

turn (Rice et al. (1996) Cell 87: 1295-1306). In addition, all family members have a preference for pre-bent or curved DNA structures *e.g.* Holliday junctions, a cruciform-like structure central to DNA recombination. In fact, DNABII proteins function as accessory factors facilitating all intracellular DNA functions, including gene expression, recombination, repair and replication (Swinger et al. (2004) Curr. Opin. Struct. Biol. 14:28-35).

[0010] The DNABII family of proteins is found outside of bacterial cells in the biofilm state. Applicants have shown that these proteins are in fact bound to the extracellular DNA at critical branched junctions.

[0010a] In one aspect, the present disclosure refers to an antibody or a fragment thereof comprising: (i) a heavy chain (HC) immunoglobulin variable domain sequence comprising a sequence of amino acid (aa) 25 to aa 144 of SEQ ID NO: 13 or an equivalent thereof; and (ii) a light chain (LC) immunoglobulin variable domain sequence comprising a sequence of aa 21 to aa 132 of SEQ ID NO: 14 or an equivalent thereof.

[0010b] In another aspect, the present disclosure refers to an antibody or a fragment thereof comprising: (i) a heavy chain complementarity-determining region 1 (CDRH1) comprising a sequence of GFTFRTY (aa 50 to aa 56 of SEQ ID NO: 1 or 2 or 3 or 24); (ii) a heavy chain complementarity-determining region 2 (CDRH2) comprising a sequence of GSDRRH (aa 76 to aa 81 of SEQ ID NO: 1 or 2 or 3 or 24); (iii) a heavy chain complementarity-determining region 3 (CDRH3) comprising a sequence of VGPYDGYGGEFDY (aa 121 to aa 133 of SEQ ID NO: 1 or 2 or 3 or 24); (iv) a light chain complementarity-determining region 1 (CDRL1) comprising a sequence of QSLDSDGKTF (aa 47 to aa 57 of SEQ ID NO: 7 or 8 or 9 or 25); (v) a light chain complementarity-determining region 2 (CDRL2) comprising a sequence of LVS (aa 75 to aa 77 of SEQ ID NO: 7 or 8 or 9 or 25); and (vi) a light chain complementarity-determining region 3 (CDRL3) comprising a sequence of WQGTHFP (aa 114 to aa 120 of SEQ ID NO: 7 or 8 or 9 or 25).

[0010c] In another aspect, the present disclosure refers to an antibody or a fragment thereof comprising: (i) a heavy chain complementarity-determining region 1 (CDRH1) comprising a sequence of GFTFSRY (aa 50 to aa 56 of SEQ ID NO: 4 or 5 or 6 or 26); (ii) a heavy chain complementarity-determining region 2 (CDRH2) comprising a sequence of SSGGSY (aa 76 to aa 81 of SEQ ID NO: 4 or 5 or 6 or 26); (iii) a heavy chain complementarity-determining region 3 (CDRH3) comprising a sequence of ER (aa 121 to aa 122 of SEQ ID NO: 4 or 5 or 6

or 26); (iv) a light chain complementarity-determining region 1 (CDRL1) comprising a sequence of QDISNY (aa 47 to aa 52 of SEQ ID NO: 10 or 11 or 12 or 27); (v) a light chain complementarity-determining region 2 (CDRL2) comprising a sequence of YTS (aa 70 to aa 72 of SEQ ID NO: 10 or 11 or 12 or 27); and (vi) A light chain complementarity-determining region 3 (CDRL3) comprising a sequence of QQ (aa 109 to aa 110 of SEQ ID NO: 10 or 11 or 12 or 27).

[0010d] In another aspect, the present disclosure refers to an antigen binding fragment of the antibody as disclosed herein.

[0010e] In another aspect, the present disclosure refers to an isolated polynucleotide encoding the antibody or a fragment thereof as disclosed herein, the antigen binding fragment as disclosed herein or an equivalent of each thereof, and optionally operatively linked to a promoter and enhancer element.

[0010f] In another aspect, the present disclosure refers to a vector comprising an isolated polynucleotide as disclosed herein.

[0010g] In another aspect, the present disclosure refers to a host cell comprising the polynucleotide as disclosed herein, or the vector as disclosed herein.

[0010h] In another aspect, the present disclosure refers to a composition comprising a carrier and one or more of: an antibody or a fragment thereof as disclosed herein, an isolated polynucleotide as disclosed herein, a vector as disclosed herein, or a host cell as disclosed herein.

[0010i] In another aspect, the present disclosure refers to a method of producing an antibody or a fragment thereof as disclosed herein, comprising culturing a host cell comprising a polynucleotide encoding the antibody or fragment under conditions for expression of the antibody or fragment, and optionally isolating the antibody or fragment thereof.

[0010j] In yet another aspect, the present disclosure refers to an *ex vivo* method for inhibiting or competing with the binding of a DNABII polypeptide or protein to a microbial DNA, comprising contacting the DNABII polypeptide or protein with an antibody or a fragment thereof as disclosed herein, wherein the antibody or fragment thereof binds a tip region of a DNABII peptide.

[0010k] In yet another aspect, the present disclosure refers to an *ex vivo* method to disrupt a biofilm, comprising contacting the biofilm with an antibody or a fragment thereof as disclosed herein, wherein the antibody or fragment thereof binds a tip region of a DNABII peptide.

[0010l] In yet another aspect, the present disclosure refers to an *ex vivo* method to prevent formation of or to disrupt a biofilm on a surface comprising treating the surface susceptible to or containing a biofilm with an antibody or a fragment thereof as disclosed herein, wherein the antibody or fragment thereof binds a tip region of a DNABII peptide.

[0010m] In yet another aspect, the present disclosure refers to the use of an antibody or a fragment thereof as disclosed herein in the manufacture of a medicament for preventing or disrupting a biofilm in a subject, wherein the antibody or fragment thereof binds to a tip region of a DNABII peptide.

[0010n] In yet another aspect, the present disclosure refers to the use of an antibody or a fragment thereof as disclosed herein in the manufacture of a medicament for inhibiting, preventing or treating a microbial infection that produces a biofilm in a subject, wherein the antibody or fragment thereof binds to a tip region of a DNABII peptide.

[0010o] In yet another aspect, the present disclosure refers to the use of an antibody or a fragment as disclosed herein in the manufacture of a medicament for treating a condition characterized by the formation of a biofilm in a subject, wherein the antibody or fragment thereof binds to a tip region of a DNABII peptide.

[0010p] In yet another aspect, the present disclosure refers to the use of an antibody or a fragment thereof as disclosed herein in the manufacture of a medicament for detecting binding of the antibody or the fragment to the biofilm if present, wherein the antibody or fragment thereof bind to a tip region of a DNABII peptide.

[0010q] In yet another aspect, the present disclosure refers to the use of an antibody or a fragment thereof as disclosed herein that binds to a tip region of a DNABII peptide, in the manufacture of a medicament for conferring passive immunity in a subject.

[0010r] In yet another aspect, the present disclosure refers to a non-physiological surface coated with an antibody or a fragment thereof as disclosed herein; and optionally, wherein the surface is in an industrial setting.

[0010s] In yet another aspect, the present disclosure refers to a kit comprising one or more of: an antibody or a fragment thereof as disclosed herein, a polynucleotide as disclosed herein, a vector as disclosed herein, the host cell as disclosed herein, or the composition as disclosed herein; and optionally instructions for use.

[0011] Thus, provided herein is an antibody or an antigen binding fragment thereof, that comprises, or consists essentially of, or yet further consists of: a heavy chain (HC) immunoglobulin variable domain sequence comprising, or consisting essentially of, or yet further consisting of a sequence of amino acid (aa) 25 to aa 144 of SEQ ID NO: 13 or an equivalent thereof, and/or a light chain (LC) immunoglobulin variable domain sequence comprising, or consisting essentially of, or yet further consisting of a sequence selected from the group of aa 21 to aa 132 of SEQ ID NO: 14, or an equivalent thereof. Further provided herein is an antibody or an antigen binding fragment thereof, that comprises or consists essentially of, or yet further consists of: a heavy chain (HC) immunoglobulin variable domain sequence comprising, or consisting essentially of, or yet further consisting of a sequence selected from the group of aa 25 to aa 144 of SEQ ID NO: 13, 24 or 26, or an equivalent of each thereof, and/or a light chain (LC) immunoglobulin variable domain sequence comprising, or consisting essentially of, or yet further consisting of a sequence selected from the group of aa 21 to aa 132 of SEQ ID NOs: 14 or 25, aa 21 to aa 126 of SEQ ID NO: 27, or an equivalent of each thereof. In certain ~~embodiment~~examples, the antibody or fragment thereof binds to a DNABII peptide (such as the tip region of the DNABII peptide including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, and/or the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}; and/or the tail region of the DNABII peptide, including but not limited to: a tail region of IHF or HU, a tail region of IHFA or IHFB, and/or the tail-chimeric peptide IhfA3-IhfB2_{NTHI}). In one ~~embodiment~~example, the antibody or fragment thereof binds to the tip-chimeric peptide IhfA5-mIhfB4_{NTHI} or the tail-chimeric peptide IhfA3-IhfB2_{NTHI}.

[0012] Also provided herein is an antibody or an antigen binding fragment thereof, that comprises or consists essentially of, or yet further consists of: a heavy chain (HC)

immunoglobulin variable domain sequence comprising, or consisting essentially of, or yet further consisting of a sequence selected from the group of aa 25 to aa 144 of SEQ ID NO: 13 or 24, or an equivalent of each thereof, and/or a light chain (LC) immunoglobulin variable domain sequence comprising, or consisting essentially of, or yet further consisting of a sequence selected from the group of aa 21 to aa 132 of SEQ ID NO: 14 or 25 or an equivalent of each thereof. In certain ~~embodiment~~examples, the antibody or fragment thereof binds to a DNABII peptide (such as the tip region of the DNABII peptide including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, and/or the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}). In one ~~embodiment~~example, the antibody or fragment thereof binds to the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}.

[0013] Yet further provided is an antibody or an antigen binding fragment thereof, that comprises or consists essentially of, or yet further consists of: a heavy chain (HC) immunoglobulin variable domain sequence comprising, or consisting essentially of, or yet further consisting of a sequence selected from the group of aa 25 to aa 144 of SEQ ID NOs: 1-6, 24 or 26 or an equivalent of each thereof, and/or a light chain (LC) immunoglobulin variable domain sequence comprising, or consisting essentially of, or yet further consisting of a sequence selected from the group of aa 21 to aa 132 of SEQ ID NOs: 7-9 or 25, aa 21 to aa 126 of SEQ ID NOs: 10-12 or 27, or an equivalent of each thereof. In certain ~~embodiment~~examples, the antibody or fragment thereof binds to a DNABII peptide (such as the tip region of the DNABII peptide including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, and/or the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}; and/or the tail region of the DNABII peptide, including but not limited to: a tail region of IHF or HU, a tail region of IHFA or IHFB, and/or the tail-chimeric peptide IhfA3-IhfB2_{NTHI}). In one ~~embodiment~~example, the antibody or fragment thereof binds to the tip-chimeric peptide IhfA5-mIhfB4_{NTHI} or the tail-chimeric peptide IhfA3-IhfB2_{NTHI}.

[0014] Also provided is an antibody or an antigen binding fragment thereof, that comprises or consists essentially of, or yet further consists of: a heavy chain (HC) comprising, or consisting essentially of, or yet further consisting of a sequence selected from the group of aa 25 to aa 473 of SEQ ID NOs: 1-6, 13, 24 or 26 or an equivalent of each thereof, and/or a light chain (LC) comprising, or consisting essentially of, or yet further consisting of a sequence selected from the group of aa 21 to aa 239 of SEQ ID NOs: 7-9, 14, or 25, aa 21 to aa 233 of SEQ ID NOs: 10-12 or 27, or an equivalent of each thereof. In certain ~~embodiment~~examples, the

antibody or fragment thereof binds to a DNABII peptide (such as the tip region of the DNABII peptide including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, and/or the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}; and/or the tail region of the DNABII peptide, including but not limited to: a tail region of IHF or HU, a tail region of IHFA or IHFB, and/or the tail-chimeric peptide IhfA3-IhfB2_{NTHI}). In one ~~embodiment~~example, the antibody or fragment thereof binds to the tip-chimeric peptide IhfA5-mIhfB4_{NTHI} or the tail-chimeric peptide IhfA3-IhfB2_{NTHI}.

[0015] Additionally provided is an antibody or a fragment thereof that comprises or consists essentially of, or yet further consists of: any one or any two or all three CDRs of a sequence selected from the group of: SEQ ID NOs: 1-6, 13, 24 or 26, or an equivalent of each thereof; and/or any one or any two or all three CDRs of a sequence selected from the group of: SEQ ID NOs: 7-12, 14, 25 or 27, or an equivalent of each thereof. In certain ~~embodiment~~examples, the antibody or fragment thereof binds to a DNABII peptide (such as the tip region of the DNABII peptide including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, and/or the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}; and/or the tail region of the DNABII peptide, including but not limited to: a tail region of IHF or HU, a tail region of IHFA or IHFB, and/or the tail-chimeric peptide IhfA3-IhfB2_{NTHI}). In one ~~embodiment~~example, the antibody or fragment thereof binds to the tip-chimeric peptide IhfA5-mIhfB4_{NTHI} or the tail-chimeric peptide IhfA3-IhfB2_{NTHI}.

[0016] Non-limiting examples of antigen binding fragments are selected from a Fab, F(ab')₂, Fab', scFv, or Fv.

[0017] In another ~~aspect~~example, a Fab fragment of the antibody is provided herein, wherein the antibody specifically binds the tip region of a DNABII peptide (including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, and/or the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}). Also, provided is a fragment of an antibody disclosed herein. In one ~~embodiment~~example, the fragment is antigen binding fragment selected from the group of Fab, F(ab')₂, Fab', scFv, or Fv. In a further ~~embodiment~~example, the fragment specifically binds the tip region of a DNABII peptide.

[0018] Further provided are formulations comprising the Fab fragment.

[0019] In another ~~aspect~~example, the antibody or fragment thereof is modified. Non-limiting examples of modifications include PEGylation, a PEG mimetic, polysialylation, HESylation or glycosylation.

[0020] The antibodies and antigen binding fragments can be detectably labeled or comprise a detectable label and/or a purification marker.

[0021] Also provided herein are polypeptides comprising, consisting essentially of or consisting of, a complementarity-determining region (CDR) of an antibody or antigen binding fragment or region as disclosed above. The CDR can be selected from the group of CDR1, CDR2 or CDR3. The CDRs can be detectably labeled or comprise a detectable label and/or a purification marker.

[0022] Further provided are isolated polypeptides, wherein the polypeptides comprise, consist essentially of, or yet further consist of, an amino acid sequence selected from the group of: SEQ ID NOs: 1-14 or 24-27; amino acid (aa) 25 to aa 144 of SEQ ID NOs: 1-6, 13, 24 or 26; aa 21 to aa 132 of SEQ ID NOs: 7-9, 14 or 25; aa 21 to aa 126 of SEQ ID NOS: 10-12 or 27; or an equivalent of each thereof. Also provided is an isolated polypeptide comprising, or alternatively consisting essentially of, or yet further consisting of one or more of amino acid sequences of the antibodies or fragments thereof as disclosed herein. The polypeptides can be detectably labeled and/or comprise a detectable label and/or a purification marker. In a further ~~embodiment~~example, the polypeptides further comprise a signal peptide.

[0023] Further provided are isolated polynucleotides encoding the antibodies or antigen binding fragments thereof, or the CDRs of the antigen binding fragments or antibodies, as well as the polypeptides of this disclosure, or an equivalent of each thereof, that are optionally operatively linked to a promoter and/or enhancer element. The polynucleotides can be detectably labeled and/or comprise a detectable label and/or a purification marker. The polynucleotides can further comprise a signal peptide polynucleotide sequence located upstream of the immunoglobulin variable domain of the antibody. They can be contained within a vector and/or a host cell. Thus, further provided is a vector comprising, or alternatively consisting essentially of, or yet further consisting of one or more of the isolated polynucleotides as disclosed herein. Such vector may be a plasmid or a viral vector, optionally selected from a group consisting of a retroviral vector, a lentiviral vector, an

adenoviral vector, and an adeno-associated viral vector. Also provided is a host cell comprising one or more of the polynucleotides and/or the vectors as disclosed herein.

[0024] Further provided are compositions comprising, or alternatively consisting of, or yet further consisting of, a carrier and one or more of: the antibody or fragment thereof, the CDRs, the polypeptides, the isolated polynucleotides, the vectors, or the host cells. In one embodimentexample, the carrier is a pharmaceutically acceptable carrier. Additionally or alternatively, the carrier is a solid phase carrier or a solid phase support. In another embodimentexample, the carrier is suitable for use in an industrial setting. Also provided is a non-physiological surface coated with an antibody or a thereof as disclosed herein. In one embodimentexample, the surface is in an industrial setting. In certain embodimentexamples, the fragment is an antigen binding fragment.

[0025] Also provided are methods to produce the antibodies, fragments, CDRs, or polypeptides comprising, or alternatively consisting of, or yet further consisting of, culturing a host cell comprising a polynucleotide encoding the antibody, antigen binding fragment, polypeptide, or CDR under conditions for expression of the polynucleotide, and optionally isolating the antibody, fragment, CDR and/or polypeptide from the cell and/or culture. In one embodimentexample, the host cell is a mammalian cell.

[0026] In one aspectexample, provided is a method for inhibiting or competing with the binding of a DNABII polypeptide or protein to a microbial DNA. The method comprises or consists essentially of, or yet further consists of contacting the DNABII polypeptide or protein with one or more of an antibody, a fragment thereof, a polypeptide, or a CDR as disclosed herein. In one embodimentexample, the antibody, fragment thereof, polypeptide, or CDR binds a tip region of a DNABII peptide (including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, and/or the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}). In a further embodimentexample, the antibody, fragment thereof, polypeptide, or CDR binds the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}. In yet a further embodimentexample, the contacting is in vivo or in vitro.

[0027] In another aspectexample, provided is a method to disrupt a biofilm. The method comprises or consists essentially of, or yet further consists of contacting the biofilm with one or more of an antibody, a fragment thereof, a polypeptide, or a CDR as disclosed herein. In one embodimentexample, the antibody, fragment thereof, polypeptide, or CDR binds a tip region of a DNABII peptide (including but not limited to: a tip region of IHF or HU, a tip region of

IHFA or IHFB, the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}). In a further ~~embodiment~~example, the antibody, fragment thereof, polypeptide, or CDR binds the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}. In yet a further ~~embodiment~~example, the contacting is in vivo or in vitro.

[0028] Yet further provided are methods to prevent formation of, or to disrupt a biofilm on a surface comprising, or alternatively consisting of, or yet further consisting of, treating the surface susceptible to or containing a biofilm with, e.g., one or more of the antibody, antigen binding fragment, polypeptide, or CDR as described herein, wherein the antibody, fragment thereof, polypeptide, or CDR binds a tip region of a DNABII peptide (including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}). In a further ~~embodiment~~example, the antibody, fragment thereof, polypeptide, or CDR binds the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}. In yet a further ~~embodiment~~example, the treating is in vivo or in vitro.

[0029] Also further provided are methods to detect a biofilm on a surface comprising, or alternatively consisting of, or yet further consisting of, contacting the surface (in one ~~aspect~~example susceptible to or containing a biofilm) with one or more of the antibody, antigen binding fragment, polypeptide or CDR as described herein, wherein the antibody, fragment thereof, polypeptide or CDR binds a tail or tip region of a DNABII peptide (including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}, tail region of IHF or HU, a tail region of IHFA or IHFB, and/or or the tail-chimeric peptide IhfA3-IhfB2_{NTHI}). In a further ~~embodiment~~example, the antibody, fragment thereof, polypeptide, or CDR binds the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}. In one ~~embodiment~~example, the contacting is in vivo or in vitro.

[0030] In one ~~aspect~~example, provided is a method for detecting a microbial infection that produces a biofilm in a subject. The method comprises, or alternatively consists of, or yet further consists of contacting one or more of the antibody, fragment thereof, polypeptide, or CDR as disclosed herein with a biological sample suspected of comprising the biofilm and isolated from the subject and detecting the binding of the antibody, fragment thereof, polypeptide, or CDR to any biofilm in the sample. The amount can be determined by the treating physician or veterinarian, e.g., an effective amount for the subject. In one ~~embodiment~~example, the antibody, fragment thereof, polypeptide or CDR binds a tail or tip region of a DNABII peptide (including but not limited to: a tip region of IHF or HU, a tip region of

IHFA or IHFB, the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}, a tail region of IHF or HU, a tail region of IHFA or IHFB, and/or the tail-chimeric peptide IhfA3-IhfB2_{NTHI}). In a further embodimentexample, the contacting is in vivo or in vitro.

[0031] In another aspectexample, provided is a method for screening subjects having a biofilm, comprising or alternatively consisting of, or yet further consisting of, contacting one or more of an antibody, a fragment thereof, a polypeptide, or a CDR as disclosed herein with a biological sample comprising the biofilm and isolated from the subject, and detecting the binding of the antibody, fragment thereof, polypeptide, or CDR to any biofilm in the sample. In one embodimentexample, the antibody, fragment thereof, polypeptide or CDR binds a tail or tip region of a DNABII peptide (including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}, a tail region of IHF or HU, a tail region of IHFA or IHFB, and/or the tail-chimeric peptide IhfA3-IhfB2_{NTHI}). In a further embodimentexample, a subject detected with the binding is selected for administration with one or more of an antibody, a fragment thereof, a polypeptide, or a CDR as disclosed herein, and/or one or more of a polynucleotide or a vector encoding the antibody, fragment thereof, polypeptide or CDR, wherein the antibody, fragment thereof, polypeptide, or CDR binds a tip region of a DNABII peptide (including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, and/or the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}). The amount can be determined by the treating physician or veterinarian, e.g., an effective amount for the subject. In yet a further embodimentexample, the contacting is in vivo or in vitro.

[0032] Provided herein are methods to detect a biofilm in a subject by administering to the subject one or more of the antibody or the fragment thereof as disclosed herein, and detecting any binding of the antibody, the fragment thereof, polypeptide or CDR as disclosed herein to the biofilm. In one aspectexample, the antibody, fragment thereof, polypeptide or CDR binds a tail or tip region of a DNABII peptide (including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}, a tail region of IHF or HU, a tail region of IHFA or IHFB, and/or the tail-chimeric peptide IhfA3-IhfB2_{NTHI}). In another embodimentexample, the method further comprises detecting binding of the antibody, fragment thereof, polypeptide or CDR to the biofilm.

[0033] In one aspectexample, methods to prevent or disrupt a biofilm in a subject are provided, comprising, or alternatively consisting of, or yet further consisting of, administering to the

subject one or more of the antibody, fragment thereof, polypeptide, or CDR as disclosed herein, and/or one or more of a polynucleotide or a vector encoding the antibody, fragment thereof, polypeptide or CDR, wherein such binds to a tip region of a DNABII peptide (including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, and/or the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}). The amount can be determined by the treating physician or veterinarian, e.g., an effective amount for the subject. In one

embodimentexample, the method further comprises detecting a biofilm by contacting one or more of an antibody, a fragment thereof, a polypeptide, or a CDR as disclosed herein with a sample suspected of containing a biofilm, and detecting the binding of the biofilm and the antibody, fragment thereof, polypeptide, or CDR, and wherein the antibody, fragment thereof, polypeptide, or CDR binds to the tip region or the tail region of a DNABII peptide (including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}, a tail region of IHF or HU, a tail region of IHFA or IHFB, and/or the tail-chimeric peptide IhfA3-IhfB2_{NTHI}).

[0034] In another aspectexample, methods for inhibiting, preventing or treating a microbial infection that produces a biofilm in a subject are provided, comprising, or alternatively consisting of, or yet further consisting of, administering to the subject one or more of the antibody, fragment thereof, polypeptide, or CDR as disclosed herein, and/or of one or more of a polynucleotide or a vector encoding the antibody, fragment thereof, polypeptide or CDR, wherein such binds to a tip region of a DNABII peptide (including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, and/or the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}). The amount can be determined by the treating physician or veterinarian, e.g., an effective amount for the subject. In one

embodimentexample, the method further comprises detecting a biofilm by contacting one or more of an antibody, a fragment thereof, a polypeptide, or a CDR as disclosed herein with a sample suspected of containing a biofilm, and detecting the binding of the biofilm and the antibody, fragment thereof, polypeptide, or CDR, and wherein the antibody, fragment thereof, polypeptide, or CDR binds to the tip region or the tail region of a DNABII peptide (including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}, a tail region of IHF or HU, a tail region of IHFA or IHFB, and/or the tail-chimeric peptide IhfA3-IhfB2_{NTHI}).

[0035] In yet another aspectexample, methods to prevent or treat a condition characterized by the formation of biofilm in a subject are provided by administering to the subject one or more of

the antibody, the fragment thereof, polypeptide, or CDR as disclosed herein, and/or one or more of a polynucleotide or a vector encoding the antibody, fragment thereof, polypeptide or CDR, wherein such binds to a tip region of a DNABII peptide (including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, and/or the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}). The amount can be determined by the treating physician or veterinarian, e.g., an effective amount for the subject. Non-limiting examples of condition include chronic non-healing wounds, infections of the lung due to *Burkholderia* sp., venous ulcers, diabetic foot ulcers, ear infections, sinus infections, urinary tract infections, gastrointestinal tract ailments, hospital acquired pneumonia, ventilator-associated pneumonia, surgical implant-associated infections, pulmonary infections, respiratory tract infections, cystic fibrosis, chronic obstructive pulmonary disease, catheter-associated infections, indwelling devices associated infections, infections associated with implanted prostheses, osteomyelitis, cellulitis, abscesses, and periodontal disease. In one ~~embodiment~~example, the method further comprises detecting a biofilm by contacting one or more of an antibody, a fragment thereof, a polypeptide, or a CDR as disclosed herein with a sample suspected of containing a biofilm, and detecting the binding of the biofilm and the antibody, fragment thereof, polypeptide, or CDR, and wherein the antibody, fragment thereof, polypeptide, or CDR binds to the tip region or the tail region of a DNABII peptide (including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}, a tail region of IHF or HU, a tail region of IHFA or IHFB, and/or the tail-chimeric peptide IhfA3-IhfB2_{NTHI}).

[0036] In certain ~~embodiment~~examples of a method disclosed herein, administration of one or more of the antibody, fragment thereof, polypeptide, or CDR reduces one or more of pro-inflammatory cytokines in the subject. Non-limiting examples of the pro-inflammatory cytokines includes: IL-1 β , IL6, IL8, IL12p70, IL17A, Interferon (IFN) and tumor necrosis factor (TNF). Additionally or alternatively, administration of one or more of the antibody, fragment thereof, polypeptide, or CDR increases one or more of anti-inflammatory cytokines in the subject. In one ~~embodiment~~example, the anti-inflammatory cytokines include, but are not limited to, IL10, IL13, IL-1ra, IL-4, IL-11, and transforming growth factor - β (TGF- β).

[0037] Also provided is a method for conferring passive immunity in a subject, comprising, or alternatively consisting essentially of, or yet further consisting of administering to the subject one or more of an antibody, fragment thereof of, polypeptide, or CDR as disclosed

herein, and/or one or more of a polynucleotide or a vector encoding the antibody, fragment thereof, polypeptide or CDR, wherein the antibody, fragment, polypeptide or CDR binds to a tip region of a DNABII peptide (including but not limited to: a tip region of IHF or HU, a tip region of IHFA or IHFB, and/or the tip-chimeric peptide IhfA5-mIhfB4_{NTHI}). The amount can be determined by the treating physician or veterinarian, e.g., an effective amount for the subject.

[0038] In one aspectexample, the therapeutic methods are combined with diagnostic methods to detect and/or monitor biofilm formation and disruption, using an antibody, a fragment thereof, a polypeptide or a CDR as disclosed herein.

[0039] In certain embodimentexamples, the biofilm is derived from (i.e., produced by) a gram negative or a gram positive biofilm producing bacteria. In certain embodimentexamples, the biofilm comprises a DNABII protein. In a further embodimentexample, the biofilm comprises a histone-like protein from E. coli strain U93 (HU) or an integration host factor (IHF) binding protein. In certain embodimentexamples, the DNABII peptide is an IHF peptide. Additionally or alternatively, the DNABII peptide is an HU peptide. In certain embodimentexamples, the tip region of DNABII peptide is the tip region of IHFA and/or the tip region of IHFB. In a further embodimentexample, the tip region of DNABII peptide is an IHFA tip region conjugated directly or indirectly (for example via a linker) to an IHFB tip region. In yet a further embodimentexample, the tip region of DNABII peptide is the IhfA5-mIhfB4_{NTHI} Tip chimeric peptide. In certain embodimentexamples, the tail region of DNABII peptide is the tail region of IHFA and/or the tail region of IHFB. In a further embodimentexample, the tail region of DNABII peptide is an IHFA tail region conjugated directly or indirectly (for example via a linker) to an IHFB tail region. In yet a further embodimentexample, the tail region of DNABII peptide is the IhfA3-IhfB2_{NTHI} Tail chimeric peptide.

[0040] Yet further provided are methods to prepare an interfering nucleic acid, or alternatively consisting of, or yet further consisting of, preparing a nucleic acid consisting of about 10-20 nucleotides that specifically binds a specific binding partner to the antibody or fragment thereof as disclosed herein, and optionally isolating the interfering nucleic acid prepared by the method.

[0041] In another aspectexample, provided herein is a non-physiological surface coated with one or more of an antibody, a fragment thereof, a polypeptide, or a CDR as disclosed herein, and optionally, wherein in one aspectexample, the surface is in an industrial setting.

WHAT IS CLAIMED:

1. An antibody or a fragment thereof comprising:
 - (i) a heavy chain (HC) immunoglobulin variable domain sequence comprising a sequence of amino acid (aa) 25 to aa 144 of SEQ ID NO: 13 or an equivalent thereof; and
 - (ii) a light chain (LC) immunoglobulin variable domain sequence comprising a sequence of aa 21 to aa 132 of SEQ ID NO: 14 or an equivalent thereof.
2. The antibody or a fragment thereof of claim 1, wherein the antibody comprises:
 - (i) a heavy chain (HC) immunoglobulin variable domain sequence comprising a sequence of aa 25 to aa 144 of SEQ ID NO: 24 or an equivalent thereof; and
 - (ii) a light chain (LC) immunoglobulin variable domain sequence comprising a sequence of aa 21 to aa 132 of SEQ ID NO: 25 or an equivalent thereof.
3. The antibody or a fragment thereof of claim 1, wherein the antibody comprises:
 - (i) a heavy chain (HC) immunoglobulin variable domain sequence comprising a sequence of aa 25 to aa 144 of SEQ ID NO: 26 or an equivalent thereof; and
 - (ii) a light chain (LC) immunoglobulin variable domain sequence comprising a sequence of aa 21 to aa 126 of SEQ ID NO: 27, or an equivalent thereof.
4. The antibody or a fragment thereof of claim 1 or 2, wherein the heavy chain (HC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 25 to aa 144 of SEQ ID NO: 1 or an equivalent thereof, and wherein the light chain (LC) immunoglobulin variable domain sequence comprises an amino acid sequence selected from the group of: aa 21 to aa 132 of SEQ ID NOs: 7-9, or an equivalent of each thereof.
5. The antibody or a fragment thereof of claim 1, 2, or 4, wherein the heavy chain (HC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 25 to aa 144 of SEQ ID NO: 1 or an equivalent thereof, and wherein the light chain

- (LC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 21 to aa 132 of SEQ ID NO: 7 or an equivalent thereof.
6. The antibody or a fragment thereof of claim 1, 2, or 4, wherein the heavy chain (HC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 25 to aa 144 of SEQ ID NO: 1 or an equivalent thereof, and wherein the light chain (LC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 21 to aa 132 of SEQ ID NO: 8 or an equivalent thereof.
 7. The antibody or a fragment thereof of claim 1, 2, or 4, wherein the heavy chain (HC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 25 to aa 144 of SEQ ID NO: 1 or an equivalent thereof, and wherein the light chain (LC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 21 to aa 132 of SEQ ID NO: 9 or an equivalent thereof.
 8. The antibody or a fragment thereof of claim 1 or 2, wherein the heavy chain (HC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 25 to aa 144 of SEQ ID NO: 2 or an equivalent thereof, and wherein the light chain (LC) immunoglobulin variable domain sequence comprises an amino acid sequence aa 21 to aa 132 of SEQ ID of NO: 7 or an equivalent thereof.
 9. The antibody or a fragment thereof of claim 1 or 2, wherein the heavy chain (HC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 25 to aa 144 of SEQ ID NO: 2 or an equivalent thereof, and wherein the light chain (LC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 21 to aa 132 of SEQ ID NO: 8 or an equivalent thereof.
 10. The antibody or a fragment thereof of claim 1 or 2, wherein the heavy chain (HC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 25 to aa 144 of SEQ ID NO: 2 or an equivalent thereof, and wherein the light chain (LC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 21 to aa 132 of SEQ ID NO: 9 or an equivalent thereof.
 11. The antibody or a fragment thereof of claim 1 or 2, wherein the heavy chain (HC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 25 to aa 144 of SEQ ID NO: 3 or an equivalent thereof, and wherein the light chain

- (LC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 21 to aa 132 of SEQ ID NO: 7 or an equivalent thereof.
12. The antibody or a fragment thereof of claim 1 or 2, wherein the heavy chain (HC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 25 to aa 144 of SEQ ID NO: 3 or an equivalent thereof, and wherein the light chain (LC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 21 to aa 132 of SEQ ID NO: 8 or an equivalent thereof.
 13. The antibody or a fragment thereof of claim 1 or 2, wherein the heavy chain (HC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 25 to aa 144 of SEQ ID NO: 3 or an equivalent thereof, and wherein the light chain (LC) immunoglobulin variable domain sequence comprises an amino acid sequence of aa 21 to aa 132 of SEQ ID NO: 9 or an equivalent thereof.
 14. The antibody or a fragment thereof of any one of claims 1, 2, and 4-13, wherein the antibody comprises:
 - (i) CDRs 1-3 of a sequence selected from the group of: SEQ ID NOs: 1-6, or an equivalent of each thereof; and
 - (ii) CDRs 1-3 of a sequence selected from the group of: SEQ ID NOs: 7-12, or an equivalent of each thereof.
 15. An antibody or a fragment thereof comprising:
 - (i) a heavy chain complementarity-determining region 1 (CDRH1) comprising a sequence of GFTFRTY (aa 50 to aa 56 of SEQ ID NO: 1 or 2 or 3 or 24);
 - (ii) a heavy chain complementarity-determining region 2 (CDRH2) comprising a sequence of GSDRRH (aa 76 to aa 81 of SEQ ID NO: 1 or 2 or 3 or 24);
 - (iii) a heavy chain complementarity-determining region 3 (CDRH3) comprising a sequence of VGPYDGYGGEFDY (aa 121 to aa 133 of SEQ ID NO: 1 or 2 or 3 or 24);

- (iv) a light chain complementarity-determining region 1 (CDRL1) comprising a sequence of QSLDSDGKTF (aa 47 to aa 57 of SEQ ID NO: 7 or 8 or 9 or 25);
 - (v) a light chain complementarity-determining region 2 (CDRL2) comprising a sequence of LVS (aa 75 to aa 77 of SEQ ID NO: 7 or 8 or 9 or 25); and
 - (vi) a light chain complementarity-determining region 3 (CDRL3) comprising a sequence of WQGTHFP (aa 114 to aa 120 of SEQ ID NO: 7 or 8 or 9 or 25).
16. The antibody or a fragment thereof of claim 15, wherein the CDRL3 comprises a sequence of WQGTHFPYT (aa 114 to aa 122 of SEQ ID NO: 7 or 8 or 9 or 25).
17. The antibody or a fragment thereof of claim 15 or 16, wherein the antibody comprises:
- (i) a heavy chain complementarity-determining region 1 (CDRH1) comprising a sequence of GFTFRTYA (aa 50 to aa 57 of SEQ ID NO: 1 or 2 or 3 or 24);
 - (ii) a heavy chain complementarity-determining region 2 (CDRH2) comprising a sequence of IGSDRRHT (aa 75 to aa 82 of SEQ ID NO: 1 or 2 or 3 or 24);
 - (iii) a heavy chain complementarity-determining region 3 (CDRH3) comprising a sequence of VGPYDGYGGEFDY (aa 121 to aa 133 of SEQ ID NO: 1 or 2 or 3 or 24);
 - (iv) a light chain complementarity-determining region 1 (CDRL1) comprising a sequence of QSLDSDGKTF (aa 47 to aa 57 of SEQ ID NO: 7 or 8 or 9 or 25);
 - (v) a light chain complementarity-determining region 2 (CDRL2) comprising a sequence of LVS (aa 75 to aa 77 of SEQ ID NO: 7 or 8 or 9 or 25); and
 - (vi) a light chain complementarity-determining region 3 (CDRL3) comprising a sequence of WQGTHFPYT (aa 114 to aa 122 of SEQ ID NO: 7 or 8 or 9 or 25).

18. The antibody or a fragment thereof of any one of claims 15, 16 and 17, wherein the antibody comprises:
- (i) a heavy chain complementarity-determining region 1 (CDRH1) comprising a sequence of aASGFTFRTYAMS (aa 47 to aa 59 of SEQ ID NO: 24), wherein the small letter a is A (aa 47 to aa 59 of SEQ ID NO: 1 or 2) or wherein the small letter a is K (aa 47 to aa 59 of SEQ ID NO: 3);
 - (ii) a heavy chain complementarity-determining region 2 (CDRH2) comprising a sequence of TIGSDRRHTY (aa 74 to aa 83 of SEQ ID NO: 1 or 2 or 3 or 24);
 - (iii) a heavy chain complementarity-determining region 3 (CDRH3) comprising a sequence of VGPYDGYGGEFDY (aa 121 to aa 133 of SEQ ID NO: 1 or 2 or 3 or 24);
 - (iv) a light chain complementarity-determining region 1 (CDRL1) comprising a sequence of rSSQSLLDSDGKTFLN (aa 44 to aa 59 of SEQ ID NO: 25), wherein the smaller letter r is R (aa 44 to aa 59 of SEQ ID NO: 7 or 8) or wherein the smaller letter r is K (aa 44 to aa 59 of SEQ ID NO: 9);
 - (v) a light chain complementarity-determining region 2 (CDRL2) comprising a sequence of YLVSKIDS (aa 74 to aa 81 of SEQ ID NO: 25), wherein the smaller letter l is L (aa 74 to aa 81 of SEQ ID NO: 7 or 9) or wherein the smaller letter l is R (aa 74 to aa 81 of SEQ ID NO: 8); and
 - (vi) a light chain complementarity-determining region 3 (CDRL3) comprising a sequence of WQGTHFPYT (aa 114 to aa 122 of SEQ ID NO: 7 or 8 or 9 or 25).
19. An antibody or a fragment thereof comprising:
- (i) a heavy chain complementarity-determining region 1 (CDRH1) comprising a sequence of GFTFSRY (aa 50 to aa 56 of SEQ ID NO: 4 or 5 or 6 or 26);
 - (ii) a heavy chain complementarity-determining region 2 (CDRH2) comprising a sequence of SSGGSY (aa 76 to aa 81 of SEQ ID NO: 4 or 5 or 6 or 26);

- (iii) a heavy chain complementarity-determining region 3 (CDRH3) comprising a sequence of ER (aa 121 to aa 122 of SEQ ID NO: 4 or 5 or 6 or 26);
 - (iv) a light chain complementarity-determining region 1 (CDRL1) comprising a sequence of QDISNY (aa 47 to aa 52 of SEQ ID NO: 10 or 11 or 12 or 27);
 - (v) a light chain complementarity-determining region 2 (CDRL2) comprising a sequence of YTS (aa 70 to aa 72 of SEQ ID NO: 10 or 11 or 12 or 27); and
 - (vi) A light chain complementarity-determining region 3 (CDRL3) comprising a sequence of QQ (aa 109 to aa 110 of SEQ ID NO: 10 or 11 or 12 or 27).
20. The antibody or a fragment thereof of any one of claims 1-19, wherein the antibody further comprises a constant region selected from the group of: an IgA constant region, an IgD constant region, an IgE constant region, an IgG constant region or an IgM constant region.
 21. The antibody or a fragment thereof of claim 20, wherein the constant region is an IgG1 constant region.
 22. An antigen binding fragment of the antibody of any one of claims 1-21.
 23. The antigen binding fragment of claim 22, wherein the antigen binding fragment is selected from the group of Fab, F(ab')₂, Fab', scFv, or Fv.
 24. The antibody or a fragment thereof of any one of claims 1-23, wherein an equivalent to an amino acid sequence comprises a polypeptide having at least 80% amino acid identity to the amino acid, or wherein an equivalent to the amino acid sequence comprises a polypeptide that is encoded by a polynucleotide that hybridizes under conditions of high stringency to the complement of the polynucleotide encoding the amino acid sequence.
 25. The antibody or a fragment thereof of any one of claims 1-24 or the antigen binding fragment of claim 41 or 42, wherein the antibody or fragment thereof is modified, and optionally wherein the modification is selected from the group of PEGylation, a PEG mimetic, polysialylation, HESylation or glycosylation.

26. An isolated polynucleotide encoding the antibody or a fragment thereof of any one of claims 1-21, 24 and 25, the antigen binding fragment of claim 22 or 23 or an equivalent of each thereof, and optionally operatively linked to a promoter and enhancer element.
27. A vector comprising an isolated polynucleotide of claim 26.
28. A host cell comprising the polynucleotide of claim 26, or the vector of claim 27.
29. A composition comprising a carrier and one or more of: an antibody or a fragment thereof of any of claims 1-25, an isolated polynucleotide of claim 26, a vector of claim 27, or a host cell of claim 28.
30. A method of producing an antibody or a fragment thereof of any one of claims 1-25, comprising culturing a host cell comprising a polynucleotide encoding the antibody or fragment under conditions for expression of the antibody or fragment, and optionally isolating the antibody or fragment thereof.
31. An *ex vivo* method for inhibiting or competing with the binding of a DNABII polypeptide or protein to a microbial DNA, comprising contacting the DNABII polypeptide or protein with an antibody or a fragment thereof of any one of claims 1, 2, 4-18 and 20-25, wherein the antibody or fragment thereof binds a tip region of a DNABII peptide.
32. An *ex vivo* method to disrupt a biofilm, comprising contacting the biofilm with an antibody or a fragment thereof of any one of claims 1, 2, 4-18 and 20-25, wherein the antibody or fragment thereof binds a tip region of a DNABII peptide.
33. An *ex vivo* method to prevent formation of or to disrupt a biofilm on a surface comprising treating the surface susceptible to or containing a biofilm with an antibody or a fragment thereof of any one of claims 1, 2, 4-18 and 20-25, wherein the antibody or fragment thereof binds a tip region of a DNABII peptide.
34. Use of A method to prevent or disrupt a biofilm in a subject, comprising administering to the subject an antibody or a fragment thereof of any one of claims 1, 2, 4-18 and 20-25 in the manufacture of a medicament for preventing or disrupting a biofilm in a subject, wherein the antibody or fragment thereof binds to a tip region of a DNABII peptide.

35. ~~Use of A method for inhibiting, preventing or treating a microbial infection that produces a biofilm in a subject, comprising administering to the subject an antibody or a fragment thereof of any one of claims 1, 2, 4-18 and 20-25 in the manufacture of a medicament for inhibiting, preventing or treating a microbial infection that produces a biofilm in a subject, wherein the antibody or fragment thereof binds to a tip region of a DNABII peptide.~~
36. ~~Use of A method to treat a condition characterized by the formation of a biofilm in a subject, comprising administering to the subject an antibody or a fragment thereof of any of claims 1, 2, 4-18 and 20-25 in the manufacture of a medicament for treating a condition characterized by the formation of a biofilm in a subject, wherein the antibody or fragment thereof binds to a tip region of a DNABII peptide.~~
37. ~~A method to detect a biofilm in a subject, comprising administering to the subject~~Use of an antibody or a fragment thereof of any one of claims 1, 2, 4-18 and 20-25 in the manufacture of a medicament for 1-25, and detecting binding of the antibody or the fragment to the biofilm if present, wherein the antibody or fragment thereof bind to a tip region of a DNABII peptide.
38. ~~Use of A method for conferring passive immunity in a subject, comprising administering to the subject an antibody or a fragment thereof of any one of claims 1, 2, 4-18 and 20-25 that binds to a tip region of a DNABII peptide, in the manufacture of a medicament for conferring passive immunity in a subject.~~
39. A non-physiological surface coated with an antibody or a fragment thereof of any of claims 1-25; and optionally, wherein the surface is in an industrial setting.
40. A kit comprising one or more of: an antibody or a fragment thereof of any one of claims 1-25, a polynucleotide of claim 26, a vector of claim 27, the host cell of claim 28, or the composition of claim 29; and optionally instructions for use.