cytarabine, cyclocytidine, hydroxyurea, and derivatives of the foregoing drugs;

In some embodiments, the antitumor antibiotic is selected from the group consisting of actinomycin, mitomycin, jaundice, doxorubicin, daunomycin, dactinomycin, bleomycin and derivatives of the foregoing drugs;

In some embodiments, the hormone drug is selected from the group consisting of a sex hormone, a corticosteroid hormone, and derivatives of the foregoing drugs.

In some embodiments, the substance that promotes mucosal immune absorption or mucosal adhesion is one or more selected from the group consisting of anionic surfactants (such as carboxylates, sulfonates, sulfates, phosphates, etc.), cationic surfactants (such as amine salts, quaternary ammonium salts, heterocycles, onium salts, etc.), zwitterionic surfactants (such as carboxylate type, sulfonate type, phosphate type, betaine type, imidazoline type, amino acid type, etc.), non-ionic surfactants (such as alkyl polyglycoside type, polyoxyethylene type, polyol type, alkanolamide type, block polyether type), special surfactants (such as fluorine-containing type, silicon-containing type, boron-containing type, polymer type, etc.), chelating agents (such as polyphosphate, aminocarboxylic acid, 1,3-diketone, hydroxycarboxylic acid, polyamine, etc.), adhesives [water-soluble adhesives (such as starch, dextrin, polyvinyl alcohol, carboxymethyl cellulose, etc.), hot melt adhesives (such as polyurethane, polystyrene, polyacrylate, ethylene-vinyl acetate copolymer, etc.), solvent adhesives (such as shellac, butyl rubber, etc.), emulsion adhesives (such as vinyl acetate resin, acrylic resin, chlorinated rubber, etc.), solvent-free liquid adhesives (such as epoxy resin, etc.)], polylactic acid-hydroxyacetic acid copolymer, dextran, and polysaccharide.

In some embodiments, the immunomodulator is one or more selected from the group consisting of cytokines, chemokines, stem cell growth factors, lymphotoxins, hematopoietic factors, colony stimulating factors (CSFs), interferons, erythropoietins, thrombopoietins, tumor necrosis factors (TNFs), interleukins (ILs), granulocyte-colony stimulating factors (G-CSFs), granulocyte macrophage-colony stimulating factors (GM-CSFs) and stem cell growth factors.

In some embodiments, the pathogenic antigen is selected from the group consisting of tumors, virus, bacterium, fungi or parasite antigens.

In some embodiments, the tumors include: tumors arising from any lesions in bone, bone connection, muscle, lung, trachea, pharynx, nose, heart, spleen, artery, vein, blood, capillary, lymph node, lymphatic vessel, lymphatic fluid, oral cavity, pharynx, esophagus, stomach, duodenum, small intestine, colon, rectum, anus, appendix, liver, gallbladder, pancreas, parotid gland, sublingual gland, urinary kidney, ureter, bladder, urethra, ovary, fallopian tube, uterus, vagina, vulva, scrotum, testes, vas deferens, penis, eyes, ears, nose, tongue, skin, brain, brainstem, medulla oblongata, spinal cord, cerebro-spinal fluid, nerves, thyroid, parathyroid gland, adrenal gland, pituitary gland, pineal gland, pancreatic islet, thymus, gonad, sublingual gland, and parotid gland.

In some embodiments, the bacterium includes one or more of *Staphylococcus*, *Streptococcus, Listeria*, *Erysipelothrix*,*Renibacterium*, *Bacillus*, *Clostridium*, *Mycobacterium*, *Actinomyces*, *Nocardia*, *Corynebacterium*, *Rhodococcus*, *Bacillus anthracis*, *erysipelas bacillus*, *Bacillus tetani*, *listeria monocytogenes*, *Bacillus perfringens*, *Bacillus gangraenae emphysematosae, tuberculosis*, *Escherichia coli*, *Bacterium proteus*, *Shigella dysenteriae*, *Pneumobacillus*, *Bacterium burgeri*, *Clostridium perfringens, Haemophilus influenzae*, *Haemophilus parainfluenzae*, *Moraxella catarrhalis*, *Acinetobacter*, *Yersinia, Legionella pneumophila*, *Bordetella pertussis*, *Bordetella parapertussis*, *Shigella, Pasteurella*, *Vibrio cholerae*, *and Vibrio Parahemolyticus*.

In some embodiments, the parasite includes one or more of parasites in the digestive tract (such as roundworms, hookworms, tapeworms, endoamoeba histolytica, and Yal's flagellum, etc.), intraluminal parasites (such as trichomonas vaginalis) , intrahepatic parasites (such as liver fluke, echinococcus), intrapulmonary parasites (such as paragonimus westermani), brain tissue parasites (such as Cysticercus cellulosae, toxoplasma gondii), intravascular parasites (such as schistosomiasis), intralymphatic parasites (such as filaria), muscle tissue parasites (such as Trichinella larvae), intracellular parasites (such as plasmodium, Leishmania), bone tissue parasites (such as hydatid; skin parasites, such as sarcoptid, follicle mite), and intraocular parasites (such as thelazia callipaeda, Cysticerecus cellulosaes).

In some embodiments, the viruse includes one or more of adeniviridae, arenaviridae, astroviridae, bunyaviridae, cliciviridae, flaviviridae, hepatitis delta virus, hepeviridae, mononegavirales, nidovirales, picornaviridae, orthomyxoviridae, papillomaviridae, parvoviridae, polyomaviridae, poxviridae, reoviridae, retroviridae, or

CLAIMS

1. A combination product for potentiating an immune response, comprising a polyinosinic-polycytidylic acid, at least one~~a~~ cationic stabilizer, and a soluble calcium salt ~~in a liquid reaction system~~;

wherein the cationic stabilizer is ~~a water-soluble non-antibiotic amino compound having a molecular weight of less than or equal to 5 kDa, or~~ a graft formed by ~~the~~a chitosan oligosaccharide~~water-soluble non-antibiotic amino compound~~ and one or more of methoxypolyethylene glycol, polyethylene glycol, and polyethylenimine~~, folic acid and galactose;~~, or

wherein the cationic stabilizer is chitosan oligosaccharide and polyethyleneimine;~~.~~

~~optionally, the water-soluble non-antibiotic amino compound is one or more selected from the group consisting of chitosan oligosaccharides, chitooligosaccharides, glucosamines, cationic liposomes, DEAE-dextran, polyacrylamide, polyamines, tetraaminofulvene, and polyethyleneimine;~~

~~optionally, the cationic stabilizer is selected from the group consisting of a chitosan oligosaccharide, a graft of chitosan oligosaccharide and methoxypolyethylene glycol, and a graft of chitosan oligosaccharide, methoxypolyethylene glycol and polyethyleneimine;~~

optionally, the graft has a molecular weight of less than or equal to 50 kDa;

optionally, the chitosan oligosaccharide has a degree of deacetylation that is greater than or equal to 70%;

optionally, the soluble calcium salt is $CaCl_2$ and/or $Ca(NO_3)_2$.~~;~~

optionally, the polyinosinic-polycytidylic acid has a molecular weight of 100 bp-3000 bp;

optionally, the polyinosinic-polycytidylic acid has a molecular weight of 100 bp-1500 bp;

optionally, the combination product further comprises one or more of a pH adjuster, sodium tripolyphosphate, sodium alginate, phenylboronic acid, catechol, buffer salt/reagent, and water.

2. A complex for potentiating an immune response, prepared from reagents in the combination product of claim 1.

3. The complex according to claim 2, wherein preparation is carried out in a solution system, and in the reagents, the polyinosinic-polycytidylic acid has a concentration of 0.1 mg/ml~10 mg/ml;

optionally, the concentration of the polyinosinic-polycytidylic acid is 0.5 mg/ml~5 mg/ml;

optionally, preparation is carried out in a solution system, and in the reagents, the cationic stabilizer has a concentration of 0.5 mg/ml~51.2 mg/ml;

optionally, the concentration of the cationic stabilizer is 0.8 mg/ml~25.6 mg/ml;

optionally, preparation is carried out in a solution system, and in the reagents, the concentration of calcium ions in the soluble calcium salt is 0.1 mM~1 mM.

4. The complex according to claim 2 or 3, wherein, the complex is stored in a solution;

optionally, the solution is a buffer solution;

optionally, the solution has a pH in a range of 5.0~7.2;

optionally, the solution has a pH in a range of 5.9~6.9.

5. The ~~non-therapeutic~~ use of the complex according to any one of claims 2 to 4 as an immune adjuvant.

6. The use of the complex according to any one of claims 2 to ~~5~~ 4 for preparing an antibody, a vaccine formulation or a vaccine composition, or for preparing a vaccine excipient or a vaccine adjuvant.

7. A vaccine composition comprising the complex according to any one of claims 2 to ~~6~~ 4 and at least one antigen;

optionally, the antigen is a virus, a bacterium, a protein, a polypeptide, a polysaccharide, a nucleic acid, or a small molecule-protein conjugate.

8. Use of the complex according to any one of claims 2 to ~~6~~ 4 in the preparation of a medicine for regulating immune cell activity, wherein the use is applied in vivo or in vitro;

optionally, the regulating immune cell activity is specifically potentiating immune cell activity;

optionally, the immune cell is selected from macrophages, lymphocytes, and dendritic cells;

optionally, regulating and potentiating immune cell activity is promoting immune cell releasing inflammatory factors;

optionally, the inflammatory factors include IL-2, IL-6, IL-12p40, IL-18, IL-22, IFN-α, IFN-γ, and TNF-α.

9. Use of the complex according to any one of claims 2 to ~~6~~ 4 in the preparation of drugs for treating and/preventing tumors, anti-virus, anti-bacteria, anti-fungus, anti-parasitism, reducing side effects of chemotherapy, resisting fatigue or improving immunity, relieving host pain, and promoting an immune response to an antigen in a host;

optionally, the drug is a dosage form of injection administration, a dosage form of respiratory administration, nasal drops, a dosage form of skin administration, a dosage form of mucosal administration, or a dosage form of cavitary administration;

optionally, the antigen includes a tumor, a virus, a bacterium, a fungus or a parasite antigen;

optionally, the host is a mammal;

optionally, the host is a primate;

optionally, the host is human;

optionally, when the antigen is a virus, a bacterium, a fungus, or a parasite antigen, the drug has an amount in a range of 1 mg ~8 mg per dose;

when the antigen is a tumor antigen, the drug has an amount in a range of 1 mg~10 mg per dose.

10. A pharmaceutical composition comprising the complex according to any one of claims 2 to ~~6~~4, wherein the pharmaceutical composition comprises ~~the~~ said complex ~~as described above~~, and the pharmaceutical composition further comprises one or more of an immune cell therapy drug, an antibody therapy drug, a chemical drug, a substance that promotes mucosal immune absorption or mucosal adhesion, an immunomodulator, a pathogen antigen, a pattern recognition receptor ligand, and a pharmaceutically acceptable salt or excipient.

11. The pharmaceutical composition according to claim 10, wherein the immune cell therapy drug is one or more selected from the group consisting of tumor infiltrating lymphocytes (TILs), dendritic cells (DCs), cytokine induced killer cells (CIKs), dendritic cells-cytokine induced killer cells (DCs-CIKs), natural killer cells (NKs), γδT cells, CD3AK, CAR-T and TCR-T.

12. The pharmaceutical composition according to claim 10 or 11, wherein the antibody therapeutic drug is selected from the group consisting of an anti-PD1 antibody, an anti-PDL1 antibody, an anti-CTLA4 antibody and an anti-CD antigen antibody.

13. The pharmaceutical composition according to any one of claims 10 to 12, wherein the chemical drug is one or more selected from the group consisting of an alkylating agent, an antimetabolity, an antitumor antibiotic, a plant antitumor drug, a hormone drug and a miscellaneous drug;

wherein the miscellaneous drug is selected from the group consisting of L-asparaginase, cisplatin, carboplatin, oxaliplatin, dacarbazine, hexamethylmelamine drugs, and derivatives of aforementioned drugs.

14. The pharmaceutical composition according to any one of claims 10 to 13, wherein the substance that promotes mucosal immune absorption or mucosal adhesion is one or more selected from the group consisting of anionic surfactants, cationic surfactants, zwitterionic surfactants, nonionic surfactants, special surfactants, chelating agents, adhesives, polylactic acid-glycolic acid copolymers, dextrans, and polysaccharides.

15. The pharmaceutical composition according to any one of claims 10 to 14, wherein the immunomodulator is one or more selected from the group consisting of cytokines, chemokines, stem cell growth factors, lymphotoxins, hematopoietic factors, colony stimulating factors (CSFs), interferons, erythropoietins, thrombopoietins, tumor necrosis factors (TNFs), interleukins (ILs), granulocyte-colony stimulating factors (G-CSFs), granulocyte macrophage-colony stimulating factors (GM-CSFs) and stem cell growth factors.

16. The pharmaceutical composition according to any one of claims 10 to 15, wherein the pathogen antigen is selected from the group consisting of a tumor, a virus, a bacterium, a fungus or a parasite antigen;

optionally, the tumor includes those arising from any lesions in bone, bone connection, muscle, lung, trachea, pharynx, nose, heart, spleen, artery, vein, blood, capillary, lymph node, lymphatic vessel, lymphatic fluid, oral cavity, pharynx, esophagus, stomach, duodenum, small intestine, colon, rectum, anus, appendix, liver, gallbladder, pancreas, parotid gland, sublingual gland, urinary kidney, ureter, bladder, urethra, ovary, fallopian tube, uterus, vagina, vulva, scrotum, testes, vas deferens, penis, eyes, ears, nose, tongue, skin, brain, brainstem, medulla oblongata, spinal cord, cerebro-spinal fluid, nerves, thyroid, parathyroid gland, adrenal gland, pituitary gland, pineal gland, pancreatic islet, thymus, gonad, sublingual gland, and parotid gland;

optionally, the bacterium includes one or more of *Staphylococcus*, *Streptococcus, Listeria*, *Erysipelothrix*,*Renibacterium*, *Bacillus*, *Clostridium*, *Mycobacterium*, *Actinomyces*, *Nocardia*, *Corynebacterium*, *Rhodococcus*, *Bacillus anthracis*, *erysipelas bacillus*, *Bacillus tetani*, *listeria monocytogenes*, *Bacillus perfringens*, *Bacillus gangraenae emphysematosae, tuberculosis*, *Escherichia coli*, *Bacterium proteus*, *Shigella dysenteriae*, *Pneumobacillus*, *Bacterium burgeri*, *Clostridium perfringens, Haemophilus influenzae*, *Haemophilus parainfluenzae*, *Moraxella catarrhalis*, *Acinetobacter*, *Yersinia, Legionella pneumophila*, *Bordetella pertussis*, *Bordetella parapertussis*, *Shigella, Pasteurella*, *Vibrio cholerae*, *and Vibrio Parahemolyticus*;

optionally, the parasite includes one or more of parasites in the digestive tract, intraluminal parasites, intrahepatic parasites, intrapulmonary parasites, brain tissue parasites, intravascular parasites, intralymphatic parasites, muscle tissue parasites, intracellular parasites, bone tissue parasites, and intraocular parasites;

optionally, the viruse includes one or more of adeniviridae, arenaviridae, astroviridae, bunyaviridae, cliciviridae, flaviviridae, hepatitis delta virus, hepeviridae, mononegavirales, nidovirales, picornaviridae, orthomyxoviridae, papillomaviridae, parvoviridae, polyomaviridae, poxviridae, reoviridae, retroviridae or togaviridae;

optionally, the fungus includes one or more of *Coccidioides immitis*, *Coccidioides posadasii*, *Histoplasma capsulatum*, *Histoplasma duboisii*, *Blastomyces lobo*, *Paracoccidiodes brasiliensis*, *Blastomyces dermatitis*, *Sporothrix schenckii*, *Penicillium marneffei*, *Candida albicans*, *Candida glabrata*, *Candida tropicalis*, *Candida lusitaniae*, *Pneumocystis carinii*, *Aspergillus*, *Exophiala jeanselmei*, *Fonsecaea Pedrosoi*, *Fonsecaea compacta*, *Chromomyces verruciformis*, *Pigmentation dermatitis*, *Geotrichum candidum*, *Pseudallescheria boydii*, *Cryptococcus neoformans*, *Trichosporon Cutaneum*, *Rhizopus oryzae*, *Mucor indicus*, *Absidia corymbifera*, *Syncephalastrum racemosum, Basidiobolus ranarum*, *Conidiobolus coronatus*, *Conidiobolus incongruus*, *Enterocytozoon bieneusi*, *Encephalitozoon intestinalis*, *Rhinosporidium seeberi*, *hyalohyphomycet*, and *phaeohyphomycete*.

17. The pharmaceutical composition according to any one of claims 10 to 16, wherein the pattern recognition receptor-ligand is selected from the group consisting of a TLR receptor-ligand, a RLR receptor-ligand, a CLR receptor-ligand, and a NLR receptor-ligand.

18. ~~A method for promoting *in vivo* immune response to an antigen in a host, regulating and potentiating immune cell activity in a host, helping a host to reduce fatigue, or alleviating pain in a host, comprising: administrating to the host with~~ Use of the complex according to any one of claims 2 to ~~6~~4, or the vaccine composition according to claim 7, or the pharmaceutical composition according to any one of claims 10 to 17 in the preparation of a medicine for promoting *in vivo* immune response to an antigen in a host, regulating and potentiating immune cell activity in a host, helping a host to reduce fatigue, or alleviating pain in a host.

~~19. The method according to claim 18, wherein when the antigen is a virus, a bacterium, a fungus, or a parasite antigen, the drug is administered at 1 mg/kg-8 mg/kg each time; alternatively and preferably, administered once every day, every 2 days, every 3 days, or every 4 days;~~

~~when the antigen is a tumor antigen, the drug is administered at 1 mg/kg-10 mg/kg each time and preferably, administered for at least 360 days, at least 180 days, at least 60 days or at least 30 days.~~