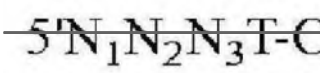
Claims

1. An oligodeoxynucleotide comprising humanized K type CpG oligodeoxynucleotide and poly deoxyadenylate, wherein the poly deoxyadenylate is placed on the 3′-side of the humanized K type CpG oligodeoxynucleotide.

2. The oligodeoxynucleotide according to claim 1, wherein the humanized K type CpG oligodeoxynucleotide has a length of not less than 10 nucleotides, and comprises a nucleotide sequence represented by the formula:



wherein CpG motif in the center is not methylated, W is A or T, and N_1, N_2, N_3, N_4, N_5 and N_6 may be any nucleotides.

3. The oligodeoxynucleotide according to claim 1 or 2, wherein the humanized K type CpG oligodeoxynucleotide consists of the nucleotide sequence shown by SEQ ID NO: 1.

4. The oligodeoxynucleotide according to any of claims 1 to 3, wherein phosphodiester bonds in the oligodeoxynucleotide are partly or entirely substituted by phosphorothioate bonds.

5. The oligodeoxynucleotide according to claim 4, wherein the phosphodiester bonds in the oligodeoxynucleotide are entirely substituted by phosphorothioate bonds.

6. The oligodeoxynucleotide according to any of claims 1 to 5, wherein the poly deoxyadenylate has a length of 20 – 60 nucleotides.

7. A complex comprising the oligodeoxynucleotide according to any of claims 1 to 6 and β-1,3-glucan.

~~8. The complex according to claim 7, wherein the β-1,3-glucan is lentinan, schizophyllan, sclereglucan, curdlan, pachyman, grifolan, or laminaran.~~

~~9. The complex according to claim 8, wherein the β-1,3-glucan is lentinan, schizophyllan or sclereglucan.~~

~~10. A complex consisting of an oligodeoxynucleotide described in the following (i), and β-1,3 glucan described in (ii):~~
~~(i) an oligodeoxynucleotide wherein poly deoxyadenylate of 20 - 60 nucleotide length is bound at the 3'-end of an oligodeoxynucleotide consisting of the nucleotide sequence shown by SEQ ID NO: 1, and all of the phosphodiester bonds are substituted by phosphorothioate bonds~~
~~(ii) lentinan or schizophyllan.~~

~~11. The complex according to any of claims 7 to 10, having a triple helix structure.~~

~~12. The complex according to any of claims 7 to 11, having an activity to activate B cells to produce IL-6, and an activity to activate dendritic cells to produce IFN-α.~~

~~13. A pharmaceutical composition comprising the oligodeoxynucleotide according to any of claims 1 to 6, or the complex according to any of claims 7 to 12.~~

~~14. The pharmaceutical composition according to claim 13, which is for the prophylaxis or treatment of virus infection, cancer, an allergic disease, or intracellular parasitic protozoan or bacterial infection.~~

~~15. The pharmaceutical composition according to claim 14, which is for the prophylaxis or treatment of virus infection.~~

16. The pharmaceutical composition according to claim 15, wherein the virus infection is RS virus or influenza virus infection.

17. An agent for inducing production of type I and/or type II interferon, comprising the complex according to any of claims 7 to 12.

18. An immunostimulating agent comprising the oligodeoxynucleotide according to any of claims 1 to 6, or the complex according to any of claims 7 to 12.

19. The immunostimulating agent according to claim 18, which is a vaccine adjuvant.

20. A prophylactic or therapeutic agent for virus infection, cancer, an allergic disease, or intracellular parasitic protozoan or bacterial infection, comprising the oligodeoxynucleotide according to any of claims 1 to 6, or the complex according to any of claims 7 to 12.

21. The prophylactic or therapeutic agent according to claim 20, wherein the virus infection is RS virus or influenza virus infection.

22. Use of the oligodeoxynucleotide according to any of claims 1 to 6, or the complex according to any of claims 7 to 12, for the production of a pharmaceutical composition.

23. The use according to claim 22, wherein the pharmaceutical composition is a pharmaceutical composition for the prophylaxis or treatment of virus infection, cancer, an allergic disease, or intracellular parasitic protozoan or bacterial infection.

24. The use according to claim 23, wherein the virus infection is

~~RS virus or influenza virus infection.~~

~~25. A method for the treatment or prophylaxis of a disease in a warm-blooded animal, comprising administering a pharmacologically effective amount of the oligodeoxynucleotide according to any of claims 1 to 6, or the complex according to any of claims 7 to 12 to the warm-blooded animal.~~

~~26. The method according to claim 25, wherein the disease is virus infection, cancer, an allergic disease, or intracellular parasitic protozoan or bacterial infection.~~

~~27. The method according to claim 26, wherein the virus infection is RS virus or influenza virus infection.~~

~~28. The method according to any of claims 25 to 27, wherein the warm-blooded animal is human.~~

~~29. A method of inducing a protective immune reaction in a warm-blooded animal, comprising administering a pharmacologically effective amount of the oligodeoxynucleotide according to any of claims 1 to 6, or the complex according to any of claims 7 to 12 to the warm-blooded animal.~~

~~30. The oligodeoxynucleotide according to any of claims 1 to 6, or the complex according to any of claims 7 to 12, for use for the treatment or prophylaxis of virus infection, cancer, an allergic disease, or intracellular parasitic protozoan or bacterial infection.~~

~~31. The oligodeoxynucleotide or complex according to claim 30, wherein the virus infection is RS virus or influenza virus infection.~~

~~32. A pharmaceutical composition comprising~~

~~(a) the oligodeoxynucleotide according to any of claims 1 to 6, or the complex according to any of claims 7 to 12, and~~

~~(b) an antigen.~~

~~33. The composition according to claim 32, which is for inducing an immune reaction to the antigen.~~

~~34. The composition according to claim 33, wherein the antigen is derived from a pathogen.~~

~~35. The composition according to claim 34, which is for the prophylaxis or treatment of infection with the pathogen.~~

~~36. The composition according to claim 35, wherein the pathogen is a virus.~~

~~37. The composition according to claim 36, wherein the virus is an RS virus or influenza virus.~~

Claims

1. A complex comprising:

an oligodeoxynucleotide that comprises humanized K type CpG oligodeoxynucleotide consisting of the nucleotide sequence shown by SEQ ID NO: 1 and poly deoxyadenylate, wherein the poly deoxyadenylate is placed on the 3'-side of the humanized K type CpG oligodeoxynucleotide, and

lentinan.

2. The complex according to claim 1, wherein phosphodiester bonds in the oligodeoxynucleotide are partly or entirely substituted by phosphorothioate bonds.

3. The complex according to claim 2, wherein the phosphodiester bonds in the oligodeoxynucleotide are entirely substituted by phosphorothioate bonds.

4. The complex according to any one of claims 1 to 3, wherein the poly deoxyadenylate has a length of 20 - 60 nucleotides.

5. A complex consisting of:

(i) an oligodeoxynucleotide wherein poly deoxyadenylate having a length of 20 - 60 nucleotides is bound at the 3'-end of an oligodeoxynucleotide consisting of the nucleotide sequence shown by SEQ ID NO: 1, and all of the phosphodiester bonds in the oligodeoxynucleotide are substituted by phosphorothioate bonds; and

(ii) lentinan

6. The complex according to any one of claims 1 to 5, wherein the complex has a triple helix structure.

7. The complex according to any one of claims 1 to 6, wherein the complex has an activity to activate B cells to produce IL-6, and an activity to activate dendritic cells to produce IFN-α.

8. A pharmaceutical composition comprising the complex according to any of claims 1 to 7.

9. The pharmaceutical composition according to claim 8, for use in the prophylaxis or treatment of virus infection, cancer, an allergic disease, or intracellular parasitic protozoan or bacterial infection.

10. The pharmaceutical composition according to claim 9, for use in the prophylaxis or treatment of virus infection.

11. The pharmaceutical composition according to claim 10, wherein the virus infection is RS virus or influenza virus infection.

12. An agent for inducing production of type I and/or type II interferon, comprising the complex according to any one of claims 1 to 7.

13. An immunostimulating agent comprising the complex according to any one of claims 1 to 7.

14. The immunostimulating agent according to claim 13, which is a vaccine adjuvant.

15. An agent for the prophylaxis or treatment of virus infection, cancer, an allergic disease, or intracellular parasitic protozoan or bacterial infection, comprising the complex according to any one of claims 1 to 7.

16. The agent according to claim 15, wherein the virus infection is RS virus or influenza virus infection.

17 A pharmaceutical composition comprising:
(a) the complex according to any one of claims 1 to 7, and (b) an antigen.

18. The composition according to claim 17, for use in the induction of an immune reaction to the antigen.

19. The composition according to claim 18, wherein the antigen is derived from a pathogen.

20. The composition according to claim 19, for use in the prophylaxis or treatment of infection with the pathogen.

21. The composition according to claim 20, wherein the pathogen is a virus.

22. The composition according to claim 21, wherein the virus is an RS virus or influenza virus.

23. Use of the complex according to any of claims 1 to 7, or the pharmaceutical composition according to any one of claims 8 to 11 or 17 to 22 in the manufacture of a medicament for the treatment or prophylaxis of virus infection, cancer, an allergic disease, or intracellular parasitic protozoan or bacterial infection.

24. The use according to claim 23, wherein the disease is virus infection.

25. The use according to claim 24, wherein the virus infection is RS virus or influenza virus infection.