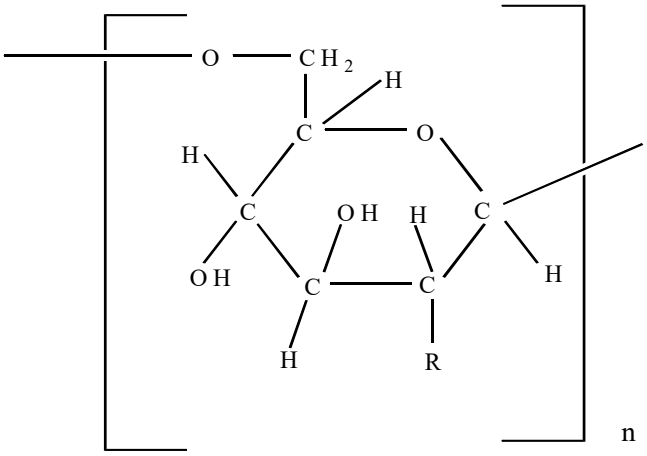
CLAIMS

1. Use of an isolated polysaccharide having the formula



wherein n is at least 5, R is selected from the group consisting of -NH-CO-CH_3 and -NH_2, provided that less than 50% of the R groups are -NH-CO-CH_3 in the preparation of a pharmaceutical composition for inducing an immune response against a pathogen in a subject having or at risk of developing an infection by the pathogen, wherein the pathogen is selected from:

(a) *S. pneumonia*, Group A *Streptococcus*, Group B *Streptococcus*, and *Enterococcus,*

(b) *Listeria*, *Clostridium difficile*, *B. subtilis*, *M. tuberculosis*, or *M. smegmatis*,

(c) *Neisseria meningitides*, *Neisseria gonorrhoeae*, Non-typable *H. influenzae*, *Helicobacter*, or *Campylobacter*,

(d) *Bacteroides fragilis, B. thetaiotamicron, B. vulgatis, Citrobacter rodentium, Vibrio cholera, Salmonella enterica* serovar typhi, or *Salmonella enterica* serovar typhimurium,

(e) *Candida albicans* (yeast), *Candida albicans* (hyphae), *Aspergillus*, *Fusarium*, or *Cryptococcus,*

(f) *P. bergei* or *P. falciparum*, and

(g) *Trichomonas vaginalis*.

2. The use of claim 1 for treating a subject having an infection by the pathogen.

3. The use of claim 1 for preventing an infection in a subject at risk of developing an infection by the pathogen.

4. The use of any one of claims 1 to 3, wherein the isolated polysaccharide is conjugated to a carrier,

optionally wherein the isolated polysaccharide is conjugated to the carrier through a linker,

further optionally, wherein the carrier is a peptide carrier.

5. The use of any one of claims 1 to 4, wherein

(a) less than 30%, less than 20%, less than 10%, or less than 5% of R groups are –NH-CO-CH_3, and/or

(b) none of the R groups is –NH-CO-CH_3, and/or

(c) n is at least 15, at least 20, at least 50, at least 100, at least 200, at least 300, at least 400 or at least 500, and/or

(d) the isolated polysaccharide has a molecular weight of 100-500 kDa.

6. The use of any one of claims 1 to 5, wherein

the isolated polysaccharide is used with an adjuvant, and optionally formulated for

(a) systemic administration or

(b) local administration.

7. Use of a PNAG-specific antibody or an antigen-binding fragment thereof in the preparation of a pharmaceutical composition for inducing an immune response against a pathogen in a subject having or at risk of developing an infection by the pathogen, wherein the pathogen is selected from:

(a) *S. pneumonia*, Group A *Streptococcus*, Group B *Streptococcus*, and *Enterococcus,*

(b) *Listeria*, *Clostridium difficile*, *B. subtilis*, *M. tuberculosis*, or *M. smegmatis*,

(c) *Neisseria meningitides*, *Neisseria gonorrhoeae*, Non-typable *H. influenzae*, *Helicobacter*, or *Campylobacter*,

(d) *Bacteroides fragilis, B. thetaiotamicron, B. vulgatis, Citrobacter rodentium, Vibrio cholera, Salmonella enterica* serovar typhi, or *Salmonella enterica* serovar typhimurium,

(e) *Candida albicans* (yeast), *Candida albicans* (hyphae), *Aspergillus*, *Fusarium*, or *Cryptococcus,*

(f) *P. bergei* or *P. falciparum*, and

(g) *Trichomonas vaginalis*.

8. The use of claim 7 for treating a subject having an infection by the pathogen.

9. The use of claim 7 for preventing an infection in a subject at risk of developing an infection by the pathogen.

10. The use of any one of claims 7 to 9 wherein the antibody or antigen-binding fragment thereof is formulated for

(a) systemic administration or

(b) local administration,

optionally wherein the antibody or antigen-binding fragment thereof is

(a) F598 (ATCC PTA-5931) antibody or an antigen-binding fragment thereof,

(b) F628 (ATCC PTA-5932) antibody or an antigen-binding fragment thereof, or

(c) F630 (ATCC PTA-5933) antibody or an antigen-binding fragment thereof,

further optionally wherein the antibody or antigen-binding fragment thereof is conjugated to an agent, optionally wherein the agent is a cytotoxic agent.

11. The use of any one of the foregoing claims, wherein the subject is

(a) human or

(b) a primate, horse, cow, swine, goat, sheep, dog, or cat.

12. Use of any one of claims 1-11, wherein the pathogen is *Listeria*, *Clostridium difficile*, *B. subtilis*, *M. tuberculosis*, or *M. smegmatis*.

13. Use of any one of claims 1-11, wherein the pathogen is *Neisseria meningitides*, *Neisseria gonorrhoeae*, Non-typable *H. influenzae*, *Helicobacter*, or *Campylobacter*.

14. Use of any one of claims 1-11, wherein the pathogen is *Bacteroides fragilis, B. thetaiotamicron, B. vulgatis, Citrobacter rodentium, Vibrio cholera, Salmonella enterica* serovar typhi, or *Salmonella enterica* serovar typhimurium.

15. Use of any one of claims 1-11, wherein the pathogen is *Candida albicans* (yeast), *Candida albicans* (hyphae), *Aspergillus*, *Fusarium*, or *Cryptococcus*.

16. Use of any one of claims 1-11, wherein the pathogen is *S. pneumonia*.

17. Use of any one of claims 1-11, wherein the pathogen is Group A *Streptococcus*.

18. Use of any one of claims 1-11, wherein the pathogen is Group B *Streptococcus*.

19. Use of any one of claims 1-11, wherein the pathogen is *M. tuberculosis*.

20. Use of any one of claims 1-11, wherein the pathogen is *N. meningitidis*.

21. Use of any one of claims 1-11, wherein the pathogen is *N. gonorrhoeae*.

22. Use of any one of claims 1-11, wherein the pathogen is *Salmonella enterica* serovar typhi.

23. Use of any one of claims 1-11, wherein the pathogen is *Candida albicans* (yeast).

24. Use of any one of claims 1-11, wherein the pathogen is *Candida albicans* (hyphae).

25. Use of any one of claims 1-11, wherein the pathogen is *Aspergillus*.

26. Use of any one of claims 1-11, wherein the pathogen is *Fusarium*.

27. Use of any one of claims 1-11, wherein the pathogen is *Crytococcus*.

28. Use of any one of claims 1-11, wherein the pathogen is *P. falcipairum*.

29. A pharmaceutical composition comprising an effective amount of the isolated polysaccharide as defined in claims 1 to 6, and an adjuvant, for use in producing antibodies.

30. A method for detecting a non-*ica/pga* PNAG-positive pathogen, comprising

contacting a sample suspected of containing a non-*ica/pga* PNAG-positive pathogen with a PNAG-specific antibody or antibody fragment, and

detecting binding of the antibody or antibody fragment to the sample,

wherein binding of the antibody or antibody fragment indicates the non-*ica/pga* PNAG-positive pathogen is present in the sample,

optionally

(a) wherein the sample is Staphylococcus negative and/or

(b) wherein the sample is a biological sample from a subject, optionally wherein the biological sample is urine, blood, pus, skin, sputum, joint fluid, lymph, or milk, and/or

(c) wherein the antibody or antibody fragment is conjugated to a detectable label, wherein the non-ica/pga PNAG-positive pathogen is one that does not possess a nucleotide sequence occurring in the same contiguous stretch of chromosomal DNA and having at least 25% homology throughout the entire length of the nucleotide sequence of the ica locus deposited under AF086783, and the non-ica/pga PNAG-positive pathogen is one that does not possess a nucleotide sequence occurring in the same contiguous stretch of chromosomal DNA and having at least 25% homology to the totality of nucleotides sequences of the pga locus deposited under AAC74106.1, AAC74107.1, AAC74108.1 and AAC74109.