

## Supplementary Materials

# Investigation of the Genes Involved in the Outbreaks of *Escherichia coli* and *Salmonella* spp. in the United States

**Table S1.** Functions of Outlier Genes Shown in Figures 1–5.

| Genes              | Function of Genes  |
|--------------------|--|
| <i>aadA1</i>       | aminoglycoside adenyltransferase (resistance enzyme in Gram-negative pathogens)                            |
| <i>acrF</i>        | multidrug efflux pump  |
| <i>aph(3'')-Ib</i> | aminoglycoside phosphotransferase (catalyzes the addition of phosphate from ATP)                           |
| <i>aph(6)-Id</i>   | aminoglycoside O-phosphotransferase (catalyzes the addition of phosphate from ATP)                         |
| <i>arsA</i>        | provides instructions for making the enzyme arylsulfatase A  |
| <i>arsB</i>        | provides instructions for producing an enzyme called arylsulfatase B                                       |
| <i>arsC</i>        | arsenate reductase (reduces arsenate to arsenite)  |
| <i>arsD</i>        | arylsulfatase D (protein coding gene)  |
| <i>arsR</i>        | family transcriptional regulator (trans-acting regulator protein)  |
| <i>asr</i>         | arylsulfatase (regulates an acid shock protein)  |
| <i>blaEC</i>       | <i>beta-lactamase (resistance to antibiotics like penicillin)</i>  |
| <i>blaTEM-1</i>    | <i>ampicillin resistance protein</i>   |
| <i>cdtB</i>        | cytolethal distending toxin (causes DNA damage in intoxicated cells)                                       |
| <i>cif</i>         | <i>ubiquitin specific peptidase (gene that process proteins that label other proteins for degradation)</i> |
| <i>eae</i>         | <i>intimin (virulence protein that attaches to the host cell)</i>  |
| <i>efa1</i>        | <i>defensin alpha 1</i>  |
| <i>ehxA</i>        | <i>calcium-binding region protein</i>  |
| <i>emrE</i>        | <i>multidrug resistance pump</i>   |
| <i>epeA</i>        | <i>EHEC plasmid-encoded autotransporter</i>  |
| <i>espA</i>        | <i>protein espA</i>  |
| <i>espB</i>        | <i>protein espB</i>  |
| <i>espF</i>        | <i>espF-like protein</i>   |

|                  |  |
|------------------|--|
| <i>espJ</i>      | <i>hypothetical protein</i>  |
| <i>espK</i>      | <i>protein espK-like shape</i>   |
| <i>espP</i>      | <i>putative exoprotein-precursor (extracellular protein?)</i>  |
| <i>espX1</i>     | <i>secreted effector that binds to a protein and regulates its activity</i>  |
| <i>etpD</i>      | <i>secretion protein</i>   |
| <i>fdeC</i>      | <i>intimin-like adhesin (helps attach protein to host cell)</i>  |
| <i>floR</i>      | Florfenicol (resistance gene for florfenicol)  |
| <i>fosA7</i>     | Fosfomycin Resistance Gene   |
| <i>golS</i>      | MerR-like sensor that is highly selective for Au ions  |
| <i>golT</i>      | P-type ATPase  |
| <i>gyrA_D87Y</i> | fluoroquinolone resistance   |
| <i>iha</i>       | <i>pyrimidine-specific ribonucleoside hydrolase (hydrolyzes certain nucleotides)</i>   |
| <i>iss</i>       | <i>guanine nucleotide disassociation stimulator</i>  |
| <i>iucA</i>      | <i>Aerobactin siderophore biosynthesis (forms iron siderophores, compounds, which aid in the process of biosynthesis)</i>      |
| <i>iutA</i>      | <i>signal recognition particle (receptor)</i>  |
| <i>iroB</i>      | enterobactin C-glucosyltransferase (encodes putative glucosyltransferase)  |
| <i>iroC</i>      | gliotoxin/asperochlorine/mycotoxins biosynthesis cytochrome P450 monooxygenase (multidrug ABC transporter ATP-binding protein) |
| <i>iutA</i>      | encodes the aerobactin siderophore ferric receptor protein   |
| <i>mchF</i>      | colicin V synthesis protein (ABC transporter protein)  |
| <i>katP</i>      | <i>potassium channel</i>   |
| <i>lpfA</i>      | <i>fast skeletal myosin light chain</i>  |
| <i>lpfA1</i>     | <i>long polar fimbrial protein LpfA v</i>  |
| <i>lpfA2</i>     | <i>major type 1 subunit fimbria (pilin)</i>  |
| <i>mdsA</i>      | Mucin-desulfating sulfatase (the membrane fusion protein of the multidrug and metal efflux complex MdsABC)                     |
| <i>mdsB</i>      | inner membrane transporter of the multidrug and metal efflux complex MdsABC  |
| <i>mdtM</i>      | <i>mdtM</i>  |
| <i>merA</i>      | Mercuric reductase (volatilizing mercury as Hg <sup>0</sup> )  |
| <i>merC</i>      | Mercuric transport protein MerC (Involved in mercuric ion uptake and binding)  |

|                   |   |
|-------------------|---|
| <i>merD</i>       | HTH-type transcriptional regulator MerD (DNA binding)   |
| <i>merE</i>       | Broad-spectrum mercury transporter MerE (mercury ion transmembrane transporter activity: mediates the transport of both CH <sub>3</sub> Hg(I) and Hg(II) across the membrane) |
| <i>merP</i>       | Mercuric transport protein periplasmic component (mercury resistance operon protein: specifically scavenges for and binds to mercuric ions)                                   |
| <i>merR</i>       | Mercuric resistance operon regulatory protein (represses transcription of the mer operator)   |
| <i>merT</i>       | Mercuric transport protein MerT (transfers mercuric ion from the MerP protein to the MerA protein)  |
| <i>nleA</i>       | <i>unknown protein encoded by cryptic prophage CP-933P</i>  |
| <i>nleB</i>       | <i>T3SS secreted effector NleB (proteins secreted inserted into the host cell to increase pathogenicity)</i>  |
| <i>nleB2</i>      | <i>T3SS secreted effector NleB</i>  |
| <i>nleC</i>       | <i>T3SS secreted effector NleC</i>  |
| <i>pcoA</i>       | Copper resistance protein A (Required for copper resistance: oxidase activity)  |
| <i>pcoB</i>       | Copper resistance protein B (Required for copper resistance)  |
| <i>pcoC</i>       | Copper resistance protein C (Required for copper resistance)  |
| <i>pcoD</i>       | Copper resistance protein D (Required for copper resistance)  |
| <i>pcoE</i>       | Probable copper-binding protein (Required for copper resistance through the activation of the two-component regulatory system CusS/CusR)                                      |
| <i>pcoR</i>       | Transcriptional regulatory protein pcoR (protein in the two-component regulatory system PcoS/PcoR; [possibly a] transcription factor for the cop operon promoter)             |
| <i>pcoS</i>       | Probable sensor protein PcoS (protein in the two-component regulatory system PcoS/PcoR: activates PcoR through phosphorylation)   |
| <i>qacEdelta1</i> | Quaternary ammonium compound efflux SMR transporter QacE delta 1: transmembrane transporter activity  |
| <i>silA</i>       | Putative cation efflux system protein SilA: part of a three-component cation/proton antiporter in the sil cation-efflux system that causes resistance to silver               |
| <i>silB</i>       | Putative membrane fusion protein SilB: part of a three-component cation/proton antiporter in the sil cation-efflux system that causes resistance to silver                    |
| <i>silC</i>       | Probable outer membrane lipoprotein SilC: part of a three-component cation/proton antiporter in the sil cation-efflux system that causes resistance to silver                 |
| <i>silE</i>       | Silver-binding protein SilE: component of the sil cation-efflux system that causes resistance to silver   |
| <i>silF</i>       | cation efflux system protein silF: component of the sil cation-efflux system that causes resistance to silver   |

|               |   |
|---------------|---|
| <i>silP</i>   | Silver exporting P-type ATPase: component of the sil cation-efflux system that causes resistance to silver  |
| <i>silR</i>   | transcriptional regulatory protein SilR: component of the two-component regulatory system SilS/SilR and the sil cation-efflux system that causes resistance to silver   |
| <i>silS</i>   | sensor kinase SilS: component of the two-component regulatory system SilS/SilR and the sil cation-efflux system that causes resistance to silver; possible activation of SilR through phosphorylation                       |
| <i>sinH</i>   | Intimin-like inverse autotransporter protein: cell adhesion and pathogenesis  |
| <i>sslE</i>   | <i>putative secreted and surface-associated lipoprotein mucinase</i>  |
| <i>stxA1a</i> | Shiga toxin 1a  |
| <i>stxA2c</i> | <i>shiga toxin 2c</i>   |
| <i>stxA2d</i> | <i>shiga toxin 2d</i>   |
| <i>stxB1a</i> | <i>encoding subunits A and B of Stx1a</i>   |
| <i>stxB2a</i> | <i>focus on the purification of the holotoxin or the separated B-subunit</i>  |
| <i>stxB2c</i> | shiga toxin 2c subunit B  |
| <i>subA</i>   | (RefSeq) histone H2B sub acrosomal variant  |
| <i>subB</i>   | (RefSeq) Nt-SubB44, TCIP; cold and drought-regulated protein CORA-like  |
| <i>sul1</i>   | Dihydropteroate synthase type-1: resistant to sulfonamide; To produce 7,8-dihydropteroate, it catalyzes the condensation of para-aminobenzoate (pABA) with 6-hydroxymethyl-7,8-dihydropterin diphosphate (DHPPt-PP) (H2Pte) |
| <i>tccP</i>   | couples Tir to the actin-cytoskeleton   |
| <i>terD</i>   | involved in calcium homeostasis and participates in calcium regulation of a DosR-like regulon in <i>Streptomyces coelicolor</i> .   |
| <i>terW</i>   | mediates heavy metal ion resistance to tellurium compounds.   |
| <i>terZ</i>   | contribute to the tellurium resistance (Ter) mechanism.   |
| <i>tet(A)</i> | tetracycline efflux MFS transporter: tetracycline resistance protein; MFS transporter   |
| <i>tet(B)</i> | tetracycline efflux MFS transporter: tetracycline resistance protein; MFS transporter   |
| <i>tir</i>    | <i>required for efficient pedestal formation in host epithelial cells during infection.</i>   |
| <i>toxB</i>   | restored full adherence capacity to O157Cu, including production and secretion of the proteins.   |
| <i>ybtP</i>   | putative ATP binding protein of ABC transporter: nucleotide binding   |
| <i>ybtQ</i>   | ABC transporter ATP-binding protein: nucleotide binding   |

*ymgB*

repress biofilm formation in rich medium containing glucose, decrease cellular motility and protect the cell from acid which indicates that YmgB has an important function in acid-resistance.

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Black—antimicrobial resistance genes; Blue—stress response genes; Red—virulence genes.