

reduced quality of life (3). Pregnant women and those with weak immune systems—including neonates, the elderly, and cancer patients—are particularly vulnerable to listeriosis (2, 4). It can result in abortion and premature birth, as well as meningoen­cephalitis (in 55-70% of cases) or septicemia (15-50% of cases) in the immunocompromised (4, 5).

5 Therefore, timely detection of *L. monocytogenes* is vital to reduce the burden of this detrimental disease. Similarly salmonellosis is an infection caused by *Salmonella* and is a major health risk. Additionally legionella is another pathogenic organism that can cause sickness. Types of *E. coli* can also be pathogenic and cause sickness. Rapid diagnostic tests that can be used directly in the field site, manufacturing plants, and farms would allow for
10 early detection of potential contaminants to reduce the current large burden of these foodborne pathogens.

Accordingly, in some aspects, the disclosure relates to antigen-binding molecules comprising a reduced charge Sso7d(rcSso7d) antigen-binding protein that binds to a bacterium. In some ~~embodiments~~examples, an rcSso7d antigen-binding protein binds to a
15 gram-positive bacterium. In some ~~embodiments~~examples, an rcSso7d antigen-binding protein binds to a gram-negative bacterium. In some ~~embodiments~~examples, an rcSso7d antigen-binding protein binds to a pathogenic bacterium. In some ~~embodiments~~examples, an rcSso7d antigen-binding protein binds to a bacterium that causes food poisoning. In some ~~embodiments~~examples, an rcSso7d antigen-binding protein binds to a bacterium that causes
20 food spoilage. In some ~~embodiments~~examples, an rcSso7d antigen-binding protein binds to a bacterium of the genus *Listeria*, *Escherichia*, *Salmonella*, and/or *Legionella*. In some ~~embodiments~~examples, the rcSso7d antigen-binding protein binds to a *Listeria monocytogenes*, *Salmonella typhi*, and/or *E. coli*.

In some ~~embodiments~~examples, the antigen-binding molecule binds to at least two
25 antigens. In some ~~embodiments~~examples, two or more of the at least two antigens are specific to different types of bacteria.

In some ~~embodiments~~examples, the antigen-binding molecule binds to a protein antigen, a glycosylated protein antigen, and/or a carbohydrate antigen.

In ~~some embodiments~~one aspect, an antigen-binding molecule comprises an rcSso7d
30 antigen-binding protein that binds *Listeria monocytogenes* protein LMOF2365_0639, wherein the antigen-binding protein comprises a variable region having: (i) the amino acid sequence of any one of SEQ ID NOs: 1-8; or (ii) an amino acid sequence having 2 or 1 amino acid differences with any one of SEQ ID NOs: 1-8.

In some ~~embodiments~~examples, the antigen-binding molecule comprises a variable region having: (i) the amino acid sequence of any one of SEQ ID NOs: 3, 5 or 7; or (ii) an amino acid sequence having no more than 2 or 1 amino acid differences with any one of SEQ ID NOs: 3, 5 or 7.

5 In some ~~embodiments~~examples, the rcSso7d antigen-binding protein comprises: (i) the amino acid sequence of any one of SEQ ID NOs: 13-15; (ii) an amino acid sequence having no more than ten amino acid differences with any one of SEQ ID NOs: 13-15; or (iii) an amino acid sequence having at least 80% identity with any one of any one of SEQ ID NOs: 13-15. In some ~~embodiments~~examples, the rcSso7d antigen-binding protein comprises
10 the amino acid sequence of any one of SEQ ID NOs: 13-15.

In some ~~embodiments~~examples, the antigen-binding protein comprises a variable region having: (i) the amino acid sequence of any one of SEQ ID NOs: 1, 2, 4, or 6; or (ii) an amino acid sequence no more than 2 or 1 amino acid differences with any one of SEQ ID NOs: 1, 2, 4, or 6.

15 In some ~~embodiments~~examples, the rcSso7d antigen-binding protein comprises: (i) the amino acid sequence of any one of SEQ ID NOs: 16-19; (ii) an amino acid sequence having no more than seven amino acid differences with any one of SEQ ID NOs: 16-19; or (iii) an amino acid sequence having at least 80% identity with any one of any one of SEQ ID NOs: 16-19. In some ~~embodiments~~examples, the rcSso7d antigen-binding protein comprises
20 the amino acid sequence of any one of SEQ ID NOs: 16-19.

In some ~~embodiments~~examples, the antigen-binding molecule further comprises an enzyme, a fluorescent protein, an immunoglobulin, a peptide tag, a small molecule, or a combination thereof.

In some ~~embodiments~~examples, the antigen-binding molecule comprises an enzyme
25 selected from the group consisting of alkaline phosphatase, horseradish peroxidase, and β -galactosidase.

In some ~~embodiments~~examples, the antigen-binding molecule comprises a fluorescent protein selected from the group consisting of TagBFP, mTagBFP2, Azurite, EBFP2, EBFP2, Sirius, Sapphire, T-Sapphire, ECFP, Cerulean, SCFP3A, mTurquoise, mTurquoise2,
30 monomeric Midoriishi-Cyan, TagCFP, mTFP1, EGFP, Emerald, Superfolder GFP, Monomeric Azami Green, TagGFP2, mUKG, mWasabi, Clover, mNeonGreen, EYFP, Citrine, Venus, SYFP2, TagYFP, Monomeric Kusabira-Orange, mKO κ , mKO2, mOrange, mOrange2, mRaspberry,

mCherry, mStrawberry, mTangerine, tdTomato, TagRFP, TagRFP-T, mApple, mRuby, mRuby2, mPlum, HcRed-Tandem, mKate2, mNeptune, and NirFP.

In some ~~embodiments~~examples, the antigen-binding molecule comprises a peptide tag selected from the group consisting of a His tag, a biotin acceptor tag, an HA tag, a c-Myc tag, a streptavidin tag, and a FLAG tag.

In some ~~embodiments~~examples, the antigen-binding molecule comprises biotin.

In ~~some embodiments~~one aspect, an antigen-binding molecule comprising a reduced charge Sso7d (rcSso7d) antigen-binding protein that binds *Salmonella typhi* Native Omp, said Native Omp comprising the amino acid sequence of *Salmonella typhi* membrane proteins OmpA, OmpW, OmpC, OmpF, OmpD, and phoE, wherein the antigen-binding protein comprises a variable region having: (i) the amino acid sequence of any one of SEQ ID NOs: 58-71; or (ii) an amino acid sequence having 2 or 1 amino acid differences with any one of SEQ ID NOs: 58-71.

In some ~~embodiments~~examples, the rcSso7d antigen-binding protein comprises: (i) the amino acid sequence of any one of SEQ ID NOs: 33-46; (ii) an amino acid sequence having no more than ten amino acid differences with any one of SEQ ID NOs: 33-46; or (iii) an amino acid sequence having at least 80% identity with any one of any one of SEQ ID NOs: 33-46.

In some ~~embodiments~~examples, the rcSso7d antigen-binding protein comprises the amino acid sequence of any one of SEQ ID NOs: 33-46.

In some ~~embodiments~~examples, the antigen-binding molecule further comprises an enzyme, a fluorescent protein, an immunoglobulin, a peptide tag, a small molecule, or a combination thereof.

In some ~~embodiments~~examples, the antigen-binding molecule comprises an enzyme selected from the group consisting of alkaline phosphatase, horseradish peroxidase, and β -galactosidase.

In some ~~embodiments~~examples, the antigen-binding molecule comprises a fluorescent protein selected from the group consisting of TagBFP, mTagBFP2, Azurite, EBFP2, EBFP2, Sirius, Sapphire, T-Sapphire, ECFP, Cerulean, SCFP3A, mTurquoise, mTurquoise2, monomeric Midoriishi-Cyan, TagCFP, mTFP1, EGFP, Emerald, Superfolder GFP, Monomeric Azami Green, TagGFP2, mUKG, mWasabi, Clover, mNeonGreen, EYFP, Citrine, Venus, SYFP2, TagYFP, Monomeric Kusabira-Orange, mKO κ , mKO2, mOrange, mOrange2, mRaspberry,

mCherry, mStrawberry, mTangerine, tdTomato, TagRFP, TagRFP-T, mApple, mRuby, mRuby2, mPlum, HcRed-Tandem, mKate2, mNeptune, and NirFP.

In some ~~embodiments~~examples, the antigen-binding molecule comprises a peptide tag selected from the group consisting of a His tag, a biotin acceptor tag, an HA tag, a c-Myc tag, a streptavidin tag, and a FLAG tag.

In some ~~embodiments~~examples, the antigen-binding molecule comprises biotin.

In ~~some embodiments~~one aspect, an antigen-binding molecule comprising a reduced charge Sso7d (rcSso7d) antigen-binding protein that binds *E. coli* OmpW, wherein the antigen-binding protein comprises a variable region having: (i) the amino acid sequence of any one of SEQ ID NOs: 73-80; or (ii) an amino acid sequence having 2 or 1 amino acid differences with any one of SEQ ID NOs: 73-80.

In some ~~embodiments~~examples, the rcSso7d antigen-binding protein comprises: (i) the amino acid sequence of any one of SEQ ID NOs: 47-54; (ii) an amino acid sequence having no more than ten amino acid differences with any one of SEQ ID NOs: 47-54; or (iii) an amino acid sequence having at least 80% identity with any one of any one of SEQ ID NOs: 47-54.

In some ~~embodiments~~examples, the rcSso7d antigen-binding protein comprises the amino acid sequence of any one of SEQ ID NOs: 47-54.

In some ~~embodiments~~examples, the antigen-binding molecule further comprises an enzyme, a fluorescent protein, an immunoglobulin, a peptide tag, a small molecule, or a combination thereof.

In some ~~embodiments~~examples, the antigen-binding molecule comprises an enzyme selected from the group consisting of alkaline phosphatase, horseradish peroxidase, and β -galactosidase.

In some ~~embodiments~~examples, the antigen-binding molecule comprises a fluorescent protein selected from the group consisting of TagBFP, mTagBFP2, Azurite, EBFP2, EBFP2, Sirius, Sapphire, T-Sapphire, ECFP, Cerulean, SCFP3A, mTurquoise, mTurquoise2, monomeric Midoriishi-Cyan, TagCFP, mTFP1, EGFP, Emerald, Superfolder GFP, Monomeric Azami Green, TagGFP2, mUKG, mWasabi, Clover, mNeonGreen, EYFP, Citrine, Venus, SYFP2, TagYFP, Monomeric Kusabira-Orange, mKOok, mKO2, mOrange, mOrange2, mRaspberry, mCherry, mStrawberry, mTangerine, tdTomato, TagRFP, TagRFP-T, mApple, mRuby, mRuby2, mPlum, HcRed-Tandem, mKate2, mNeptune, and NirFP.

In some ~~embodiments~~examples, the antigen-binding molecule comprises a peptide tag selected from the group consisting of a His tag, a biotin acceptor tag, an HA tag, a c-Myc tag, a streptavidin tag, and a FLAG tag.

In some ~~embodiments~~examples, the antigen-binding molecule comprises biotin.

5 In ~~some embodiments~~one aspect, an antigen-binding molecule comprising a reduced charge Sso7d (rcSso7d) antigen-binding protein that binds *E. coli* OmpA, wherein the antigen-binding protein comprises a variable region having: (i) the amino acid sequence of any one of SEQ ID NOs: 81-83; or (ii) an amino acid sequence having 2 or 1 amino acid differences with any one of SEQ ID NOs: 81-83.

10 In some ~~embodiments~~examples, the rcSso7d antigen-binding protein comprises: (i) the amino acid sequence of any one of SEQ ID NOs: 55-57; (ii) an amino acid sequence having no more than ten amino acid differences with any one of SEQ ID NOs: 55-57; or (iii) an amino acid sequence having at least 80% identity with any one of any one of SEQ ID NOs: 55-57. In some ~~embodiments~~examples, the rcSso7d antigen-binding protein comprises
15 the amino acid sequence of any one of SEQ ID NOs: 55-57.

In some ~~embodiments~~examples, the antigen-binding molecule further comprises an enzyme, a fluorescent protein, an immunoglobulin, a peptide tag, a small molecule, or a combination thereof.

20 In some ~~embodiments~~examples, the antigen-binding molecule comprises an enzyme selected from the group consisting of alkaline phosphatase, horseradish peroxidase, and β -galactosidase.

In some ~~embodiments~~examples, the antigen-binding molecule comprises a fluorescent protein selected from the group consisting of TagBFP, mTagBFP2, Azurite, EBFP2, EBFP2, Sirius, Sapphire, T-Sapphire, ECFP, Cerulean, SCFP3A, mTurquoise, mTurquoise2,
25 monomeric Midoriishi-Cyan, TagCFP, mTFP1, EGFP, Emerald, Superfolder GFP, Monomeric Azami Green, TagGFP2, mUKG, mWasabi, Clover, mNeonGreen, EYFP, Citrine, Venus, SYFP2, TagYFP, Monomeric Kusabira-Orange, mKO_κ, mKO2, mOrange, mOrange2, mRaspberry, mCherry, mStrawberry, mTangerine, tdTomato, TagRFP, TagRFP-T, mApple, mRuby, mRuby2, mPlum, HcRed-Tandem, mKate2, mNeptune, and NirFP.

30 In some ~~embodiments~~examples, the antigen-binding molecule comprises a peptide tag selected from the group consisting of a His tag, a biotin acceptor tag, an HA tag, a c-Myc tag, a streptavidin tag, and a FLAG tag.

In some ~~embodiments~~examples, the antigen-binding molecule comprises biotin.

In ~~some aspects~~one aspect, the disclosure relates to compositions comprising an antigen-binding molecule described herein and a buffer, wherein the buffer has a pH $\leq$ 6.0.

In some embodiments, the buffer has a pH of 5.0 – 6.0. In some

~~embodiments~~examples, the buffer has a pH of about 5.5.

In some ~~embodiments~~examples, the buffer comprises sodium acetate and/or phosphate-buffered saline.

In some ~~embodiments~~examples, the composition further comprises a LMOF2365_0639 protein, an OmpA protein, an OmpW protein, an OmpC protein, an OmpF protein, an OmpD protein, a phoE protein, or a combination thereof.

In some ~~embodiments~~examples, the composition further comprises a *Listeria monocytogenes* cell, a *Salmonella typhi* cell, an *E. coli* cell, or a combination thereof.

In some ~~aspects~~examples, the disclosure relates to methods of detecting a protein of interest in a sample.

In ~~some embodiments~~one aspect, a method of detecting LMOF2365_0639 in a sample comprises: (a) contacting the sample with an antigen-binding molecule described herein that binds to LMOF2365_0639; and (b) detecting, if present, LMOF2365_0639 protein bound by the antigen-binding molecule.

In ~~some embodiments~~another aspect, a method of detecting OmpA, OmpW, OmpC, OmpF, OmpD, phoE, or a combination thereof in a sample comprises: (a) contacting the sample with an antigen-binding molecule described herein that binds to OmpA, OmpW, OmpC, OmpF, OmpD, phoE, or a combination thereof; and (b) detecting, if present, OmpA, OmpW, OmpC, OmpF, OmpD, phoE, or a combination thereof bound by the antigen-binding molecule.

In ~~some embodiments~~yet another aspect, a method of detecting OmpW in a sample comprises: (a) contacting the sample with an antigen-binding molecule described herein that binds to OmpW; and (b) detecting, if present, OmpW bound by the antigen-binding molecule.

In some ~~embodiments~~one aspect, a method of detecting OmpA in a sample comprises: (a) contacting the sample with an antigen-binding molecule described herein that binds to OmpA; and (b) detecting, if present, OmpA bound by the antigen-binding molecule.

In some ~~embodiments~~examples, the sample is from a food product. In some ~~embodiments~~examples, the sample is from a subject. In some ~~embodiments~~examples, the subject is a mammal. In some

~~embodiments~~examples, the subject is a human. In some ~~embodiments~~examples, the method further comprises treating the subject.

In some ~~embodiments~~examples, the sample is contacted with the antigen-binding protein at a pH ≤ 6.0 . In some ~~embodiments~~examples, the sample is contacted at a pH of 5.0 – 6.0. In some ~~embodiments~~examples, the sample is contacted at a pH of about 5.5.

In some ~~embodiments~~examples, the sample comprises sodium acetate and/or phosphate-buffered saline.

In some ~~embodiments~~examples, step (a) further comprises contacting the sample with a detection agent, wherein the detection agent binds to or is bound by the antigen-binding molecule.

In some ~~embodiments~~examples, the detection agent comprises an enzyme, a fluorescent protein, an immunoglobulin, a peptide tag, a small molecule, and/or a combination thereof.

In some ~~embodiments~~examples, the detection enzyme comprises an enzyme selected from the group consisting of alkaline phosphatase, horseradish peroxidase, and β -galactosidase.

In some ~~embodiments~~examples, the detection agent comprises a fluorescent protein selected from the group consisting of TagBFP, mTagBFP2, Azurite, EBFP2, EBFP2, Sirius, Sapphire, T-Sapphire, ECFP, Cerulean, SCFP3A, mTurquoise, mTurquoise2, monomeric Midoriishi-Cyan, TagCFP, mTFP1, EGFP, Emerald, Superfolder GFP, Monomeric Azami Green, TagGFP2, mUKG, mWasabi, Clover, mNeonGreen, EYFP, Citrine, Venus, SYFP2, TagYFP, Monomeric Kusabira-Orange, mKO_κ, mKO2, mOrange, mOrange2, mRaspberry, mCherry, mStrawberry, mTangerine, tdTomato, TagRFP, TagRFP-T, mApple, mRuby, mRuby2, mPlum, HcRed-Tandem, mKate2, mNeptune, and NirFP.

In some ~~embodiments~~examples, the detection agent comprises a peptide tag selected from the group consisting of a His tag, a biotin acceptor tag, an HA tag, a c-Myc tag, a streptavidin tag, and a FLAG tag.

In some ~~embodiments~~examples, the detection agent comprises biotin.

In some aspects, the disclosure relates to methods of detecting bacteria in a sample.

In ~~some embodiments~~one aspect, the method comprises: (a) contacting the sample with an antigen-binding molecule described herein that binds to LMOF2365_0639; and (b) detecting, if present, bacteria bound by the antigen-binding molecule. In ~~some embodiments~~another aspect, the method is a method of detecting a *Listeria monocytogenes* cell in a sample comprising: (a) contacting the sample with an antigen-binding molecule described herein that binds to

LMOF2365_0639; and (b) detecting, if present, *Listeria monocytogenes* bound by the antigen-binding molecule.

In some ~~embodiments~~examples, the method comprises: (a) contacting the sample with an antigen-binding molecule described herein that binds to OmpA, OmpW, OmpC, OmpF, OmpD, phoE, or a combination thereof; and (b) detecting, if present, bacteria bound by the antigen-binding molecule. In ~~some embodiments~~one aspect, the method is a method of detecting a *Salmonella typhi* cell in a sample comprising: (a) contacting the sample with an antigen-binding molecule described herein OmpA, OmpW, OmpC, OmpF, OmpD, phoE, or a combination thereof; and (b) detecting, if present, *Salmonella typhi* bound by the antigen-binding molecule.

In some ~~embodiments~~examples, the method comprises: (a) contacting the sample with an antigen-binding molecule described herein that binds to OmpW; and (b) detecting, if present, bacteria bound by the antigen-binding molecule. In ~~some embodiments~~one aspect, the method is a method of detecting a *E. coli* cell in a sample comprising: (a) contacting the sample with an antigen-binding molecule described herein that binds to OmpW or OmpA; and (b) detecting, if present, *E. coli* bound by the antigen-binding molecule.

In some ~~embodiments~~examples, the sample is from a food product. In some ~~embodiments~~examples, the sample is from a subject. In some ~~embodiments~~examples, the subject is a mammal. In some ~~embodiments~~examples, the subject is a human. In some ~~embodiments~~examples, the method further comprises treating the subject.

In some ~~embodiments~~examples, the sample is contacted with the antigen-binding protein at a $\text{pH} \leq 6.0$. In some ~~embodiments~~examples, the sample is contacted at a pH of 5.0 – 6.0. In some ~~embodiments~~examples, the sample is contacted at a pH of about 5.5.

In some ~~embodiments~~examples, the sample comprises sodium acetate and/or phosphate-buffered saline.

In some ~~embodiments~~examples, step (a) further comprises contacting the sample with a detection agent, wherein the detection agent binds to or is bound by the antigen-binding molecule.

In some ~~embodiments~~examples, the detection agent comprises an enzyme, a fluorescent protein, an immunoglobulin, a peptide tag, a small molecule, and/or a combination thereof.

In some ~~embodiments~~examples, the detection enzyme comprises an enzyme selected from the group consisting of alkaline phosphatase, horseradish peroxidase, and β -galactosidase.

In some ~~embodiments~~examples, the detection agent comprises a fluorescent protein selected from the group consisting of TagBFP, mTagBFP2, Azurite, EBFP2, EBFP2, Sirius, Sapphire, T-Sapphire, ECFP, Cerulean, SCFP3A, mTurquoise, mTurquoise2, monomeric Midoriishi-Cyan, TagCFP, mTFP1, EGFP, Emerald, Superfolder GFP, Monomeric Azami Green, TagGFP2, mUKG, mWasabi, Clover, mNeonGreen, EYFP, Citrine, Venus, SYFP2, TagYFP, Monomeric Kusabira-Orange, mKOκ, mKO2, mOrange, mOrange2, mRaspberry, mCherry, mStrawberry, mTangerine, tdTomato, TagRFP, TagRFP-T, mApple, mRuby, mRuby2, mPlum, HcRed-Tandem, mKate2, mNeptune, and NirFP.

In some ~~embodiments~~examples, the detection agent comprises a peptide tag selected from the group consisting of a His tag, a biotin acceptor tag, an HA tag, a c-Myc tag, a streptavidin tag, and a FLAG tag.

In some ~~embodiments~~examples, the detection agent comprises biotin.

In some aspects, the disclosure relates to methods of killing a bacterial cell.

In ~~some embodiments~~one aspect, the method comprises contacting a *Listeria monocytogenes* cell with an antigen-binding molecule described herein that binds to LMO2365_0639, wherein the antigen-binding molecule further comprises a cytotoxic agent.

In ~~some embodiments~~another aspect, the method comprises contacting a *Salmonella typhi* cell with an antigen-binding molecule described herein that binds to OmpA, OmpW, OmpC, OmpF, OmpD, phoE, or a combination thereof, wherein the antigen-binding molecule further comprises a cytotoxic agent.

In ~~some embodiments~~yet another aspect, the method comprises contacting an *E. coli* cell with an antigen-binding molecule described herein that binds to OmpW or OmpA, wherein the antigen-binding molecule further comprises a cytotoxic agent.

In some ~~embodiments~~examples, the sample is contacted with the antigen-binding protein at a pH ≤ 6.0 . In some ~~embodiments~~examples, the sample is contacted at a pH of 5.0 – 6.0. In some ~~embodiments~~examples, the sample is contacted at a pH of about 5.5.

In some ~~embodiments~~examples, the sample comprises sodium acetate and/or phosphate-buffered saline.

In some aspects, the disclosure relates to methods of monitoring growth of a population of bacteria. In ~~some embodiments~~one aspect, the method comprises: (a) contacting a sample comprising at least a subset of the population with an antigen-binding molecule described herein; and (b) repeating step (a) at least once.

In ~~some embodiments~~another aspect, the method is a method of monitoring growth of *Listeria monocytogenes* comprising: (a) contacting a sample comprising at least a subset of the population with an antigen-binding molecule described herein that binds to LMOF2365_0639; and (b) repeating step (a) at least once.

5 In some ~~embodiments~~yet another aspect, the method is a method of monitoring growth of *Salmonella typhi* comprising: (a) contacting a sample comprising at least a subset of the population with an antigen-binding molecule described herein that binds to OmpA, OmpW, OmpC, OmpF, OmpD, phoE, or a combination thereof; and (b) repeating step (a) at least once.

10 In some ~~embodiments~~one aspect, the method is a method of monitoring growth of *E. coli* comprising: (a) contacting a sample comprising at least a subset of the population with an antigen-binding molecule described herein that binds to OmpW or OmpA; and (b) repeating step (a) at least once.

In some ~~embodiments~~examples, step (a) further comprises contacting the sample with
15 a detection agent, wherein the detection agent binds to or is bound by the antigen-binding molecule.

In some ~~embodiments~~examples, the detection agent comprises an enzyme, a fluorescent protein, an immunoglobulin, a peptide tag, a small molecule, and/or a combination thereof.

20 In some ~~embodiments~~examples, the detection enzyme comprises an enzyme selected from the group consisting of alkaline phosphatase, horseradish peroxidase, and β -galactosidase.

In some ~~embodiments~~examples, the detection agent comprises a fluorescent protein selected from the group consisting of TagBFP, mTagBFP2, Azurite, EBFP2, EBFP2, Sirius, Sapphire, T-Sapphire, ECFP, Cerulean, SCFP3A, mTurquoise, mTurquoise2, monomeric
25 Midoriishi-Cyan, TagCFP, mTFP1, EGFP, Emerald, Superfolder GFP, Monomeric Azami Green, TagGFP2, mUKG, mWasabi, Clover, mNeonGreen, EYFP, Citrine, Venus, SYFP2, TagYFP, Monomeric Kusabira-Orange, mKO κ , mKO2, mOrange, mOrange2, mRaspberry, mCherry, mStrawberry, mTangerine, tdTomato, TagRFP, TagRFP-T, mApple, mRuby, mRuby2, mPlum, HcRed-Tandem, mKate2, mNeptune, and NirFP.

30 In some ~~embodiments~~examples, the detection agent comprises a peptide tag selected from the group consisting of a His tag, a biotin acceptor tag, an HA tag, a c-Myc tag, a streptavidin tag, and a FLAG tag.

In some ~~embodiments~~examples, the detection agent comprises biotin.

In some aspects, the disclosure relates to kits comprising an antigen-binding molecule described herein.

In some ~~embodiments~~examples, the kit further comprises a buffer. In some ~~embodiments~~examples, the buffer has a pH of ≤ 6.0 . In some ~~embodiments~~examples, the buffer has a pH of 5.0 – 6.0. In some ~~embodiments~~examples, the buffer has a pH of about 5.5. In some ~~embodiments~~examples, the buffer comprises sodium acetate and/or phosphate-buffered saline.

In some ~~embodiments~~examples, the kit further comprises a substrate. In some ~~embodiments~~examples, the substrate comprises paper, nitrocellulose, cellulose powder, and/or a liquid colloid. In some ~~embodiments~~examples, the antigen-binding molecule is bound to the substrate.

In some ~~embodiments~~examples, the kit further comprises a growth media that allows for bacterial growth.

BRIEF DESCRIPTION OF THE DRAWINGS

The following drawings form part of the present specification and are included to further demonstrate certain aspects of the present disclosure, which can be better understood by reference to one or more of these drawings in combination with the detailed description of specific embodiments presented herein. It is to be understood that the data illustrated in the drawings in no way limit the scope of the disclosure.

FIGs. 1A-1C. FIG. 1A. Schematic of the combinatorial yeast-surface display library for rcSso7d (diversity: $\sim 1.4 \times 10^9$). FIG. 1B. Schematic of the yeast surface display complex. rcSso7d (PDB: 1SSO) is expressed with HA/c-Myc epitope tags and genetically fused to the Aga2p protein, which is linked to Aga1p in the cell wall via disulfide bonds. The variable binding face of rcSso7d is indicated. FIG. 1C. Schematic of *L. monocytogenes* and the target surface protein, LMOF2365_0639 (“LSP”).

FIG. 2. Representative FACS dot plots for the FACS selections (“a”: MBS and FACS against His-LSP, top; “b”: MBS against His-LSP and FACS against LSP-BA, middle; “c”: MBS and FACS against LSP-BA, bottom). Positive sorts are shown for FACS #1, #2, and #4 to show enrichment. Negative sorts were conducted prior to FACS #2a, #4a, #2b, and #4b. Concentration of His-LSP or LSP-BA used are listed above the plots, with a reduction in concentration in subsequent FACS rounds for increased stringency. Numbers indicate the percentage of the population in each quadrant. Gates drawn indicate the gates used for sorting.

What is claimed is:

CLAIMS

- 5 1. An antigen-binding molecule comprising a reduced charge Sso7d(rcSso7d) antigen-binding protein that binds to a bacterium.
2. The antigen-binding molecule of claim 1, wherein the rcSso7d antigen-binding protein binds to a gram-positive bacterium.
- 10 3. The antigen-binding molecule of claim 1, wherein the rcSso7d antigen-binding protein binds to a gram-negative bacterium.
4. The antigen-binding molecule of any one of claims 1-3, wherein the rcSso7d antigen-binding protein binds to a pathogenic bacterium.
- 15 5. The antigen-binding molecule of any one of claims 1-4, wherein the rcSso7d antigen-binding protein binds to a bacterium that causes food poisoning.
6. The antigen-binding molecule of any one of claims 1-4, wherein the rcSso7d antigen-binding protein binds to a bacterium that causes food spoilage.
- 20 7. The antigen-binding molecule of any one of claims 1-6, wherein the rcSso7d antigen-binding protein binds to a bacterium of the genus *Listeria*, *Escherichia*, *Salmonella*, and/or *Legionella*.
- 25 8. The antigen-binding molecule of claim 7, wherein the rcSso7d antigen-binding protein binds to a *Listeria monocytogenes*, *Salmonella typhi* and/or *E. coli*.
- 30 9. The antigen-binding molecule of claim 1-8, wherein the antigen-binding molecule binds to at least two antigens.

10. The antigen-binding molecule of claim 9, wherein two or more of the at least two antigens are specific to different types of bacteria.
- 5 11. The antigen-binding molecule of any one of claims 1-10, wherein the antigen-binding molecule binds to a protein antigen, a glycosylated protein antigen, and/or a carbohydrate antigen.
- 10 12. An antigen-binding molecule comprising a reduced charge Sso7d (rcSso7d) antigen-binding protein that binds *Listeria monocytogenes* protein LMOF2365_0639, wherein the antigen-binding protein comprises a variable region having:
- (i) the amino acid sequence of any one of SEQ ID NOs: 1-8; or
 - (ii) an amino acid sequence having 2 or 1 amino acid differences with any one of SEQ ID NOs: 1-8.
- 15 13. The antigen-binding molecule of claim 12, wherein the antigen-binding molecule comprises a variable region having:
- (i) the amino acid sequence of any one of SEQ ID NOs: 3, 5 or 7; or
 - (ii) an amino acid sequence having no more than 2 or 1 amino acid differences
- 20 with any one of SEQ ID NOs: 3, 5 or 7.
14. The antigen-binding molecule of claim 13, wherein the rcSso7d antigen-binding protein comprises:
- (i) the amino acid sequence of any one of SEQ ID NOs: 13-15;
 - 25 (ii) an amino acid sequence having no more than ten amino acid differences with any one of SEQ ID NOs: 13-15; or
 - (iii) an amino acid sequence having at least 80% identity with any one of any one of SEQ ID NOs: 13-15.
- 30 15. The antigen-binding molecule of claim 13 or claim 14, wherein the rcSso7d antigen-binding protein comprises the amino acid sequence of any one of SEQ ID NOs: 13-15.

16. The antigen-binding molecule of claim 12, wherein the antigen-binding protein comprises a variable region having:
 - (i) the amino acid sequence of any one of SEQ ID NOs: 1, 2, 4, or 6; or
 - (ii) an amino acid sequence no more than 2 or 1 amino acid differences with any one of SEQ ID NOs: 1, 2, 4, or 6.
17. The antigen-binding molecule of claim 16, wherein the rcSso7d antigen-binding protein comprises:
 - (i) the amino acid sequence of any one of SEQ ID NOs: 16-19;
 - (ii) an amino acid sequence having no more than seven amino acid differences with any one of SEQ ID NOs: 16-19; or
 - (iii) an amino acid sequence having at least 80% identity with any one of any one of SEQ ID NOs: 16-19.
18. The antigen-binding molecule of claim 16 or claim 17, wherein the rcSso7d antigen-binding protein comprises the amino acid sequence of any one of SEQ ID NOs: 16-19.
19. The antigen-binding molecule of any one of claims 1-18, further comprising an enzyme, a fluorescent protein, an immunoglobulin, a peptide tag, a small molecule, or a combination thereof.
20. The antigen-binding molecule of claim 19, wherein the antigen-binding molecule comprises an enzyme selected from the group consisting of alkaline phosphatase, horseradish peroxidase, and β -galactosidase.
21. The antigen-binding molecule of claim 19 or claim 20, wherein the antigen-binding molecule comprises a fluorescent protein selected from the group consisting of TagBFP, mTagBFP2, Azurite, EBFP2, EBFP2, Sirius, Sapphire, T-Sapphire, ECFP, Cerulean, SCFP3A, mTurquoise, mTurquoise2, monomeric Midoriishi-Cyan, TagCFP, mTFP1, EGFP, Emerald, Superfolder GFP, Monomeric Azami Green, TagGFP2, mUKG, mWasabi, Clover, mNeonGreen, EYFP, Citrine, Venus, SYFP2, TagYFP, Monomeric Kusabira-Orange, mKO₂,

mKO2, mOrange, mOrange2, mRaspberry, mCherry, mStrawberry, mTangerine, tdTomato, TagRFP, TagRFP-T, mApple, mRuby, mRuby2, mPlum, HcRed-Tandem, mKate2, mNeptune, and NirFP.

- 5 22. The antigen-binding molecule of any one of claims 19-21, wherein the antigen-binding molecule comprises a peptide tag selected from the group consisting of a His tag, a biotin acceptor tag, an HA tag, a c-Myc tag, a streptavidin tag, and a FLAG tag.
- 10 23. The antigen-binding molecule of any one of claims 19-22, wherein the antigen-binding molecule comprises biotin.
24. An antigen-binding molecule comprising a reduced charge Sso7d (rcSso7d) antigen-binding protein that binds *Salmonella typhi* Native Omp, said Native Omp
15 comprising the amino acid sequence of *Salmonella typhi* membrane proteins OmpA, OmpW, OmpC, OmpF, OmpD, and phoE, wherein the antigen-binding protein comprises a variable region having:
 (i) the amino acid sequence of any one of SEQ ID NOs: 58-71; or
 (ii) an amino acid sequence having 2 or 1 amino acid differences with any one of
20 SEQ ID NOs: 58-71.
25. The antigen-binding molecule of claim 24, wherein the rcSso7d antigen-binding protein comprises:
 (i) the amino acid sequence of any one of SEQ ID NOs: 33-46;
25 (ii) an amino acid sequence having no more than ten amino acid differences with any one of SEQ ID NOs: 33-46; or
 (iii) an amino acid sequence having at least 80% identity with any one of any one of SEQ ID NOs: 33-46.
- 30 26. The antigen-binding molecule of claim 24 or claim 25, wherein the rcSso7d antigen-binding protein comprises the amino acid sequence of any one of SEQ ID NOs: 33-46.

27. The antigen-binding molecule of any one of claims 24-26, further comprising an enzyme, a fluorescent protein, an immunoglobulin, a peptide tag, a small molecule, or a combination thereof.
- 5 28. The antigen-binding molecule of claim 27, wherein the antigen-binding molecule comprises an enzyme selected from the group consisting of alkaline phosphatase, horseradish peroxidase, and β -galactosidase.
- 10 29. The antigen-binding molecule of claim 27 or claim 28, wherein the antigen-binding molecule comprises a fluorescent protein selected from the group consisting of TagBFP, mTagBFP2, Azurite, EBFP2, EBFP2, Sirius, Sapphire, T-Sapphire, ECFP, Cerulean, SCFP3A, mTurquoise, mTurquoise2, monomeric Midoriishi-Cyan, TagCFP, mTFP1, EGFP, Emerald, Superfolder GFP, Monomeric Azami Green, TagGFP2, mUKG, mWasabi, Clover, mNeonGreen, 15 EYFP, Citrine, Venus, SYFP2, TagYFP, Monomeric Kusabira-Orange, mKO κ , mKO2, mOrange, mOrange2, mRaspberry, mCherry, mStrawberry, mTangerine, tdTomato, TagRFP, TagRFP-T, mApple, mRuby, mRuby2, mPlum, HcRed-Tandem, mKate2, mNeptune, and NirFP.
- 20 30. The antigen-binding molecule of any one of claims 27-29, wherein the antigen-binding molecule comprises a peptide tag selected from the group consisting of a His tag, a biotin acceptor tag, an HA tag, a c-Myc tag, a streptavidin tag, and a FLAG tag.
- 25 31. The antigen-binding molecule of any one of claims 27-30, wherein the antigen-binding molecule comprises biotin.
- 30 32. An antigen-binding molecule comprising a reduced charge Sso7d (rcSso7d) antigen-binding protein that binds *E. coli* OmpW, wherein the antigen-binding protein comprises a variable region having:
 - (i) the amino acid sequence of any one of SEQ ID NOs: 73-80; or
 - (ii) an amino acid sequence having 2 or 1 amino acid differences with any one of SEQ ID NOs: 73-80.

33. The antigen-binding molecule of claim 32, wherein the rcSso7d antigen-binding protein comprises:
- (i) the amino acid sequence of any one of SEQ ID NOs: 47-54;
 - 5 (ii) an amino acid sequence having no more than ten amino acid differences with any one of SEQ ID NOs: 47-54; or
 - (iii) an amino acid sequence having at least 80% identity with any one of any one of SEQ ID NOs: 47-54.
- 10 34. The antigen-binding molecule of claim 33 or claim 34, wherein the rcSso7d antigen-binding protein comprises the amino acid sequence of any one of SEQ ID NOs: 47-54.
- 15 35. The antigen-binding molecule of any one of claims 32-34, further comprising an enzyme, a fluorescent protein, an immunoglobulin, a peptide tag, a small molecule, or a combination thereof.
- 20 36. The antigen-binding molecule of claim 35, wherein the antigen-binding molecule comprises an enzyme selected from the group consisting of alkaline phosphatase, horseradish peroxidase, and β -galactosidase.
- 25 37. The antigen-binding molecule of claim 35 or claim 36, wherein the antigen-binding molecule comprises a fluorescent protein selected from the group consisting of TagBFP, mTagBFP2, Azurite, EBFP2, EBFP2, Sirius, Sapphire, T-Sapphire, ECFP, Cerulean, SCFP3A, mTurquoise, mTurquoise2, monomeric Midoriishi-Cyan, TagCFP, mTFP1, EGFP, Emerald, Superfolder GFP, Monomeric Azami Green, TagGFP2, mUKG, mWasabi, Clover, mNeonGreen, EYFP, Citrine, Venus, SYFP2, TagYFP, Monomeric Kusabira-Orange, mKO κ , mKO2, mOrange, mOrange2, mRaspberry, mCherry, mStrawberry, mTangerine, 30 tdTomato, TagRFP, TagRFP-T, mApple, mRuby, mRuby2, mPlum, HcRed-Tandem, mKate2, mNeptune, and NirFP.

38. The antigen-binding molecule of any one of claims 35-37, wherein the antigen-binding molecule comprises a peptide tag selected from the group consisting of a His tag, a biotin acceptor tag, an HA tag, a c-Myc tag, a streptavidin tag, and a FLAG tag.
- 5
39. The antigen-binding molecule of any one of claims 35-38, wherein the antigen-binding molecule comprises biotin.
40. An antigen-binding molecule comprising a reduced charge Sso7d (rcSso7d) antigen-binding protein that binds *E. coli* OmpA, wherein the antigen-binding protein comprises a variable region having:
- 10
- (i) the amino acid sequence of any one of SEQ ID NOs: 81-83; or
 - (ii) an amino acid sequence having 2 or 1 amino acid differences with any one of SEQ ID NOs: 81-83.
- 15
41. The antigen-binding molecule of claim 40, wherein the rcSso7d antigen-binding protein comprises:
- (i) the amino acid sequence of any one of SEQ ID NOs: 55-57;
 - (ii) an amino acid sequence having no more than ten amino acid differences with any one of SEQ ID NOs: 55-57; or
 - (iii) an amino acid sequence having at least 80% identity with any one of any one of SEQ ID NOs: 55-57.
- 20
42. The antigen-binding molecule of claim 40 or claim 41, wherein the rcSso7d antigen-binding protein comprises the amino acid sequence of any one of SEQ ID NOs: 55-57.
- 25
43. The antigen-binding molecule of any one of claims 40-42, further comprising an enzyme, a fluorescent protein, an immunoglobulin, a peptide tag, a small molecule, or a combination thereof.
- 30

44. The antigen-binding molecule of claim 43, wherein the antigen-binding molecule comprises an enzyme selected from the group consisting of alkaline phosphatase, horseradish peroxidase, and β -galactosidase.
- 5 45. The antigen-binding molecule of claim 43 or claim 44, wherein the antigen-binding molecule comprises a fluorescent protein selected from the group consisting of TagBFP, mTagBFP2, Azurite, EBFP2, EBFP2, Sirius, Sapphire, T-Sapphire, ECFP, Cerulean, SCFP3A, mTurquoise, mTurquoise2, monomeric Midoriishi-Cyan, TagCFP, mTFP1, EGFP, Emerald, Superfolder GFP,
- 10 Monomeric Azami Green, TagGFP2, mUKG, mWasabi, Clover, mNeonGreen, EYFP, Citrine, Venus, SYFP2, TagYFP, Monomeric Kusabira-Orange, mKO κ , mKO2, mOrange, mOrange2, mRaspberry, mCherry, mStrawberry, mTangerine, tdTomato, TagRFP, TagRFP-T, mApple, mRuby, mRuby2, mPlum, HcRed-Tandem, mKate2, mNeptune, and NirFP.
- 15 46. The antigen-binding molecule of any one of claims 43-45, wherein the antigen-binding molecule comprises a peptide tag selected from the group consisting of a His tag, a biotin acceptor tag, an HA tag, a c-Myc tag, a streptavidin tag, and a FLAG tag.
- 20 47. The antigen-binding molecule of any one of claims 43-46, wherein the antigen-binding molecule comprises biotin.
48. A composition comprising an antigen-binding molecule according to any one of
- 25 claims 1-47 and a buffer, wherein the buffer has a pH $\leq$ 6.0.
49. The composition of claim 48, wherein the buffer has a pH of 5.0 – 6.0.
50. The composition of claim 48 or claim 49, wherein the buffer has a pH of about
- 30 5.5.
51. The composition of any one of claims 48-50, wherein the buffer comprises sodium acetate and/or phosphate-buffered saline.

52. The composition of any one of claims 48-51, wherein the composition further comprises a LMOF2365_0639 protein, an OmpA protein, an OmpW protein, an OmpC protein, an OmpF protein, an OmpD protein, a phoE protein, or a combination thereof.
53. The composition of any one of claims 48-52, wherein the composition further comprises a *Listeria monocytogenes* cell, a *Salmonella typhi* cell, an *E. coli* cell, or a combination thereof.
54. A method of detecting protein LMOF2365_0639 in a sample, the method comprising:
- (a) contacting the sample with an antigen-binding molecule of any one of claims 12-23; and
 - (b) detecting, if present, LMOF2365_0639 protein bound by the antigen-binding molecule.
55. A method of detecting OmpA, OmpW, OmpC, OmpF, OmpD, phoE, or a combination thereof in a sample, the method comprising:
- (a) contacting the sample with an antigen-binding molecule of any one of claims 24-31; and
 - (b) detecting, if present, OmpA, OmpW, OmpC, OmpF, OmpD, phoE, or a combination thereof bound by the antigen-binding molecule.
56. A method of detecting OmpW in a sample, the method comprising:
- (a) contacting the sample with an antigen-binding molecule of any one of claims 32-39; and
 - (b) detecting, if present, OmpW bound by the antigen-binding molecule.
57. A method of detecting OmpA in a sample, the method comprising:
- (a) contacting the sample with an antigen-binding molecule of any one of claims 40-47; and
 - (b) detecting, if present, OmpA bound by the antigen-binding molecule.

58. The method of any one of claims 54-57, wherein the sample is from a food product.

5 59. The method of any one of claims 54-57, wherein the sample is from a subject.

60. The method of claim 59, wherein the subject is a mammal.

61. The method of claim 59, wherein the subject is a human.

10

~~62. The method of claim 60 or claim 61, further comprising treating the subject.~~

~~63-62.~~ The method of any one of claims 54-~~62~~61, wherein the sample is contacted with the antigen-binding protein at a pH $\leq$ 6.0.

15

~~64-63.~~ The method of claim ~~63~~62, wherein the sample is contacted with the antigen-binding protein at a pH of 5.0 – 6.0.

~~65-64.~~ The method of claim ~~63-62~~ or claim ~~64~~63, wherein the sample is contacted with the antigen-binding protein at a pH of about 5.5.

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~~66-65.~~ The method of any one of claims 54-~~65~~64, wherein the sample comprises sodium acetate and/or phosphate-buffered saline.

~~67-66.~~ The method of any one of claims 54-~~66~~65, wherein step (a) further comprises contacting the sample with a detection agent, wherein the detection agent binds to or is bound by the antigen-binding molecule.

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~~68-67.~~ The method of claim ~~67~~66, wherein the detection agent comprises an enzyme, a fluorescent protein, an immunoglobulin, a peptide tag, a small molecule, and/or a combination thereof.

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~~69-68.~~ The method of claim ~~68-67~~, wherein the detection enzyme comprises an enzyme selected from the group consisting of alkaline phosphatase, horseradish peroxidase, and β -galactosidase.

5 ~~70-69.~~ The method of claim ~~68-67~~ or claim ~~69-68~~, wherein the detection agent comprises a fluorescent protein selected from the group consisting of TagBFP, mTagBFP2, Azurite, EBFP2, EBFP2, Sirius, Sapphire, T-Sapphire, ECFP, Cerulean, SCFP3A, mTurquoise, mTurquoise2, monomeric Midoriishi-Cyan, TagCFP, mTFP1, EGFP, Emerald, Superfolder GFP, Monomeric Azami Green, TagGFP2, mUKG, 10 mWasabi, Clover, mNeonGreen, EYFP, Citrine, Venus, SYFP2, TagYFP, Monomeric Kusabira-Orange, mKO κ , mKO2, mOrange, mOrange2, mRaspberry, mCherry, mStrawberry, mTangerine, tdTomato, TagRFP, TagRFP-T, mApple, mRuby, mRuby2, mPlum, HcRed-Tandem, mKate2, mNeptune, and NirFP.

15 ~~71-70.~~ The method of any one of claims ~~68-67-70-69~~, wherein the detection agent comprises a peptide tag selected from the group consisting of a His tag, a biotin acceptor tag, an HA tag, a c-Myc tag, a streptavidin tag, and a FLAG tag.

20 ~~72-71.~~ The method of any one of claims ~~68-67-70-69~~, wherein the detection agent comprises biotin.

~~73-72.~~ A method of detecting bacteria in a sample comprising:

- 25 (a) contacting the sample with an antigen-binding molecule of any one of claims 1-47; and
(b) detecting, if present, bacteria bound by the antigen-binding molecule.

~~74-73.~~ A method of detecting a *Listeria monocytogenes* cell in a sample comprising:

- 30 (a) contacting the sample with an antigen-binding molecule of any one of claims 12-23; and
(b) detecting, if present, *Listeria monocytogenes* bound by the antigen-binding molecule.

~~75-74.~~ A method of detecting a *Salmonella typhi* cell in a sample comprising:

- (a) contacting the sample with an antigen-binding molecule of any one of claims 24-31; and
- (b) detecting, if present, *Salmonella typhi* bound by the antigen-binding molecule.

5 ~~76-75.~~ A method of detecting an *E. coli* cell in a sample comprising:

- (a) contacting the sample with an antigen-binding molecule of any one of claims 32-47; and
- (b) detecting, if present, *E. coli* bound by the antigen-binding molecule.

10 ~~77-76.~~ The method of any one of claims ~~73-72-76~~75, wherein the sample is from a food product.

~~78-77.~~ The method of claim any one of claims ~~73-72-76~~75, wherein the sample is from a subject.

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~~79-78.~~ The method of claim ~~78~~77, wherein the subject is a mammal.

~~80-79.~~ The method of claim ~~78~~77, wherein the subject is a human.

20

~~81.—The method of claim 79 or claim 80, further comprising treating the subject.~~

~~82-80.~~ The method of any one of claims ~~73-72-81~~79, wherein the sample is contacted with the antigen-binding protein at a pH ≤ 6.0 .

25

~~83-81.~~ The method of claim ~~82~~80, wherein the sample is contacted with the antigen-binding protein at a pH of 5.0 – 6.0.

~~84-82.~~ The method of claim ~~82~~80 or claim ~~83~~81, wherein the sample is contacted with the antigen-binding protein at a pH of about 5.5.

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~~85-83.~~ The method of any one of claims ~~73-72-84~~82, wherein the sample comprises sodium acetate and/or phosphate-buffered saline.

- ~~86-84.~~ The method of any one of claims ~~7372-8583~~, wherein step (a) further comprises contacting the sample with a detection agent, wherein the detection agent binds to or is bound by the antigen-binding molecule.
- 5 ~~87-85.~~ The method of claim ~~8684~~, wherein the detection agent comprises an enzyme, an immunoglobulin, a fluorescent protein, a peptide tag, a small molecule, or a combination thereof.
- 10 ~~88-86.~~ The method of claim ~~8785~~, wherein the detection enzyme comprises an enzyme selected from the group consisting of alkaline phosphatase, horseradish peroxidase, and β -galactosidase.
- 15 ~~89-87.~~ The method of claim ~~87-85~~ or claim ~~8886~~, wherein the detection agent comprises a fluorescent protein selected from the group consisting of TagBFP, mTagBFP2, Azurite, EBFP2, EBFP2, Sirius, Sapphire, T-Sapphire, ECFP, Cerulean, SCFP3A, mTurquoise, mTurquoise2, monomeric Midoriishi-Cyan, TagCFP, mTFP1, EGFP, Emerald, Superfolder GFP, Monomeric Azami Green, TagGFP2, mUKG, mWasabi, Clover, mNeonGreen, EYFP, Citrine, Venus, SYFP2, TagYFP, Monomeric Kusabira-Orange, mKO κ , mKO2, mOrange, mOrange2, mRaspberry, mCherry, mStrawberry, mTangerine, tdTomato, TagRFP, TagRFP-T, mApple, mRuby, mRuby2, mPlum, HcRed-Tandem, mKate2, mNeptune, and NirFP.
- 20 ~~90-88.~~ The method of any one of claims ~~8785-8987~~, wherein the detection agent comprises a peptide tag selected from the group consisting of a His tag, a biotin acceptor tag, an HA tag, a c-Myc tag, a streptavidin tag, and a FLAG tag.
- 25 ~~91-89.~~ The method of any one of claims ~~8785-9088~~, wherein the detection agent comprises biotin.
- 30 ~~92-90.~~ A method of killing a bacterial cell comprising contacting the cell with the antigen-binding molecule of any one of claims 1-47, wherein the antigen-binding molecule further comprises a cytotoxic agent.

- ~~93-91.~~ A method of killing a *Listeria monocytogenes* cell comprising contacting the cell with the antigen-binding molecule of any one of claims 12-23, wherein the antigen-binding molecule further comprises a cytotoxic agent.
- 5 ~~94-92.~~ A method of killing a *Salmonella typhi* cell comprising contacting the cell with the antigen-binding molecule of any one of claims 24-31, wherein the antigen-binding molecule further comprises a cytotoxic agent.
- 10 ~~95-93.~~ A method of killing an *E. coli* cell comprising contacting the cell with the antigen-binding molecule of any one of claims 32-47, wherein the antigen-binding molecule further comprises a cytotoxic agent.
- 15 ~~96-94.~~ The method of any one of claims ~~92-90-95-93~~, wherein the sample is contacted with the antigen-binding protein in a buffer at a pH ≤ 6.0 .
- 15 ~~97-95.~~ The method of claim ~~96-94~~, wherein the sample is contacted with the antigen-binding protein at a pH of 5.0 – 6.0.
- 20 ~~98-96.~~ The method of claim ~~96-94~~ or claim ~~97-95~~, wherein the sample is contacted with the antigen-binding protein at a pH of about 5.5.
- 25 ~~99-97.~~ The method of any one of claims ~~96-94-98-96~~, wherein the sample comprises sodium acetate and/or phosphate-buffered saline.
- 25 ~~100-98.~~ A method of monitoring growth of a population of bacteria comprising:
 (a) contacting a sample comprising at least a subset of the population with the antigen-binding molecule of any one of claims 1-47; and
 (b) repeating step (a) at least once.
- 30 ~~101-99.~~ A method of monitoring growth of *Listeria monocytogenes* comprising:
 (a) contacting a sample comprising at least a subset of the population with the antigen-binding molecule of any one of claims 12-23; and
 (b) repeating step (a) at least once.

~~102~~.100. A method of monitoring growth of *Salmonella typhi* comprising:

- (a) contacting a sample comprising at least a subset of the population with the antigen-binding molecule of any one of claims 24-31; and
- (b) repeating step (a) at least once.

~~103~~.101. A method of monitoring growth of *E. coli* comprising:

- (a) contacting a sample comprising at least a subset of the population with the antigen-binding molecule of any one of claims 32-47; and
- (b) repeating step (a) at least once.

~~104~~.102. The method of any one of claims ~~100~~98-~~103~~101, wherein step (a) further comprises contacting the sample with a detection agent, wherein the detection agent binds to or is bound by the antigen-binding molecule.

~~105~~.103. The method of claim ~~104~~102, wherein the detection agent comprises an enzyme, an immunoglobulin, a fluorescent protein, a peptide tag, a small molecule, or a combination thereof.

~~106~~.104. The method of claim ~~105~~103, wherein the detection enzyme comprises an enzyme selected from the group consisting of alkaline phosphatase, horseradish peroxidase, and β -galactosidase.

~~107~~.105. The method of claim ~~104~~102 or claim ~~105~~103, wherein the detection agent comprises a fluorescent protein selected from the group consisting of TagBFP, mTagBFP2, Azurite, EBFP2, EBFP2, Sirius, Sapphire, T-Sapphire, ECFP, Cerulean, SCFP3A, mTurquoise, mTurquoise2, monomeric Midoriishi-Cyan, TagCFP, mTFP1, EGFP, Emerald, Superfolder GFP, Monomeric Azami Green, TagGFP2, mUKG, mWasabi, Clover, mNeonGreen, EYFP, Citrine, Venus, SYFP2, TagYFP, Monomeric Kusabira-Orange, mKO κ , mKO2, mOrange, mOrange2, mRaspberry, mCherry, mStrawberry, mTangerine, tdTomato, TagRFP, TagRFP-T, mApple, mRuby, mRuby2, mPlum, HcRed-Tandem, mKate2, mNeptune, and NirFP.

~~108.106.~~ The method of any one of claims ~~104102-107105~~, wherein the detection agent comprises a peptide tag selected from the group consisting of a His tag, a biotin acceptor tag, an HA tag, a c-Myc tag, a streptavidin tag, and a FLAG tag.

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~~109.107.~~ The method of any one of claims ~~104102-108106~~, wherein the detection agent comprises biotin.

~~110.108.~~ A kit comprising the antigen-binding molecule of any one of claims 1-47.

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~~111.109.~~ The kit of claim ~~110108~~, further comprising a buffer.

~~112.110.~~ The kit of claim ~~111109~~, wherein the buffer has a pH of ≤ 6.0 .

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~~113.111.~~ The kit of claim ~~112110~~, wherein the buffer has a pH of 5.0 – 6.0.

~~114.112.~~ The kit of claim ~~112110~~ or claim ~~113111~~, wherein the buffer has a pH of about 5.5.

20

~~115.113.~~ The kit of any one of claims ~~111109-114112~~, wherein the buffer comprises sodium acetate and/or phosphate-buffered saline.

~~116.114.~~ The kit of any one of claims ~~110108-115113~~, further comprising a substrate.

25

~~117.115.~~ The kit of claim ~~116114~~, wherein the substrate comprises paper, nitrocellulose, cellulose powder, and/or a liquid colloid.

~~118.116.~~ The kit of claim ~~116114~~ or claim ~~117115~~, wherein the antigen-binding molecule is bound to the substrate.

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~~119.117.~~ The kit of any one of claims ~~110108-118116~~, further comprises a growth media that allows for bacterial growth.