i>Klebsiella sp.</i>	1
<i>Kocuria rhizophila</i>	1
<i>Lactobacillus acidophilus</i>	1
<i>Lactobacillus amylolyticus</i>	1
<i>Lactobacillus brevis subsp. Gravesensis</i>	1
<i>Lactobacillus buchneri</i>	1
<i>Lactobacillus casei</i>	2
<i>Lactobacillus crispatus</i>	2
<i>Lactobacillus delbrueckii subsp. bulgaricus</i>	1
<i>Lactobacillus delbrueckii subsp. Lactis</i>	1
<i>Lactobacillus gasseri</i>	1
<i>Lactobacillus iners</i>	6
<i>Lactobacillus jensenii</i>	1
<i>Lactobacillus johnsonii</i>	1
<i>Lactobacillus kefiranofaciens</i>	1
<i>Lactobacillus plantarum subsp. plantarum</i>	1
<i>Lactobacillus rhamnosus</i>	3
<i>Lactobacillus ruminis</i>	1
<i>Lactobacillus sanfranciscensis</i>	1
<i>Lactobacillus ultunensis</i>	1
<i>Legionella longbeachae</i>	2
<i>Leuconostoc gasicomitatum</i>	1
<i>Listeria grayi</i>	1

<i>Listeria monocytogenes</i>	1
<i>Marinobacter adhaerens</i>	1
<i>Methylobacterium extorquens</i>	3
<i>Microlunatus phosphovorus</i>	1
<i>Mus musculus</i>	1
<i>Mycobacterium abscessus</i>	1
<i>Mycobacterium avium</i>	4
<i>Mycobacterium gilvum</i>	1
<i>Mycobacterium marinum</i>	1
<i>Mycobacterium parascrofulaceum</i>	1
<i>Mycobacterium smegmatis</i>	1
<i>Mycobacterium sp.</i>	5
<i>Mycobacterium ulcerans</i>	1
<i>Mycobacterium vanbaalenii</i>	1
<i>Neisseria bacilliformis</i>	1
<i>Neisseria macacae</i>	1
<i>Neisseria meningitidis</i>	9
<i>Neisseria shayeganii</i>	1
<i>Neisseria wadsworthii</i>	1
<i>Oscillibacter valericigenes</i>	1
<i>Pantoea ananatis</i>	1
<i>Pasteurella dagmatis</i>	1
<i>Pectobacterium atrosepticum</i>	1
<i>Pediococcus acidilactici</i>	1
<i>Prevotella amnii</i>	1
<i>Prevotella marshii</i>	1
<i>Prevotella multiformis</i>	1
<i>Prevotella nigrescens</i>	1
<i>Prevotella pallens</i>	1
<i>Prevotella sp. oral taxon</i>	1
<i>Propionibacterium acnes</i>	1
<i>Proteus mirabilis</i>	2
<i>Pseudoaltermonas haloplanktis</i>	1
<i>Pseudoaltermonas sp.</i>	1
<i>Pseudomonas aeruginosa</i>	5
<i>Pseudomonas fluorescens</i>	1
<i>Psychrobacter sp.</i>	1
<i>Pyramidobacter piscicolens</i>	1
<i>Ralstonia solanacearum</i>	1
<i>Rhizobium etli</i>	3
<i>Rhodobacter capsulatus</i>	1
<i>Rhodococcus erythropolis</i>	1
<i>Roseobacter denitrificans</i>	1
<i>Roseobacter litoralis</i>	1
<i>Salinibacter ruber</i>	1
<i>Salmonella enterica subsp. enterica</i>	1
<i>Serratia odorifera</i>	1

<i>Shigella boydii</i>	1
<i>Shigella dysenteriae</i>	1
<i>Sphingobacterium spiritivorum</i>	2
<i>Sphingobium sp.</i>	1
<i>Staphylococcus aureus subsp. aureus</i>	5
<i>Staphylococcus epidermis</i>	7
<i>Staphylococcus lugdunensis</i>	1
<i>Staphylococcus pseudintermedius</i>	1
<i>Staphylococcus warneri</i>	1
<i>Stenotrophomonas maltophilia</i>	1
<i>Streptomyces avermitilis</i>	1
<i>Teredinibacter turnerae</i>	1
<i>Treponema denticola</i>	1
<i>Treponema phagedenis</i>	1
<i>Treponema vincentii</i>	1
uncultured <i>Leeuwenhoekiella</i>	1
<i>Vibrio alginolyticus</i>	1
<i>Vibrio cholerae</i>	6
<i>Vibrio fischeri</i>	1
<i>Xanthomonas albilineans</i>	1
<i>Xenorhabdus bovienii</i>	1
<i>Xenorhabdus nematophila</i>	1
<i>Yersinia enterocolitica</i>	1
<i>Yersinia pestis</i>	12
<i>Yersinia pseudotuberculosis</i>	2
<b>Total number of sequences</b>	<b>316</b>

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38 **Supplemental Table S2. List of all organisms with UmuC-like sequences**  
39 **represented in the multiple sequence alignment (MSA) of all Y-family DNA**  
40 **polymerases.** The number of sequences per organism is also provided. Each  
41 sequence was identified by a unique accession number.

Organism name	Number of sequences included in MSA
<i>Acaryochloris marina</i>	1
<i>Acetivibrio cellulolyticus</i>	1
<i>Acetobacter tropicalis</i>	1
<i>Acetonema longum</i>	1
<i>Acholeplasma laidlawii</i>	1
<i>Acidiphilium cryptum</i>	1
<i>Acidiphilium multivorum</i>	1
<i>Acidithiobacillus caldus</i>	1
<i>Acidithiobacillus ferrivorans</i>	1
<i>Acidithiobacillus ferrooxidans</i>	1
<i>Acidobacterium sp.</i>	2
<i>Acidovorax radialis</i>	1
<i>Acinetobacter baumannii</i>	38
<i>Acinetobacter calcoaceticus</i>	3
<i>Acinetobacter haemolyticus</i>	2
<i>Acinetobacter junii</i>	1
<i>Acinetobacter sp.</i>	9
<i>Advenella mimigardefordensis</i>	1
<i>Aerococcus urinae</i>	1
<i>Aeromonas hydrophilia subsp. hydrophilia</i>	2
<i>Aeromonas veronii</i>	2
<i>Afipia sp.</i>	1
<i>Alcanivorax borkumensis</i>	1
<i>Alcanivorax sp.</i>	1
<i>Alicyclophilus denitrificans</i>	2
<i>Alistipes indistinctus</i>	1
<i>Alistipes shahii</i>	1
<i>Alistipes sp.</i>	2
alpha proteobacterium	2
<i>Alteromonadales bacterium</i>	1
<i>Alteromonas sp.</i>	1
<i>Aminobacterium colombiense</i>	1
<i>Anaerobaculum hydrogeniformans</i>	1
<i>Anaerostipes caccae</i>	1
<i>Anaerostipes sp.</i>	1
<i>Arcobacter nitrofigilis</i>	1
<i>Arhtrobacter aromaticum</i>	1

<i>Arthrobacter arilaitensis</i>	2
<i>Arthrobacter chlorophenicus</i>	3
<i>Arthrobacter nitroguajacolicus</i>	1
<i>Arthrobacter phenanthrenivorans</i>	1
<i>Arthrobacter sp.</i>	1
<i>Asticcacaulis excentricus</i>	1
<i>Atopobium parvulum</i>	2
<i>Bacillus amyloliquifaciens</i>	4
<i>Bacillus anthracis</i>	35
<i>Bacillus atrophaeus</i>	1
<i>Bacillus cellulosilyticus</i>	2
<i>Bacillus cereus</i>	38
<i>Bacillus clausii</i>	1
<i>Bacillus cytotoxicus</i>	1
<i>Bacillus halodurans</i>	1
<i>Bacillus megaterium</i>	2
<i>Bacillus mycoides</i>	2
<i>Bacillus pseudofirmus</i>	2
<i>Bacillus pumilus</i>	2
<i>Bacillus selenitiriducens</i>	1
<i>Bacillus subtilis</i>	19
<i>Bacillus thuringiensis</i>	18
<i>Bacillus weihenstephanensis</i>	1
<i>Bacteriodes coprosuis</i>	1
<i>Bacteroides fragilis</i>	3
<i>Bacteroides ovatus</i>	1
<i>Bacteroides salanitronis</i>	2
<i>Bacteroides sp.</i>	4
<i>Beijerincka indica</i>	1
<i>beta proteobacterium</i>	1
<i>Brenneria sp.</i>	1
<i>Brevibacillus brevis</i>	1
<i>Brucella melitensis</i>	1
<i>Brucella suis</i>	1
<i>Butyrivibrio proteoclasticus</i>	1
<i>Caenorhabditis remanei</i>	1
<i>Caldalkalibacillus thermarum</i>	1
<i>Caldicellulosiruptor bescii</i>	1
<i>Caldicellulosiruptor hydrothermalis</i>	1
<i>Caldicellulosiruptor kristjanssonii</i>	1
<i>Caldicellulosiruptor kronotskyensis</i>	1
<i>Caldicellulosiruptor lactoaceticus</i>	1
<i>Caldicellulosiruptor obsidiansis</i>	1
<i>Caldicellulosiruptorsaccharolyticus</i>	1
<i>Campylobacter concisus</i>	1
<i>Campylobacter showae</i>	1
<i>Candidatus Cloacamonas acidaminovorans</i>	1

<i>Candidatus Odysella thessalonicensis</i>	1
<i>Candidatus Pelagibacter sp.</i>	1
<i>Candidatus Puniceispirillum marinum</i>	1
<i>Capnocytophaga canimorsus</i>	1
<i>Carnobacterium sp.</i>	2
<i>Catonella morbi</i>	1
<i>Cellulomona flavigena</i>	1
<i>Cellulophaga algicola</i>	1
<i>Cellulophaga lytica</i>	1
<i>Cellvibrio gilvus</i>	1
<i>Chelativorans sp.</i>	2
<i>Chlorobium ferroxidans</i>	1
<i>Chlorobium limicola</i>	1
<i>Chlorobium luteolum</i>	1
<i>Chlorobium phaeobacteroides</i>	2
<i>Chlorobium phaeovibriodes</i>	1
<i>Chromohalobacter salexigens</i>	2
<i>Chryseobacterium gleum</i>	1
<i>Citrobacter freundii</i>	1
<i>Citrobacter koseri</i>	1
<i>Citrobacter rodentium</i>	1
<i>Citrobacter sp.</i>	1
<i>Citrobacter youngae</i>	1
<i>Clavibacter michiganensis subsp. michiganensis</i>	1
<i>Clostridiales bacterium</i>	1
<i>Clostridium cellulolyticum</i>	1
<i>Clostridium lentocellum</i>	1
<i>Clostridium papyrosolvens</i>	1
<i>Clostridium phytofermentans</i>	1
<i>Clostridium saccharolyticum</i>	1
<i>Clostridium sp.</i>	1
<i>Clostridium sticklandii</i>	1
<i>Colwellia psychrerythraea</i>	1
<i>Comamonas testosteroni</i>	2
<i>Coraliomargarita akajimensis</i>	1
<i>Coriobacterium glomerans</i>	1
<i>Croceibacter atlanticus</i>	1
<i>Cronobacter sakazakii</i>	1
<i>Cronobacter turicensis</i>	1
<i>Cyanobium sp.</i>	1
<i>Cytophaga hutchinsonii</i>	1
delta proteobacterium	2
<i>Desulfitobacterium metallireducens</i>	1
<i>Desulfobacterium autotrophicum</i>	1
<i>Desulfohalobium retbaese</i>	1
<i>Desulfomicrobium baculatum</i>	1
<i>Desulfonatronospira thiodismutans</i>	1



<i>Desulfotomaculum kuznetsovii</i>	1
<i>Desulfovibrio aespoensis</i>	1
<i>Desulfovibrio africanus</i>	1
<i>Desulfovibrio desulfuricans</i>	1
<i>Desulfovibrio fructosovorans</i>	2
<i>Desulfovibrio magneticus</i>	1
<i>Desulfovibrio salexigens</i>	1
<i>Desulfovibrio sp.</i>	2
<i>Desulfovibrio vulgaris</i>	1
<i>Desulfurispirillum indicum</i>	1
<i>Desulfurivibrio alkaliphilus</i>	1
<i>Desulfuromonas acetoxidans</i>	1
<i>Dokdonia donghaensis</i>	1
<i>Dyadobacter fermentans</i>	1
<i>Edwardsiella tarda</i>	1
<i>Eggerthella lenta</i>	2
<i>Enterobacter aerogenes</i>	1
<i>Enterobacter asburiae</i>	1
<i>Enterobacter cancerogenus</i>	1
<i>Enterobacter cloacae</i>	5
<i>Enterobacter hormaechei</i>	1
<i>Enterobacteriaceae bacterium</i>	1
<i>Enterobacter mori</i>	1
<i>Enterobacter sp.</i>	1
<i>Enterococcus casseliflavus</i>	2
<i>Enterococcus durans</i>	1
<i>Enterococcus faecalis</i>	2
<i>Enterococcus faecium</i>	20
<i>Enterococcus gallinarum</i>	1
<i>Enterococcus saccharolyticus</i>	1
<i>Erwinia amylovora</i>	5
<i>Erwinia billingiae</i>	2
<i>Erwinia pyrifoliae</i>	2
<i>Erwinia sp.</i>	1
<i>Erwinia tasmaniensis</i>	1
<i>Escherichia coli</i>	249
<i>Escherichia fergusonii</i>	1
<i>Escherichia sp.</i>	1
<i>Eubacterium bifforme</i>	1
<i>Eubacterium ventriosum</i>	1
<i>Exiguobacterium sp.</i>	1
<i>Flavobacteria bacterium</i>	1
<i>Flavobacteriales bacterium</i>	1
<i>Flavobacterium johnsoniae</i>	1
<i>Flavobacterium psychrophilum</i>	1
<i>Fluoribacter dumoffii</i>	1
<i>Fructobacillus fructosus</i>	2

<i>Gallionella capsiferriformans</i>	2
gamma proteobacterium	2
<i>Geobacillus</i> sp.	4
<i>Geodermatophilus obscurus</i>	1
<i>Glaciecocola</i> sp.	1
<i>Gluconobacter morbifer</i>	1
<i>Gluconobacter oxydans</i>	1
<i>Granulicella</i> sp.	1
<i>Halanaerobium hydrogeniformans</i>	1
<i>Haliscomenobacter hydrossis</i>	3
<i>Halobacterium salinarum</i>	1
<i>Halobacterium</i> sp.	2
<i>Halomicrobium mukohataei</i>	1
<i>Halomonas elongata</i>	2
<i>Halomonas</i> sp.	3
halophilic archaeon	1
<i>Haloplasma contractile</i>	1
<i>Halorhabdus utahensis</i>	1
<i>Halorhodospira halophila</i>	1
<i>Haloterrigena turkmenica</i>	1
<i>Halothermothrix orenii</i>	1
<i>Halothiobacillus neapolitanus</i>	1
<i>Hydra magnipapillata</i>	1
<i>Isosphaera pallida</i>	1
<i>Jonesia denitrificans</i>	1
<i>Klebsiella oxytoca</i>	2
<i>Klebsiella pneumoniae</i>	22
<i>Klebsiella</i> sp.	6
<i>Klebsiella variicola</i>	2
<i>Kordia algicida</i>	2
<i>Kosmotoga olearia</i>	1
<i>Krokinobacter</i> sp.	1
<i>Ktedonobacter racemifer</i>	1
<i>Lachnospiraceae</i> bacterium	1
<i>Lacinutrix</i> sp.	1
<i>Lactobacillus acidophilus</i>	1
<i>Lactobacillus amylolyticus</i>	1
<i>Lactobacillus amylovorus</i>	2
<i>Lactobacillus brevis</i>	2
<i>Lactobacillus buchneri</i>	1
<i>Lactobacillus casei</i>	6
<i>Lactobacillus coleohominis</i>	1
<i>Lactobacillus coryniformis</i>	4
<i>Lactobacillus crispatus</i>	2
<i>Lactobacillus delbrueckii</i> subsp. <i>bulgaricus</i>	6
<i>Lactobacillus farciminis</i>	1
<i>Lactobacillus fermentum</i>	2

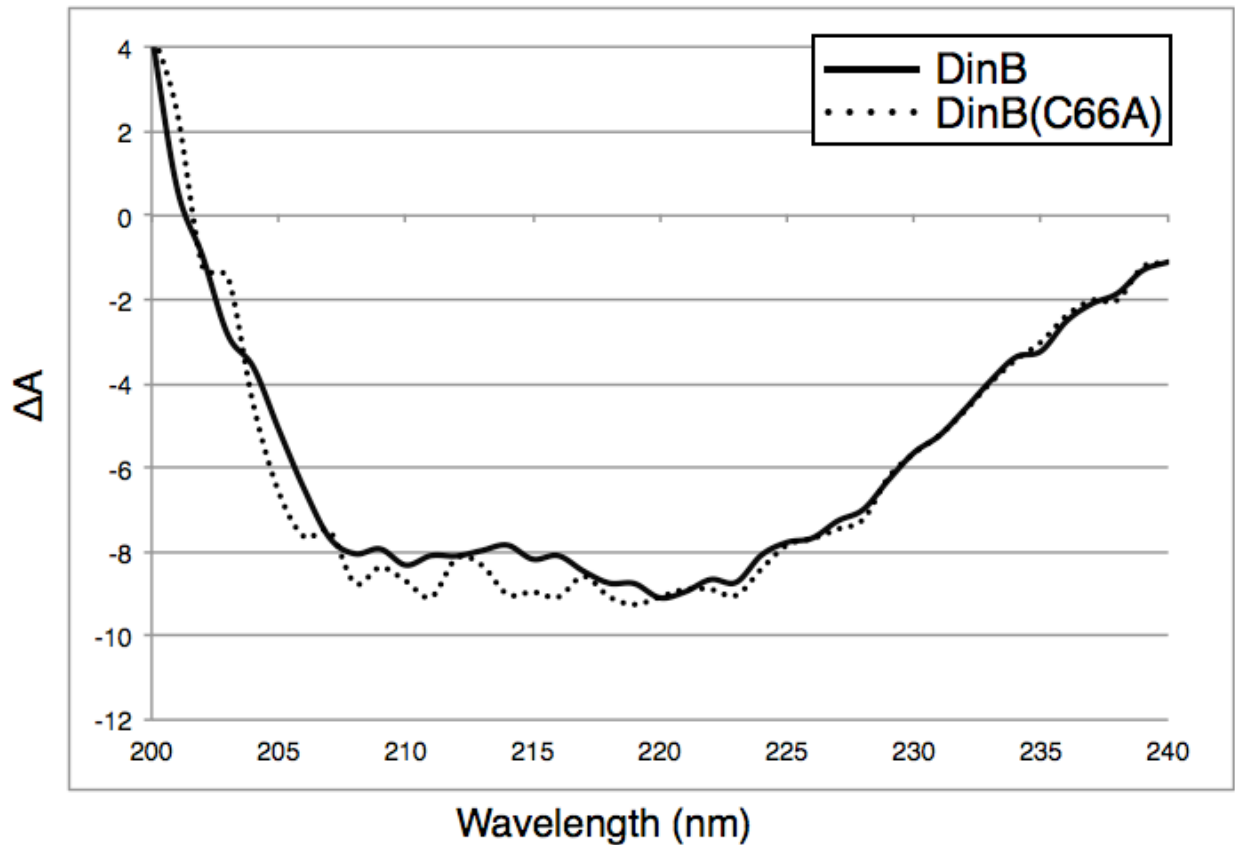
<i>Lactobacillus fructivorans</i>	1
<i>Lactobacillus gasseri</i>	4
<i>Lactobacillus helveticus</i>	3
<i>Lactobacillus hilgardii</i>	1
<i>Lactobacillus jensenii</i>	8
<i>Lactobacillus johnsonii</i>	1
<i>Lactobacillus kefiranofaciens</i>	1
<i>Lactobacillus paracasei</i>	3
<i>Lactobacillus pentosus</i>	2
<i>Lactobacillus plantarum subsp. plantarum</i>	1
<i>Lactobacillus rhamnosus</i>	4
<i>Lactobacillus sakei</i>	1
<i>Leeuwenhoekiella blandensis</i>	1
<i>Legionella longbeachae</i>	5
<i>Legionella pneumophila</i>	11
<i>Lentisphaera araneosa</i>	1
<i>Leptothrix cholodnii</i>	1
<i>Leuconostoc argentinum</i>	1
<i>Leuconostoc citreum</i>	1
<i>Leuconostoc gasicomitatum</i>	2
<i>Leuconostoc gelidum</i>	1
<i>Leuconostoc kimchii</i>	2
<i>Leuconostoc lactis</i>	1
<i>Leuconostoc mesenteroides</i>	4
<i>Leuconostoc sp.</i>	1
<i>Listeria grayi</i>	3
<i>Listeria innocua</i>	5
<i>Listeria monocytogenes</i>	33
<i>Listeria seeligeri</i>	1
<i>Listeria welshimeri</i>	1
<i>Macrococcus caseolyticus</i>	1
<i>Magnetococcus sp.</i>	1
<i>Magnetospirillum magneticum</i>	1
<i>Maricaulis maris</i>	1
<i>Marinobacter aquaeolei</i>	1
<i>Marinomonas mediterranea</i>	1
<i>Marinomonas posidonica</i>	1
<i>Marinomonas sp.</i>	2
<i>Mesorhizobium australicum</i>	2
<i>Mesorhizobium ciceri</i>	2
<i>Mesorhizobium loti</i>	2
<i>Mesorhizobium opportunistum</i>	2
<i>Methylacidiphilum infernorum</i>	1
<i>Methylibium petroleiphilum</i>	1
<i>Methylobacterium chloromethanicum</i>	2
<i>Methylobacterium extorquens</i>	3
<i>Methylobacterium nodulans</i>	2

<i>Methylobacterium populi</i>	1
<i>Methylobacterium radiotolerans</i>	1
<i>Methylobacterium sp.</i>	1
<i>Methylomicrobium album</i>	1
<i>Methylomicrobiumcaliphilum</i>	1
<i>Methylomonas methanica</i>	1
<i>Methylophilales bacterium</i>	1
<i>Methylotenera versatilis</i>	2
<i>Methylovorus glucosetrophus</i>	4
<i>Methylovorus sp.</i>	3
<i>Moritella sp.</i>	1
<i>Mucilaginibacter paludis</i>	1
<i>Muricauda ruestringensis</i>	1
<i>Mycoplasma pneumoniae</i>	1
<i>Mycoplasma pulmonis</i>	2
<i>Natrinema pellirubum</i>	1
<i>Natronobacterium gregoryi</i>	1
<i>Neisseria sicca</i>	1
<i>Neisseria sp.</i>	1
<i>Neptuniibacter caesariensis</i>	1
<i>Nitratifactor salsuginis</i>	1
<i>Nitrosomonas eutropha</i>	2
<i>Nitrosomonas sp.</i>	4
<i>Nocardioides sp.</i>	1
<i>Oceanithermus profundus</i>	1
<i>Oceanobacillus iheyensis</i>	1
<i>Ochrobactrum anthropi</i>	1
<i>Octadecabacter antarcticus</i>	6
<i>Olsenella uli</i>	1
<i>Paenibacillus curdolanolyticus</i>	2
<i>Paenibacillus lactis</i>	2
<i>Paenibacillus sp.</i>	6
<i>Paludibacter propionicigenes</i>	1
<i>Pantoea ananatis</i>	4
<i>Pantoea sp.</i>	5
<i>Pantoea vagans</i>	1
<i>Parachlamydia acanthamoebae</i>	2
<i>Parascardovia denticolens</i>	2
<i>Parasutterella excrementihominis</i>	1
<i>Parvibaculum lavamentivorans</i>	1
<i>Pectobacterium carotovorum</i>	1
<i>Pediococcus acidilactici</i>	1
<i>Pediococcus pentosaceus</i>	2
<i>Pedobacter sp.</i>	1
<i>Pelobacter propionicus</i>	3
<i>Pelodictyon phaeoclathratiforme</i>	1
<i>Photobacterium angustum</i>	1

<i>Photobacterium damsela</i>	1
<i>Photobacterium leiognathi</i>	1
<i>Photobacterium profundum</i>	2
<i>Photobacterium sp.</i>	1
<i>Planctomyces brasiliensis</i>	1
<i>Polaromonas naphthalenivorans</i>	1
<i>Polaromonas sp.</i>	1
<i>Polynucleobacter necessarius</i>	1
<i>Porphyromonas gingivalis</i>	2
<i>Prevotella bryantii</i>	2
<i>Prevotella buccalis</i>	1
<i>Prevotella ruminicola</i>	2
<i>Prevotella sp. oral taxon</i>	1
<i>Prevotella tannerae</i>	1
<i>Prevotella timonensis</i>	1
<i>Prochlorococcus marinus</i>	13
<i>Propionibacterium freudenreichii</i>	1
<i>Prosthecochloris aestuarii</i>	2
<i>Proteus mirabilis</i>	2
<i>Proteus vulgaris</i>	1
<i>Providencia alcalifaciens</i>	1
<i>Providencia rettgeri</i>	1
<i>Pseudoalteromonas atlantica</i>	1
<i>Pseudoalteromonas haloplanktis</i>	2
<i>Pseudoalteromonas sp.</i>	1
<i>Pseudoalteromonas tunicata</i>	1
<i>Pseudogulbenkinia sp.</i>	3
<i>Pseudomonas aeruginosa</i>	1
<i>Pseudomonas cichorii</i>	1
<i>Pseudomonas fluorescens</i>	3
<i>Pseudomonas fulva</i>	1
<i>Pseudomonas mendocina</i>	1
<i>Pseudomonas putida</i>	4
<i>Pseudomonas sp.</i>	2
<i>Pseudomonas syringae</i>	14
<i>Psychroflexus torquis</i>	1
<i>Rahnella sp.</i>	1
<i>Rheinheimera sp.</i>	1
<i>Rhizobium leguminosarum</i>	2
<i>Rhodanobacter sp.</i>	1
<i>Rhodoferax ferrireducens</i>	1
<i>Rhodopseudomonas palustris</i>	3
<i>Rhodothermus marinus</i>	1
<i>Roseobacter sp.</i>	2
<i>Ruminococcus albus</i>	1
<i>Runella slithyformis</i>	2
<i>Salinibacter ruber</i>	3

<i>Salmonella bongori</i>	2
<i>Salmonella enterica</i>	96
<i>Scardovia inopinata</i>	1
<i>Segniliparus rotundus</i>	1
<i>Serratia marcescens</i>	2
<i>Serratia odorifera</i>	1
<i>Serratia proteamaculans</i>	1
<i>Shewanella baltica</i>	24
<i>Shewanella denitrificans</i>	1
<i>Shewanella frigidimarina</i>	2
<i>Shewanella halifaxensis</i>	2
<i>Shewanella oneidensis</i>	1
<i>Shewanella paeleana</i>	1
<i>Shewanella piezotolerans</i>	1
<i>Shewanella putrefaciens</i>	2
<i>Shewanella sediminis</i>	1
<i>Shewanella sp.</i>	5
<i>Shewanella violacea</i>	1
<i>Shewanella woodyi</i>	1
<i>Shigella boydii</i>	2
<i>Shigella dysenteriae</i>	4
<i>Shigella flexneri</i>	13
<i>Shigella sp.</i>	1
<i>Sideroxydans lithotrophicus</i>	1
<i>Sinorhizobium medicae</i>	1
<i>Sinorhizobium meliloti</i>	3
<i>Slackia exigua</i>	1
<i>Slackia heliotrinireducens</i>	1
<i>Soliobacillus silvestris</i>	1
<i>Sphingomonas sp.</i>	1
<i>Spirosoma linguale</i>	2
<i>Sporosarcina newyorkensis</i>	2
<i>Staphylococcus aureus</i>	85
<i>Staphylococcus capitis</i>	1
<i>Staphylococcus caprae</i>	1
<i>Staphylococcus epidermis</i>	14
<i>Staphylococcus haemolyticus</i>	1
<i>Staphylococcus hominis</i>	2
<i>Staphylococcus lugdunensis</i>	3
<i>Staphylococcus pseudintermedius</i>	2
<i>Staphylococcus warneri</i>	2
<i>Stenotrophomonas maltophilia</i>	1
<i>Stenotrophomonas sp.</i>	1
<i>Streptobacillus moniliformis</i>	1
<i>Streptococcus pneumoniae</i>	2
<i>Streptococcus pyogenes</i>	1
<i>Succinatimonas hippei</i>	1

<i>Sulfitobacter</i> sp.	1
<i>Sulfuricurvum kujiense</i>	1
<i>Sulfurimonas autotrophica</i>	1
<i>Synechococcus elongatus</i>	2
<i>Synechococcus</i> sp.	18
<i>Synechocystis</i> sp.	1
<i>Syntrophobacter fumaroxidans</i>	1
<i>Syntrophobotulus glycolicus</i>	1
<i>Taylorella asinigenitalis</i>	1
<i>Taylorella equigenitalis</i>	1
<i>Terriglobus seenensis</i>	1
<i>Tetragenococcus halophilus</i>	1
<i>Thermaerobacter subterraneus</i>	1
<i>Thermoanaerobacterium thermosaccharolyticum</i>	1
<i>Thermobacillus composti</i>	2
<i>Thermodesulfobium narugense</i>	1
<i>Thermosinus carboxydivorans</i>	1
<i>Thioalkalimicrobium cyclicum</i>	1
<i>Thiomicrospira crunogena</i>	1
<i>Thiomonas intermedia</i>	2
<i>Thiorhodovibrio</i> sp.	1
<i>Turicibacter sanguinis</i>	1
<i>Turicibacter</i> sp.	1
<i>Veillonella parvula</i>	1
<i>Vibrio cholerae</i>	6
<i>Vibrio fischeri</i>	1
<i>Vibrio harveyi</i>	1
<i>Vibrio rotiferianus</i>	1
<i>Vibrio</i> sp.	2
<i>Vibrio splendidus</i>	1
<i>Virbio vulnificus</i>	1
<i>Weeksella virosa</i>	1
<i>Weisella cibaria</i>	1
<i>Weisella paramesenteroides</i>	1
<i>Weisella thailandensis</i>	1
<i>Xanthobacter autotrophicus</i>	1
<i>Xanthomonas campestris</i>	1
<i>Xanthomonas oryzae</i>	1
<i>Xylanimonas cellulolytica</i>	1
<i>Yersinia enterocolitica</i>	4
<i>Yersinia intermedia</i>	1
<i>Yersinia pseudotuberculosis</i>	1
<i>Zunongwangia profunda</i>	1
<b>Total number of sequences</b>	<b>1425</b>



43

44 **Supplemental Figure S1. The secondary structure of DinB(C66A) is similar to that**

45 **of wild-type DinB.** Circular dichroism (CD) spectra for native DinB (solid line) and

46 DinB(C66A) (dashed line) were greatly overlapping, indicating that the secondary

47 structures of these proteins was nearly identical. Shown is the change in absorbance

48 ( $\Delta A$ ) over scanned wavelengths (nm).

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55 **Supplemental Table S3. Determination of secondary structure composition for**  
56 **DinB and DinB(C66A).**

	$\alpha R^a$	$\alpha D^b$	$\beta R^c$	$\beta D^d$	$T^e$	$U^f$
<b>Native DinB</b>	0.484	0.216	0	0.035	0.143	0.121
<b>Native DinB(C66A)</b>	0.523	0.249	0.006	0.005	0.095	0.121

57

58 <sup>a</sup>Fraction of regular alpha helices

59 <sup>b</sup>Fraction of disordered alpha helices

60 <sup>c</sup>Fraction of regular beta sheets

61 <sup>d</sup>Fraction of disordered beta sheets

62 <sup>e</sup>Fraction of turns

63 <sup>f</sup>Fraction of undefined, or unstructured, elements

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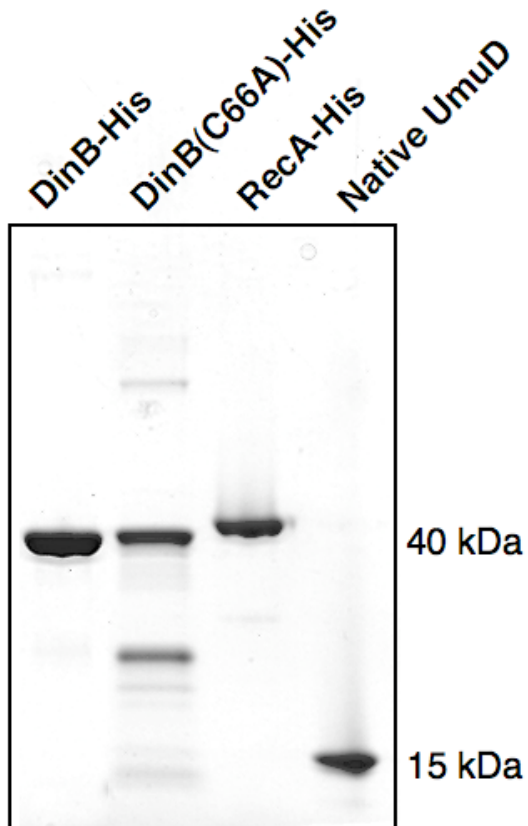
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77 **Supplemental Figure S2. Bait and prey proteins used for *in vitro* pulldown assays**

78 **were available as relatively pure proteins.** SDS-PAGE of input proteins is shown.

79 DinB-His and DinB(C66A)-His were purified by sequential rounds of ion metal affinity

80 (IMAC), cation exchange (CEC) and hydrophobicity interaction (HIC) chromatographies

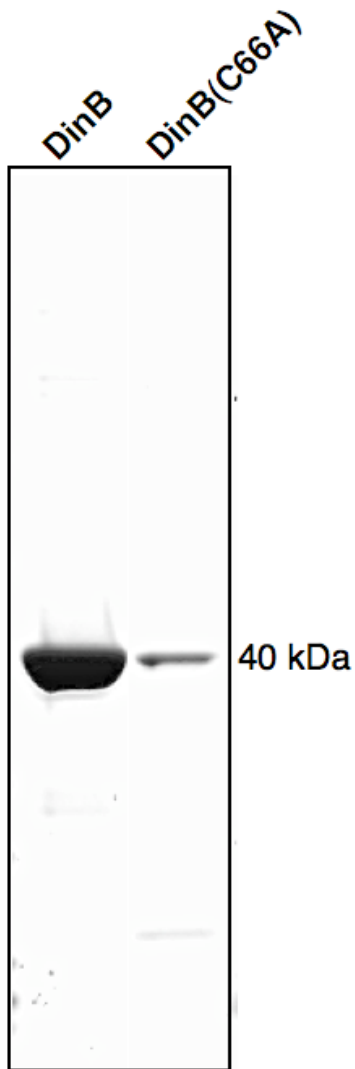
81 from a BL21 AI  $\Delta recA$  strain; one and a half  $\mu\text{g}$  of DinB-His and 0.6  $\mu\text{g}$  of DinB(C66A)-

82 His were loaded. RecA-His was purchased from New England Biolabs, and native

83 UmuD was obtained from the Walker Lab (MIT); two  $\mu\text{g}$  of each protein were loaded.

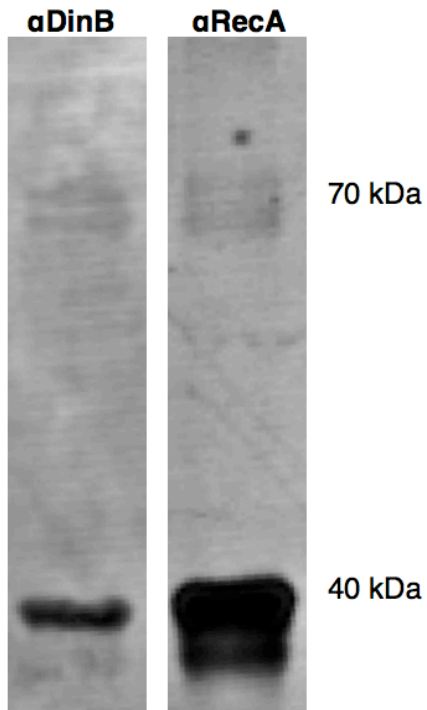
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87 **Supplemental Figure S3. DinB and DinB(C66A) can be isolated as relatively pure**  
88 **proteins by hydrophobicity interaction chromatography (HIC).** SDS-PAGE of HIC  
89 fractions for DinB and DinB(C66A) is shown. CEC fractions containing DinB or  
90 DinB(C66A) were pooled and subjected to HIC. Six microliters of pooled HIC fractions  
91 containing DinB or DinB(C66A) were run per lane.



92

93 **Supplemental Figure S4. The 70 kDa complex, obtained in the *in vitro* pulldown**

94 **experiments, contains both DinB and RecA.** Immunoblot of DinB(C66A) ternary

95 pulldown reactions. Three microliters of the reaction mixture was analyzed by SDS-

96 PAGE, and then subjected to immunoblotting to detect the presence of DinB or RecA.

97 Fluorescently labeled secondary antibodies were used to detect the presence of each

98 protein. As shown, the majority of DinB or RecA was available as a protein of about 40

99 kDa, but both proteins were faintly detected in the 70 kDa range.

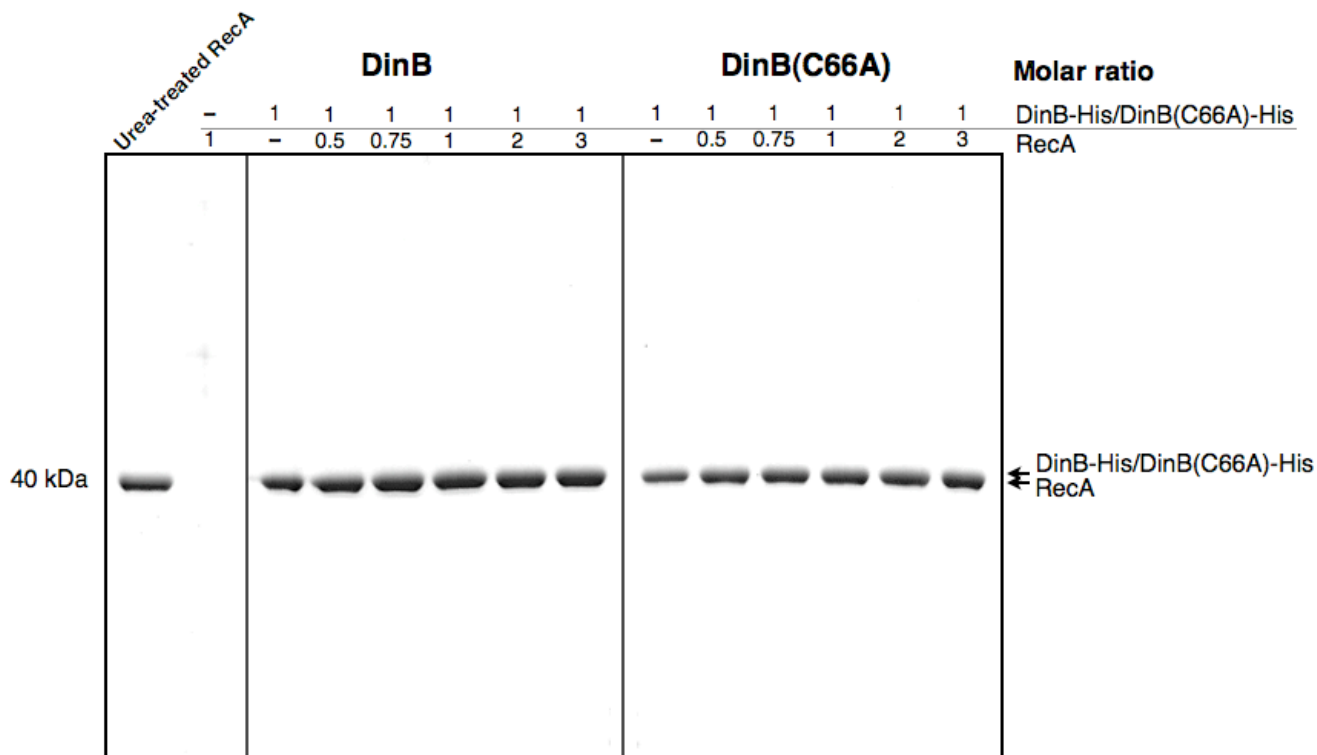
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106 **Supplemental Figure S5. Kinetically stable DinB(C66A)-RecA binary complexes**

107 **can be disrupted by treatment with 8 M urea.** The 70 kDa DinB(C66A)-RecA binary

108 complexes, which were resistant to heat and denaturants, were disrupted by treating

109 resin with 8 M urea. Urea-treated RecA, which was not incubated with resin, is shown

110 for reference. Pulldowns were done as described in Materials and Methods, except that

111 the resin was treated with 8 M urea prior to addition of sample buffer and heat

112 treatment.

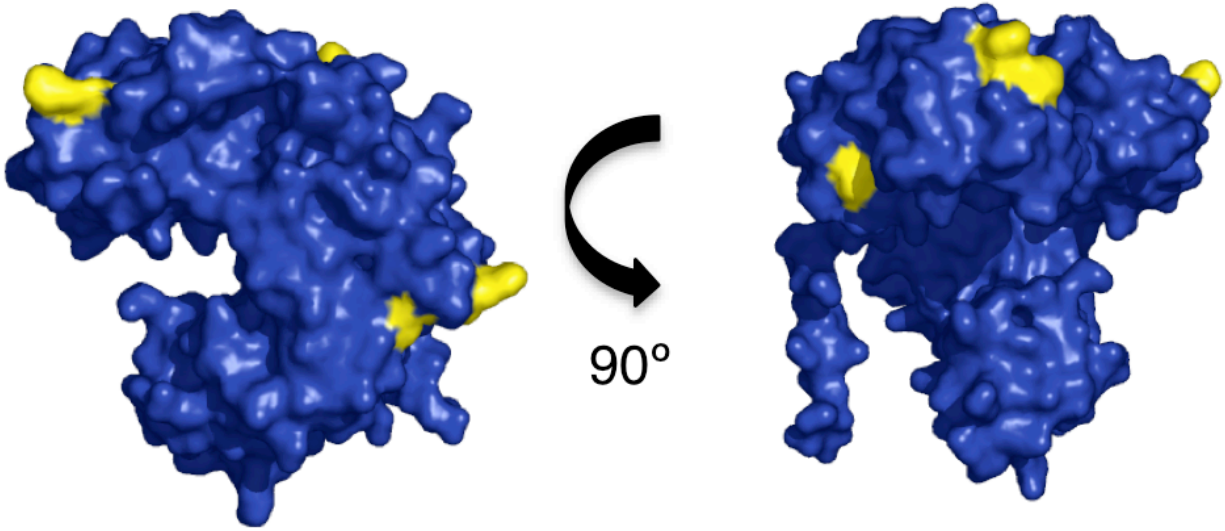
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119 **Supplemental Figure S6. Native DinB contains several surface histidine residues,**

120 **which may mediate non-specific binding to IMAC resin.** DinB contains several

121 surface histidine residues, some of which are clustered. Histidine residues are shown in

122 yellow. *In silico* model of DinB was rendered using PyMol.