Claims

1. Nucleic acid molecule of formula (I):

$$(N_uG_lX_mG_nN_v)_a \quad (I)$$

wherein:

G is guanosine, uridine or an analogue of guanosine or uridine;

X is guanosine, uridine, adenosine, thymidine, cytidine, or an analogue of these nucleotides;

N is a nucleic acid sequence having a length of about 4 to 50, preferably of about 4 to 40, more preferably of about 4 to 30 or 4 to 20 nucleic acids, each N independently selected from from guanosine, uridine, adenosine, thymidine, cytidine or an analogue of these nucleotides;

a is an integer from 1 to 20, preferably from 1 to 15, most preferably from 1 to 10;

l is an integer from 1 to 40,

wherein when l = 1, G is guanosine or an analogue thereof,

when l > 1, at least 50% of these nucleotides are guanosine or an analogue thereof;

m is an integer and is at least 3;

wherein when m = 3, X is uridine or an analogue thereof, and

when m > 3, at least 3 successive uridines or analogues of uridine occur;

n is an integer from 1 to 40,

wherein when n = 1, G is guanosine or an analogue thereof,

when n > 1, at least 50% of these nucleotides are guanosine or an analogue thereof;

u, v may be independently from each other an integer from 0 to 50, preferably

wherein when u = 0, v ≥ 1, or

when v = 0, u ≥ 1;

wherein the nucleic acid molecule of formula (I) has a length of at least 50 nucleotides, preferably of at least 100 nucleotides, more preferably of at least 150

nucleotides, even more preferably of at least 200 nucleotides and most preferably of at least 250 nucleotides.

2. Nucleic acid according to claim 1, characterized in that the nucleic acid molecule of formula (I) contains a core structure $G_lX_mG_n$, selected from at least one sequence according to any of SEQ ID NOs: 1-80:

- GGUUUUUUUUUUUUUUUGGG (SEQ ID NO: 1);
- GGGGGUUUUUUUUUUUGGGGG (SEQ ID NO: 2);
- GGGGGUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUGGGGG (SEQ ID NO: 3);
- GUGUGUGUGUGUUUUUUUUUUUUUUUUUGUGUGUGUGUGU (SEQ ID NO: 4);
- GGUUGGUUGGUUUUUUUUUUUUUUUUUUGGUUGGUUGGUU (SEQ ID NO: 5);
- GGGGGGGGGUUUGGGGGGGG (SEQ ID NO: 6);
- GGGGGGGGUUUUGGGGGGGG (SEQ ID NO: 7);
- GGGGGGGUUUUUUGGGGGGG (SEQ ID NO: 8);
- GGGGGGGUUUUUUUGGGGGG (SEQ ID NO: 9);
- GGGGGGUUUUUUUUGGGGGG (SEQ ID NO: 10);
- GGGGGGUUUUUUUUUGGGGG (SEQ ID NO: 11);
- GGGGGGUUUUUUUUUUGGGG (SEQ ID NO: 12);
- GGGGGUUUUUUUUUUUGGGG (SEQ ID NO: 13);
- GGGGGUUUUUUUUUUUUGGG (SEQ ID NO: 14);
- GGGGUUUUUUUUUUUUUGGG (SEQ ID NO: 15);
- GGGGUUUUUUUUUUUUUUGG (SEQ ID NO: 16);
- GGUUUUUUUUUUUUUUUUGG (SEQ ID NO: 17);
- GUUUUUUUUUUUUUUUUUUG (SEQ ID NO: 18);
- GGGGGGGGGGUUUGGGGGGGGG (SEQ ID NO: 19);
- GGGGGGGGGUUUUGGGGGGGGG (SEQ ID NO: 20);
- GGGGGGGGUUUUUUGGGGGGGG (SEQ ID NO: 21);
- GGGGGGGGUUUUUUUGGGGGGG (SEQ ID NO: 22);
- GGGGGGGUUUUUUUUGGGGGGG (SEQ ID NO: 23);
- GGGGGGGUUUUUUUUUGGGGGG (SEQ ID NO: 24);
- GGGGGGGUUUUUUUUUUGGGGG (SEQ ID NO: 25);
- GGGGGGUUUUUUUUUUUGGGGG (SEQ ID NO: 26);
- GGGGGGUUUUUUUUUUUUGGGG (SEQ ID NO: 27);
- GGGGGUUUUUUUUUUUUUGGGG (SEQ ID NO: 28);
- GGGGGUUUUUUUUUUUUUUGGG (SEQ ID NO: 29);
- GGGUUUUUUUUUUUUUUUUGGG (SEQ ID NO: 30);
- GGUUUUUUUUUUUUUUUUUUGG (SEQ ID NO: 31);
- GGGGGGGGGGUUUGGGGGGGGGG (SEQ ID NO: 32);
- GGGGGGGGGGUUUUGGGGGGGGG (SEQ ID NO: 33);
- GGGGGGGGGUUUUUUGGGGGGGG (SEQ ID NO: 34);
- GGGGGGGGGUUUUUUUGGGGGGG (SEQ ID NO: 35);
- GGGGGGGGUUUUUUUUGGGGGGG (SEQ ID NO: 36);
- GGGGGGGGUUUUUUUUUGGGGGG (SEQ ID NO: 37);
- GGGGGGGGUUUUUUUUUUGGGGG (SEQ ID NO: 38);
- GGGGGGGUUUUUUUUUUUGGGGG (SEQ ID NO: 39);
- GGGGGGGUUUUUUUUUUUUGGGG (SEQ ID NO: 40);
- GGGGGGUUUUUUUUUUUUUGGGG (SEQ ID NO: 41);

- GGGGGGUUUUUUUUUUUUUUUGGGG (SEQ ID NO: 42);
- GGGGUUUUUUUUUUUUUUUUGGGG (SEQ ID NO: 43);
- GGGUUUUUUUUUUUUUUUUUGGG (SEQ ID NO: 44);
- GUUUUUUUUUUUUUUUUUUUUUUUUUUUUUG (SEQ ID NO: 45);
- GGUUUUUUUUUUUUUUUUUUUUUUUUUUUUGG (SEQ ID NO: 46);
- GGGUUUUUUUUUUUUUUUUUUUUUUUUUUUGGG (SEQ ID NO: 47);
- GGGGUUUUUUUUUUUUUUUUUUUUUUUUUUUGGGG (SEQ ID NO: 48);
- GGGGGUUUUUUUUUUUUUUUUUUUUUUUUUUUGGGGG (SEQ ID NO: 49);
- GGGGGGUUUUUUUUUUUUUUUUUUUUUUUUUUUGGGGGG (SEQ ID NO: 50);
- GGGGGGGUUUUUUUUUUUUUUUUUUUUUUUUUUUGGGGGG (SEQ ID NO: 51);
- GGGGGGGGUUUUUUUUUUUUUUUUUUUUUUUUUUUGGGGGGG (SEQ ID NO: 52);
- GGGGGGGGGUUUUUUUUUUUUUUUUUUUUUUUUUUUGGGGGGGG (SEQ ID NO: 53);
- GGUUUGG (SEQ ID NO: 54);
- GGUUUUGG (SEQ ID NO: 55);
- GGUUUUUGG (SEQ ID NO: 56);
- GGUUUUUUGG (SEQ ID NO: 57);
- GGUUUUUUUGG (SEQ ID NO: 58);
- GGUUUUUUUUGG (SEQ ID NO: 59);
- GGUUUUUUUUUGG (SEQ ID NO: 60);
- GGUUUUUUUUUUGG (SEQ ID NO: 61);
- GGUUUUUUUUUUUGG (SEQ ID NO: 62);
- GGUUUUUUUUUUUUGG (SEQ ID NO: 63);
- GGUUUUUUUUUUUUUGG (SEQ ID NO: 64);
- GGUUUUUUUUUUUUUUGG (SEQ ID NO: 65);
- GGUUUUUUUUUUUUUUUGG (SEQ ID NO: 66);
- GGGUUUGGG (SEQ ID NO: 67);
- GGGUUUUGGG (SEQ ID NO: 68);
- GGGUUUUUGGG (SEQ ID NO: 69);
- GGGUUUUUUGGG (SEQ ID NO: 70);
- GGGUUUUUUUGGG (SEQ ID NO: 71);
- GGGUUUUUUUUGGG (SEQ ID NO: 72);
- GGGUUUUUUUUUGGG (SEQ ID NO: 73);
- GGGUUUUUUUUUUGGG (SEQ ID NO: 74);
- GGGUUUUUUUUUUUGGG (SEQ ID NO: 75);
- GGGUUUUUUUUUUUUGGG (SEQ ID NO: 76);
- GGGUUUUUUUUUUUUUGGG (SEQ ID NO: 77);
- GGGUUUUUUUUUUUUUUUGGGUUUUUUUUUUUUUUUGGGUUUUUUUUUUUUUUUGGG (SEQ ID NO: 78);
- GGGUUUUUUUUUUUUUUUGGGGGGUUUUUUUUUUUUUUUGGG (SEQ ID NO: 79);
- GGGUUUGGGUUUGGGUUUGGGUUUGGGUUUGGGUUUGGGUUUGGGUUUGGG (SEQ ID NO: 80);

3. Nucleic acid according to claims 1 or 2, characterized in that the nucleic acid comprises the specific formula (II)

$$poly(X)_s\,(N_u\,G_l X_m G_n\,N_v)_z\,poly(X)_t\ ,$$

wherein

G, X, N, a, l, m, n, u and v	are as defined above for formula (I); and
poly(X)	is a homopolymeric stretch of nucleic acids, wherein X may be any nucleic acid as defined for X of the nucleic acid molecule according to formula (I); and
s, t	is each an integer selected, independent from each other, from about 5 to 100, preferably about 5 to 70, more preferably about 5 to 50, even more preferably about 5 to 30 and most preferably about 5 to 20,

wherein the nucleic acid molecule of formula (II) has a length of at least 50 nucleotides, preferably of at least 100 nucleotides, more preferably of at least 150 nucleotides, even more preferably of at least 200 nucleotides and most preferably of at least 250 nucleotides

4. Nucleic acid according to claim 3, characterized in that the nucleic acid molecule according to formula (II) is specifically a nucleic acid molecule according to formula (IIa):

$$poly(X)\ (N_u\ G_l X_m G_n\ N_v)_a$$

5. Nucleic acid according to claim 3, characterized in that the nucleic acid molecule according to formula (II) is specifically a nucleic acid molecule according to formula (IIb):

$$poly(X)\ (N_u\ G_l X_m G_n\ N_v)_a\ poly(X)$$

6. Nucleic acid according to any of claims 3 to 5, characterized in that the homopolymeric stretch of nucleic acids poly(X) is a single-stranded, a partially double-stranded or a double-stranded RNA sequence.

7. Nucleic acid according to any of claims 3 to 6, characterized in that the homopolymeric stretch of nucleic acids poly(X) is selected from a single-stranded stretch of cytidines (poly(C)), guanosines (poly(G)), adenosines (poly(A)), uridines (poly(U)), inosines (poly(I)), or from a homopolymeric double-stranded stretch of inosines and cytoines (poly(I:C)), or of adenosines and uridines (poly(A:U)).

8. Nucleic acid according to any one of claims 1 or 2, characterized in that the nucleic acid comprises the specific formula (IIIa):

$$(N_u\,\text{stem1}\;G_lX_mG_n\,\text{stem2}\;N_v)_a \quad ,$$

or the specific formula (IIIb):

$$(N_u\,G_lX_mG_n\,N_v)_a\,\text{stem1}\;N_{w1}\,\text{stem2}\;N_{w2} \quad ,$$

wherein each

G, X, N, a, l, m, n, u and v	is as defined above for formula (I); and
w1, w2	are integers and independently of each other as defined above for integers u, v of formula (I); and
stem1, stem2	are palindromic sequences and form a stem loop structure, wherein the palindromic sequences are each formed by a nucleic acid sequence having a length of about 5 to 50, more preferably about 5 to 40 and most preferably about 5 to 30 nucleic acids, selected from adenosine, guanosine, cytidine, uridine, thymidine, or an analogue thereof.

9. Nucleic acid according to any of claims 1 to 8, characterized in that the nucleic acid molecule of formula (I), (II), (IIa), (IIb), (IIIa) and/or (IIIb) is in the form of RNA or DNA, is single-stranded, double-stranded or partially double-stranded, and/or is linear or circular.

10. Nucleic acid according to any one of claims 1 to 9, characterized in that the nucleic acid of any of formula (I), (II), (IIa), (IIb), (IIIa) and/or (IIIb) is in the form of a single-stranded RNA, a double-stranded RNA or a or a partially double-stranded RNA, preferably a partially double-stranded RNA.

11. Nucleic acid according to any one of claims 1 to 10, characterized in that the nucleic acid of any of formula (I), (II), (IIa), (IIb), (IIIa) and/or (IIIb) is present in the

form of RNA and additionally has at the 5' terminus a "Cap structure" and/or at the 3' terminus a poly-A tail and/or at the 3' terminus a poly-C tail.

12. Nucleic acid according to any one of claims 1 to 11, characterized in that the nucleic acid is prepared by an *in vitro* translation.

13. Nucleic acid according to any one of claims 1 to 12 as a medicament, in particular as an immunostimulating agent.

14. Pharmaceutical composition containing a nucleic acid according to any one of claims 1 to 12, a pharmaceutically acceptable carrier and, optionally, further auxiliary substances, additives and/or adjuvants.

15. Pharmaceutical composition according to claim 14, additionally comprising at least one pharmaceutically active component.

16. Pharmaceutical composition according to claim 15, characterized in that the at least one pharmaceutically active component is selected from the group consisting of peptides, proteins, nucleic acids, (therapeutically active) low molecular weight organic or inorganic compounds having a molecular weight less than 5000, sugars, antigens, antibodies, pathogens, attenuated pathogens, de-activated pathogens, (human) cells, cellular fragments or fractions and other therapeutic agents, which are preferably adapted to exhibit enhanced transfection properties, including by complexation with lipids and/or polycationic compounds, including polycationis peptides.

17. Pharmaceutical composition according to any of claims 14 to 16, characterized in that the composition contains at least one further adjuvant, which is an immunostimulating agent, selected from the group consisting of cationic peptides, including polypeptides including protamine, nucleoline, spermine or spermidine, cationic polysaccharides, including chitosan, TDM, MDP, muramyl dipeptide, pluronics, alum solution, aluminium hydroxide, ADJUMER™ (polyphosphazene); aluminium phosphate gel; glucans from algae; algammulin; aluminium hydroxide

gel (alum); highly protein-adsorbing aluminium hydroxide gel; low viscosity aluminium hydroxide gel; AF or SPT (emulsion of squalane (5%), Tween 80 (0.2%), Pluronic L121 (1.25%), phosphate-buffered saline, pH 7.4); AVRIDINE™ (propanediamine); BAY R1005™ ((N-(2-deoxy-2-L-leucylamino-b-D-glucopyranosyl)-N-octadecyldodecanoyl-amide hydroacetate); CALCITRIOL™ (1-alpha,25-dihydroxy-vitamin D3); calcium phosphate gel; CAPTM (calcium phosphate nanoparticles); cholera holotoxin, cholera-toxin-A1-protein-A-D-fragment fusion protein, sub-unit B of the cholera toxin; CRL 1005 (block copolymer P1205); cytokine-containing liposomes; DDA (dimethyldioctadecylammonium bromide); DHEA (dehydroepiandrosterone); DMPC (dimyristoylphosphatidylcholine); DMPG (dimyristoylphosphatidylglycerol); DOC/alum complex (deoxycholic acid sodium salt); Freund's complete adjuvant; Freund's incomplete adjuvant; gamma inulin; Gerbu adjuvant (mixture of: i) N-acetylglucosaminyl-(P1-4)-N-acetylmuramyl-L-alanyl-D-glutamine (GMDP), ii) dimethyldioctadecylammonium chloride (DDA), iii) zinc-L-proline salt complex (ZnPro-8); GM-CSF); GMDP (N-acetylglucosaminyl-(b1-4)-N-acetylmuramyl-L-alanyl-D-isoglutamine); imiquimod (1-(2-methypropyl)-1H-imidazo[4,5-c]quinoline-4-amine); ImmTher™ (N-acetylglucosaminyl-N-acetylmuramyl-L-Ala-D-isoGlu-L-Ala-glycerol dipalmitate); DRVs (immunoliposomes prepared from dehydration-rehydration vesicles); interferon-gamma; interleukin-1beta; interleukin-2; interleukin-7; interleukin-12; ISCOMS™ ("Immunostimulating Complexes"); ISCOPREP 7.0.3. ™; liposomes; LOXORIBINE™ (7-allyl-8-oxoguanosine (guanine)); LT oral adjuvant (E.coli labile enterotoxin-protoxin); microspheres and microparticles of any composition; MF59™; (squalene-water emulsion); MONTANIDE ISA 51™ (purified incomplete Freund's adjuvant); MONTANIDE ISA 720™ (metabolisable oil adjuvant); MPL™ (3-Q-desacyl-4'-monophosphoryl lipid A); MTP-PE and MTP-PE liposomes ((N-acetyl-L-alanyl-D-isoglutaminyl-L-alanine-2-(1,2-dipalmitoyl-sn-glycero-3-(hydroxyphosphoryloxy))ethylamide, monosodium salt); MURAMETIDE™ (Nac-Mur-L-Ala-D-Gln-OCH_3); MURAPALMITINE™ and D-MURAPALMITINE™ (Nac-Mur-L-Thr-D-isoGln-sn-glyceroldipalmitoyl); NAGO (neuraminidase-galactose oxidase); nanospheres or nanoparticles of any composition; NISVs (non-ionic surfactant vesicles); PLEURAN™ (beta-glucan); PLGA, PGA and PLA (homo- and co-polymers of lactic acid and glycolic acid; microspheres/nanospheres); PLURONIC L121™;

PMMA (polymethyl methacrylate); PODDS™ (proteinoid microspheres); polyethylene carbamate derivatives; poly-rA: poly-rU (polyadenylic acid-polyuridylic acid complex); polysorbate 80 (Tween 80); protein cochleates (Avanti Polar Lipids, Inc., Alabaster, AL); STIMULON™ (QS-21); Quil-A (Quil-A saponin); S-28463 (4-amino-otec-dimethyl-2-ethoxymethyl-1H-imidazo[4,5-c]quinoline-1-ethanol); SAF-1™ ("Syntex adjuvant formulation"); Sendai proteoliposomes and Sendai-containing lipid matrices; Span-85 (sorbitan trioleate); Specol (emulsion of Marcol 52, Span 85 and Tween 85); squalene or Robane® (2,6,10,15,19,23-hexamethyltetracosan and 2,6,10,15,19,23-hexamethyl-2,6,10,14,18,22-tetracosahexane); stearyltyrosine (octadecyltyrosine hydrochloride); Theramid® (N-acetylglucosaminyl-N-acetylmuramyl-L-Ala-D-isoGlu-L-Ala-dipalmitoxypropylamide); Theronyl-MDP (Termurtide™ or [thr 1]-MDP; N-acetylmuramyl-L-threonyl-D-isoglutamine); Ty particles (Ty-VLPs or virus-like particles); Walter-Reed liposomes (liposomes containing lipid A adsorbed on aluminium hydroxide), and lipopeptides, including Pam3Cys,

in particular aluminium salts, such as Adju-phos, Alhydrogel, Rehydragel, etc.; emulsions, such as CFA, SAF, IFA, MF59, Provax, TiterMax, Montanide, Vaxfectin, etc.; copolymers, such as Optivax (CRL1005), L121, Poloaxmer4010), etc.; liposomes, such as Stealth, etc., cochleates, such as BIORAL, etc.; plant derived adjuvants, such as QS21, Quil A, Iscomatrix, ISCOM, etc.; preferred adjuvants suitable for costimulation may include e.g. Tomatine, biopolymers, such as PLG, PMM, Inulin, etc.; microbe derived adjuvants, such as Romurtide, DETOX, MPL, CWS, Mannose, CpG7909, ISS-1018, IC31, Imidazoquinolines, Ampligen, Ribi529, IMOxine, IRIVs, VLPs, cholera toxin, heat-labile toxin, Pam3Cys, Flagellin, GPI anchor, LNFPIII/Lewis X, antimicrobial peptides, UC-1V150, RSV fusion protein, cdiGMP, etc.; preferred adjuvants suitable as antagonists may e.g. include CGRP neuropeptide,

or from cationic or polycationic compounds which are suitable for depot and delivery, including protamine, nucleoline, spermin or spermidine, or other cationic peptides or proteins, including poly-L-lysine (PLL), poly-arginine, basic polypeptides, cell penetrating peptides (CPPs), including HIV-binding peptides, Tat, HIV-1 Tat (HIV), Tat-derived peptides, Penetratin, VP22 derived or analog peptides, HSV VP22

(Herpes simplex), MAP, KALA or protein transduction domains (PTDs, PpT620, prolin-rich peptides, arginine-rich peptides, lysine-rich peptides, MPG-peptide(s), Pep-1, L-oligomers, Calcitonin peptide(s), Antennapedia-derived peptides (particularly from *Drosophila antennapedia*), pAntp, plsl, FGF, Lactoferrin, Transportan, Buforin-2, Bac715-24, SynB, SynB(1), pVEC, hCT-derived peptides, SAP, protamine, spermine, spermidine, or histones. Additionally, preferred cationic or polycationic proteins or peptides may be selected from following proteins or peptides having the following total formula: $(Arg)_l;(Lys)_m;(His)_n;(Orn)_o;(Xaa)_x$, wherein l + m + n +o + x = 8-15, and l, m, n or o independently of each other may be any number selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 or 15, provided that the overall content of Arg, Lys, His and Orn represents at least 50% of all amino acids of the oligopeptide; and Xaa may be any amino acid selected from native (= naturally occurring) or non-native amino acids except of Arg, Lys, His or Orn; and x may be any number selected from 0, 1, 2, 3 or 4, provided, that the overall content of Xaa does not exceed 50 % of all amino acids of the oligopeptide, cationic polysaccharides, for example chitosan, polybrene, cationic polymers, including polyethyleneimine (PEI), cationic lipids, including DOTMA: [1-(2,3-sioleyloxy)propyl)]-N,N,N-trimethylammonium chloride, DMRIE, di-C14-amidine, DOTIM, SAINT, DC-Chol, BGTC, CTAP, DOPC, DODAP, DOPE: Dioleyl phosphatidylethanol-amine, DOSPA, DODAB, DOIC, DMEPC, DOGS: Dioctadecylamidoglicylspermin, DIMRI: Dimyristo-oxypropyl dimethyl hydroxyethyl ammonium bromide, DOTAP: dioleoyloxy-3-(trimethylammonio)propane, DC-6-14: O,O-ditetradecanoyl-N-(α-trimethylammonioacetyl)diethanolamine chloride, CLIP1: rac-[(2,3-dioctadecyloxypropyl)(2-hydroxyethyl)]-dimethylammonium chloride, CLIP6: rac-[2(2,3-dihexadecyloxypropyl-oxymethyloxy)ethyl]trimethylammonium, CLIP9: rac-[2(2,3-dihexadecyloxypropyl-oxysuccinyloxy)ethyl]-trimethylammonium, oligofectamine, or cationic or polycationic polymers, including modified polyaminoacids, including β-aminoacid-polymers or reversed polyamides, , modified polyethylenes, including PVP (poly(N-ethyl-4-vinylpyridinium bromide)), , modified acrylates, including pDMAEMA (poly(dimethylaminoethyl methylacrylate)), , modified Amidoamines including pAMAM (poly(amidoamine)), , modified polybetaaminoester (PBAE), including diamine end modified 1,4

butanediol diacrylate-co-5-amino-1-pentanol polymers, , dendrimers, including polypropylamine dendrimers or pAMAM based dendrimers, , polyimine(s), including PEI: poly(ethyleneimine), poly(propyleneimine), , polyallylamine, sugar backbone based polymers, including cyclodextrin based polymers, dextran based polymers, Chitosan, , silan backbone based polymers , including PMOXA-PDMS copolymers, , blockpolymers consisting of a combination of one or more cationic blocks (including selected og a cationic polymer as mentioned above) and of one or more hydrophilic- or hydrophobic blocks (e.g polyethyleneglycole);

or may be selected from nucleic acids of formula (IV): $G_lX_mG_n$, wherein: G is guanosine, uridine or an analogue of guanosine or uridine; X is guanosine, uridine, adenosine, thymidine, cytidine or an analogue of the above-mentioned nucleotides; l is an integer from 1 to 40, wherein when l = 1 G is guanosine or an analogue thereof, when l > 1 at least 50% of the nucleotides are guanosine or an analogue thereof; m is an integer and is at least 3; wherein when m = 3 X is uridine or an analogue thereof, when m > 3 at least 3 successive uridines or analogues of uridine occur; n is an integer from 1 to 40, wherein when n = 1 G is guanosine or an analogue thereof, when n > 1 at least 50% of the nucleotides are guanosine or an analogue thereof;

or from nucleic acids of formula (V): $C_lX_mC_n$, wherein: C is cytidine, uridine or an analogue of cytidine or uridine; X is guanosine, uridine, adenosine, thymidine, cytidine or an analogue of the above-mentioned nucleotides; l is an integer from 1 to 40, wherein when l = 1 C is cytidine or an analogue thereof, when l > 1 at least 50% of the nucleotides are cytidine or an analogue thereof; m is an integer and is at least 3; wherein when m = 3 X is uridine or an analogue thereof, when m > 3 at least 3 successive uridines or analogues of uridine occur; n is an integer from 1 to 40, wherein when n = 1 C is cytidine or an analogue thereof, when n > 1 at least 50% of the nucleotides are cytidine or an analogue thereof.

18. Pharmaceutical composition according to any one of claims 14 to 17, characterized in that the pharmaceutical composition is a vaccine.

19. Use of a nucleic acid according to any one of claims 1 to 12 for the preparation of a medicament for the treatment of cancer diseases, autoimmune disease, allergies or infectious diseases.

20. Use according to claim 19, characterized in that cancer diseases are selected from colon carcinomas, melanomas, renal carcinomas, lymphomas, acute myeloid leukaemia (AML), acute lymphoid leukaemia (ALL), chronic myeloid leukaemia (CML), chronic lymphocytic leukaemia (CLL), gastrointestinal tumours, pulmonary carcinomas, gliomas, thyroid tumours, mammary carcinomas, prostate tumours, hepatomas, various virus-induced tumours such as, for example, papilloma virus-induced carcinomas (e.g. cervical carcinoma), adenocarcinomas, herpes virus-induced tumours (e.g. Burkitt's lymphoma, EBV-induced B-cell lymphoma), heptatitis B-induced tumours (hepatocell carcinoma), HTLV-1- and HTLV-2-induced lymphomas, acoustic neuromas/neurinomas, cervical cancer, lung cancer, pharyngeal cancer, anal carcinomas, glioblastomas, lymphomas, rectal carcinomas, astrocytomas, brain tumours, stomach cancer, retinoblastomas, basaliomas, brain metastases, medulloblastomas, vaginal cancer, pancreatic cancer, testicular cancer, melanomas, thyroidal carcinomas, bladder cancer, Hodgkin's syndrome, meningiomas, Schneeberger disease, bronchial carcinomas, hypophysis tumour, Mycosis fungoides, oesophageal cancer, breast cancer, carcinoids, neurinomas, spinaliomas, Burkitt's lymphomas, laryngeal cancer, renal cancer, thymomas, corpus carcinomas, bone cancer, non-Hodgkin's lymphomas, urethral cancer, CUP syndrome, head/neck tumours, oligodendrogliomas, vulval cancer, intestinal cancer, colon carcinomas, oesophageal carcinomas, wart involvement, tumours of the small intestine, craniopharyngeomas, ovarian carcinomas, soft tissue tumours/sarcomas, ovarian cancer, liver cancer, pancreatic carcinomas, cervical carcinomas, endometrial carcinomas, liver metastases, penile cancer, tongue cancer, gall bladder cancer, leukaemia, plasmocytomas, uterine cancer, lid tumour and prostate cancer.

21. Use according to claim 19, characterized in that infectious diseases are selected from influenza, malaria, SARS, yellow fever, AIDS, Lyme borreliosis, Leishmaniasis, anthrax, meningitis, viral infectious diseases such as AIDS, Condyloma acuminata, hollow warts, Dengue fever, three-day fever, Ebola virus, cold, early summer

meningoencephalitis (FSME), flu, shingles, hepatitis, herpes simplex type I, herpes simplex type II, Herpes zoster, influenza, Japanese encephalitis, Lassa fever, Marburg virus, measles, foot-and-mouth disease, mononucleosis, mumps, Norwalk virus infection, Pfeiffer's glandular fever, smallpox, polio (childhood lameness), pseudo-croup, fifth disease, rabies, warts, West Nile fever, chickenpox, cytomegalic virus (CMV), from bacterial infectious diseases such as miscarriage (prostate inflammation), anthrax, appendicitis, borreliosis, botulism, Camphylobacter, Chlamydia trachomatis (inflammation of the urethra, conjunctivitis), cholera, diphtheria, donavanosis, epiglottitis, typhus fever, gas gangrene, gonorrhoea, rabbit fever, Heliobacter pylori, whooping cough, climatic bubo, osteomyelitis, Legionnaire's disease, leprosy, listeriosis, pneumonia, meningitis, bacterial meningitis, anthrax, otitis media, Mycoplasma hominis, neonatal sepsis (Chorioamnionitis), noma, paratyphus, plague, Reiter's syndrome, Rocky Mountain spotted fever, Salmonella paratyphus, Salmonella typhus, scarlet fever, syphilis, tetanus, tripper, tsutsugamushi disease, tuberculosis, typhus, vaginitis (colpitis), soft chancre, and from infectious diseases caused by parasites, protozoa or fungi, such as amoebiasis, bilharziosis, Chagas disease, athlete's foot, yeast fungus spots, scabies, malaria, onchocercosis (river blindness), or fungal diseases, toxoplasmosis, trichomoniasis, trypanosomiasis (sleeping sickness), visceral Leishmaniosis, nappy/diaper dermatitis, schistosomiasis, fish poisoning (Ciguatera), candidosis, cutaneous Leishmaniosis, lambliasis (giardiasis), or sleeping sickness, or from infectious diseases caused by Echinococcus, fish tapeworm, fox tapeworm, canine tapeworm, lice, bovine tapeworm, porcine tapeworm and miniature tapeworm.

22. Use according to claim 19, characterized in that autoimmune diseases are selected from the group consisting of type I autoimmune diseases or type II autoimmune diseases or type III autoimmune diseases or type IV autoimmune diseases, such as, for example, multiple sclerosis (MS), rheumatoid arthritis, diabetes, type I diabetes (Diabetes mellitus), systemic lupus erythematosus (SLE), chronic polyarthritis, Basedow's disease, autoimmune forms of chronic hepatitis, colitis ulcerosa, type I allergy diseases, type II allergy diseases, type III allergy diseases, type IV allergy diseases, fibromyalgia, hair loss, Bechterew's disease, Crohn's disease, Myasthenia gravis, neurodermitis, Polymyalgia rheumatica, progressive systemic sclerosis (PSS),

psoriasis, Reiter's syndrome, rheumatic arthritis, psoriasis, vasculitis, etc, or type II diabetes.

23. Use according to claim 19, characterized in that the allergies are selected from the group consisting of allergic asthma (leading to swelling of the nasal mucosa), allergic conjunctivitis (leading to redness and itching of the conjunctiva), allergic rhinitis ("hay fever"), anaphylaxis, angiodema, atopic dermatitis (eczema), urticaria (hives), eosinophilia, respiratory, allergies to insect stings, skin allergies (leading to and including various rashes, such as eczema, hives (urticaria) and (contact) dermatitis), food allergies, and allergies to medicine.

24. Kit containing a nucleic acid according to any one of claims 1 to 12 or a pharmaceutical composition according to any one of claims 14 to 18, and also optionally technical instructions for use with information on the administration and dosage of the nucleic acid or the pharmaceutical composition.

SEQUENCE LISTING

<110> CureVac GmbH

<120> Nucleic acids of formula (I) (NuGlXmGnNv)a and derivatives thereof as an immune-stimulating agent/adjuvant

<130> CU01P072WO

<140>
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<150> EP 08001827.8
<151> 2008-01-31

<160> 119

<170> PatentIn version 3.5

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"GlXmGn"

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<210> 79
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<212> RNA
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<210> 82
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<210> 83
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<210> 86
<211> 60
<212> RNA
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<210> 87
<211> 60
<212> RNA
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<210> 88
<211> 40
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: Exemplary sequence according to general formula (II)

<400> 88
ccccccccc ccccccccc gguuuuuuuu uuuuuuuggg 40

<210> 89
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<400> 89
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<210> 90
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<213> Artificial

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<222> (23)..(37)
<223> sequence is double stranded ((A:U)

<400> 90
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<210> 91
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<400> 91
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<210> 92
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<400> 92

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ugcguuccua gaaguacacg 80

<210> 93
<211> 80
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<400> 93
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<210> 94
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uagcgaagcu cuuggaccua 80

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<220>
<223> Description of sequence: exemplary sequence of stem 1 (sequence is palindromic to SEQ ID NO: 96)

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<210> 96
<211> 20
<212> RNA
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uagguccaag agcuucgcua 20

<210> 97
<211> 11
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<400> 97
gccgcgggcc g 11

<210> 98
<211> 11
<212> RNA
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<400> 98
cggcccgcgg c 11

<210> 99
<211> 10
<212> RNA
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<223> Description of sequence: exemplary sequence of stem 1 (sequence is palindromic to SEQ ID NO: 100)

<400> 99
gacacggugc 10

<210> 100
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<400> 100
gcaccgugca 10

<210> 101
<211> 8
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<400> 101
accuaggu 8

<210> 102
<211> 8
<212> RNA
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<220>
<223> Description of sequence: exemplary sequence of either stem 1/stem2 (sequence is intrinsic palindromic)

<400> 102
uggaucca 8

<210> 103
<211> 5
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ccugc 5

<210> 104
<211> 5
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: exemplary sequence of stem 2 (sequence is palindromic to SEQ ID NO: 103)

<400> 104
gcagg 5

<210> 105
<211> 5
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: exemplary sequence of stem 1 (sequence is palindromic to SEQ ID NO: 106)

<400> 105
gcagg 5

<210> 106
<211> 5
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: exemplary sequence of stem 2 (sequence is palindromic to SEQ ID NO: 105)

<400> 106
ccugc 5

<210> 107
<211> 60
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: inventive nucleic acid according to either formula (IIIa) or (IIIb)

<400> 107
uagcgaagcu cuuggaccua gguuuuuuuu uuuuuuuggg uaggucccaag agcuucgcua 60

<210> 108
<211> 122
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: inventive nucleic acid according to either formula (IIIa) or (IIIb)

<400> 108
uagcgaagcu cuuggaccua gguuuuuuuu uuuuuuuggg ugcguuccua gaaguacacg 60

gccgcgggcc gugcguuccu agaaguacac gcggcccgcg gcugcguucc uagaaguaca 120

cg 122

<210> 109
<211> 18
<212> PRT
<213> Unknown

<220>
<223> Description of sequence: sequence of protamin P1

<400> 109

Ser Arg Ser Arg Tyr Tyr Arg Gln Arg Gln Arg Ser Arg Arg Arg Arg
1 5 10 15

Arg Arg

<210> 110
<211> 21
<212> PRT
<213> Unknown

<220>
<223> Description of sequence: sequence of protamin P2

<400> 110

Arg Arg Arg Leu His Arg Ile His Arg Arg Gln His Arg Ser Cys Arg
1 5 10 15

Arg Arg Lys Arg Arg
20

<210> 111
<211> 13
<212> RNA
<213> Unknown

<220>
<223> Description of sequence: Kozak sequence

<400> 111
gccgccacca ugg 13

<210> 112
<211> 15
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: generic stabilizing sequence of the formula (C/U)CCANxCCC(U/A)PyxUC(C/U)CC

<220>
<221> variation
<222> (1)..(1)
<223> /replace="cytidine (cytosine)"

/replace="uridine (uracile)"

<220>
<221> misc_feature
<222> (1)..(1)
<223> nucleic acid = cytidine (cytosine) or uridine (uracile)

<220>
<221> misc_feature
<222> (5)..(5)
<223> Nx = a, g, c or u or any other nucleic acid

<220>
<221> variation
<222> (5)..(5)
<223> /replace="cytidine (cytosine)"

/replace="uridine (uracile)"

/replace="guanosine"

/replace="adenosine", or any othe nucleic acid

<220>
<221> repeat_unit
<222> (5)..(5)
<223> x = any number

<220>
<221> misc_feature
<222> (9)..(9)
<223> nucleic acid = uridine (uracile) or adenosine

<220>
<221> variation
<222> (9)..(9)
<223> /replace="uridine (uracile)"

/replace="adonosine"

<220>
<221> misc_feature
<222> (10)..(10)
<223> Py = pyrimidine

<220>
<221> repeat_unit
<222> (10)..(10)
<223> x = any number

<220>
<221> variation
<222> (10)..(10)
<223> /replace="pyrimidine"

<220>
<221> misc_feature
<222> (13)..(13)
<223> nucleic acid = cytidine (cytosine) or uridine (uracile)

<220>
<221> variation
<222> (13)..(13)
<223> /replace="cytidine (cytosine)"

/replace="uridine (uracile)"

<400> 112
nccancccnn ucncc 15

<210> 113
<211> 20
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: immune-stimulating oligo RNA40

<400> 113
gcccgucugu ugugugacuc 20

<210> 114
<211> 229
<212> RNA
<213> Artificial Sequence

<220>
<223> Description of sequence: Exemplary sequence according to formula (I)

<400> 114
gggagaaagc ucaagcuugg agcaaugccc gcacauugag gaaaccgagu ugcauaucuc 60

agaguauugg cccccgugua gguuauucuu gacagacagu ggagcuuauu cacucccagg 120

auccgagucg cauacuacgg uacuggugac agaccuaggu cgucaguuga ccaguccgcc 180

acuagacgug aguccgucaa agcaguuaga uguuacacuc uauuagauc 229

<210> 115
<211> 547
<212> RNA
<213> Artificial Sequence

<220>
<223> Description of sequence: Exemplary sequence according to formula (I)

<400> 115
gggagaaagc ucaagcuugg agcaaugccc gcacauugag gaaaccgagu ugcauaucuc 60

agaguauugg cccccgugua gguuauucuu gacagacagu ggagcuuauu cacucccagg 120

auccgagucg cauacuacgg uacuggugac agaccuaggu cgucaguuga ccaguccgcc 180

acuagacgug aguccgucaa agcaguuaga uguuacacuc uauuagaucu cggauuacag 240

cuggaaggag caggaguagu guucuugcuc uaaguaccga gugugcccaa uacccgauca 300

gcuuauuaac gaacggcucc uccucuuaga cugcagcgua agugcggaau cuggggauca 360

aauuacugac ugccuggauu acccucggac auauaaccuu guagcacgcu guugcuguau 420

aggugaccaa cgcccacucg aguagaccag cucucuuagu ccggacaaug auaggaggcg 480

cggucaaucu acuucuggcu aguuaagaau aggcugcacc gaccucuaua aguagcgugu 540

ccucuag 547

<210> 116
<211> 1083
<212> RNA
<213> Artificial Sequence

<220>
<223> Description of sequence: Exemplary sequence according to formula (I)

<400> 116
gggagaaagc ucaagcuugg agcaaugccc gcacauugag gaaaccgagu ugcauaucuc 60

<220>
<223> Description of sequence: Exemplary sequence according to formula (I)

<400> 117
gggagaaagc ucaagcuuau ccaaguaggc uggucaccug uacaacguag ccgguauuuu 60

uuuuuuuuuu uuuuuuuuga ccgucucaag guccaaguua gucugccuau aaaggugcgg 120

auccacagcu gaugaaagac uugugcggua cgguuaaucu ccccuuuuuu uuuuuuuuuu 180

uuuuuaguaa augcgucuac ugaauccagc gaugaugcug gcccagauc 229

<210> 118
<211> 546
<212> RNA
<213> Artificial Sequence

<220>
<223> Description of sequence: Exemplary sequence according to formula (I)

<400> 118
gggagaaagc ucaagcuuau ccaaguaggc uggucaccug uacaacguag ccgguauuuu 60

uuuuuuuuuu uuuuuuuuga ccgucucaag guccaaguua gucugccuau aaaggugcgg 120

guggaguguc acugcucucg aggucucacg agagcgcucg auacaguccu uggaagaauc 480
uuuuuuuuuu uuuuuuuuuu uugugcgacg aucacagaga acuucuauuc augcaggucu 540
gcucuagaac gaacugaccu gacgccugaa cuuaugagcg ugcguauuuu uuuuuuuuuu 600
uuuuuuuuuc cucccaacaa augucgauca auagcugggc uguuggagac gcgucagcaa 660
augccguggc uccauaggac guguagacuu cuauuuuuuu uuuuuuuuuu uuuucccggg 720
accacaaaua auauucuugc uugguugggc gcaagggccc cguaucaggu cauaaacggg 780
uacauguugc acaggcuccu uuuuuuuuuu uuuuuuuuuu uucgcugagu uauuccgguc 840
ucaaaagacg gcagacguca gucgacaaca cggucuaaag cagugcuaca aucugccgug 900
uucguguuuu uuuuuuuuuu uuuuuuguga accuacacgg cgugcacugu aguucgcaau 960
ucauagggua ccggcucaga guuaugccuu gguugaaaac ugcccagcau acuuuuuuuu 1020
uuuuuuuuuu uucauauucc caugcuaagc aagggaugcc gcgagucaug uuaagcuuga 1080
auu 1083

Claims

1. RNA molecule consisting of or comprising SEQ ID NO: 117, SEQ ID NO: 118 or SEQ ID NO: 119 stimulating the innate immune response by addressing the receptors TLR-7, TLR-8, TLR-3, RIG-I or MDA-5.

2. RNA molecules according to claim 1 for use as a medicament

3. Pharmaceutical composition containing an RNA molecule according to claim 1, a pharmaceutically acceptable carrier and, optionally, further auxiliary substances, additives and/or adjuvants.

4. Pharmaceutical composition according to claim 3, additionally comprising at least one pharmaceutically active component preferably selected from the group consisting of peptides, proteins, nucleic acids, (therapeutically active) low molecular weight organic or inorganic compounds having a molecular weight less than 5000, sugars, antigens, antibodies, pathogens, attenuated pathogens, deactivated pathogens, (human) cells, cellular fragments or fractions and other therapeutic agents, which are preferably adapted to exhibit enhanced transfection properties, including by complexation with lipids and/or polycationic compounds, including polycationic peptides.

5. Pharmaceutical composition according to any of claims 3 or 4, **characterized in that** the composition contains at least one further adjuvant, which is an immunostimulating agent, selected from the group consisting of cationic peptides, including polypeptides including protamine, nucleoline, spermine or spermidine, cationic polysaccharides, including chitosan, TDM, MDP, muramyl dipeptide, pluronics, alum solution, aluminium hydroxide, ADJUMER™ (polyphosphazene); aluminium phosphate gel; glucans from algae; algammulin; aluminium hydroxide gel (alum); highly protein-adsorbing aluminium hydroxide gel; low viscosity aluminium hydroxide gel; AF or SPT (emulsion of squalane (5%), Tween 80 (0.2%), Pluronic L121 (1.25%), phosphate-buffered saline, pH 7.4); AVRIDINE™ (propanediamine); BAY R1005™ ((N-(2-deoxy-2-L-leucylamino-b-D-glucopyranosyl)-N-octadecyldodecanoyl-amide hydroacetate); CALCITRIOL™ (1-alpha,25-dihydroxy-vitamin D3); calcium phosphate gel; CAPTM (calcium phosphate nanoparticles); cholera holotoxin, cholera-toxin-A1-protein-A-D-fragment fusion protein, sub-unit B of the cholera toxin; CRL 1005 (block copolymer P1205); cytokine-containing liposomes; DDA (dimethyldioctadecylammonium bromide); DHEA (dehydroepiandrosterone); DMPC (dimyristoylphosphatidylcholine); DMPG (dimyristoylphosphatidylglycerol); DOC/alum complex (deoxycholic acid sodium salt); Freund's complete adjuvant; Freund's incomplete adjuvant; gamma inulin; Gerbu adjuvant (mixture of: i) N-acetylglucosaminyl-(P1-4)-N-acetylmuramyl-L-alanyl-D-glutamine (GMDP), ii) dimethyldioctadecylammonium chloride (DDA), iii) zinc-L-proline salt complex (ZnPro-8); GM-CSF); GMDP (N-acetylglucosaminyl-(b1-4)-N-acetylmuramyl-L-alanyl-D-isoglutamine); imiquimod (1-(2-methypropyl)-1H-imidazo[4,5-c]quinoline-4-amine); ImmTher™ (N-acetylglucosaminyl-N-acetylmuramyl-L-Ala-D-isoGlu-L-Ala-glycerol dipalmitate); DRVs (immunoliposomes prepared from dehydration-rehydration vesicles); interferon-gamma; interleukin-1beta; interleukin-2; interleukin-7; interleukin-12; ISCOMS™ ("Immunostimulating Complexes"); ISCOPREP 7.0.3. ™; liposomes; LOXORIBINE™ (7-allyl-8-oxoguanosine (guanine)); LT oral adjuvant (E.coli labile enterotoxin-protoxin); microspheres and microparticles of any composition; MF59™; (squalene-water emulsion); MONTANIDE ISA 51™ (purified incomplete Freund's adjuvant); MONTANIDE ISA 720™ (metabolisable oil adjuvant); MPL™ (3-Q-desacyl-4'-monophosphoryl lipid A); MTP-PE and MTP-PE liposomes ((N-acetyl-L-alanyl-D-isoglutaminyl-L-alanine-2-(1,2-dipalmitoyl-sn-glycero-3-(hydroxyphosphoryloxy))ethylamide, monosodium salt); MURAMETIDE™ (Nac-Mur-L-Ala-D-Gln-OCH_3); MURAPALMITINE™ and D-MURAPALMITINE™ (Nac-Mur-L-Thr-D-isoGln-sn-glyceroldipalmitoyl); NAGO (neuraminidase-galactose oxidase); nanospheres or nanoparticles of any composition; NISVs (non-ionic surfactant vesicles); PLEURAN™ (beta-glucan); PLGA, PGA and PLA (homo- and copolymers of lactic acid and glycolic acid; microspheres/nanospheres); PLURONIC L121™; PMMA (polymethyl methacrylate); PODDS™ (proteinoid microspheres); polyethylene carbamate derivatives; poly-rA: poly-rU (polyadenylic acid-polyuridylic acid complex); polysorbate 80 (Tween 80); protein cochleates (Avanti Polar Lipids, Inc., Alabaster, AL); STIMULON™ (QS-21); Quil-A (Quil-A saponin); S-28463 (4-amino-otec-dimethyl-2-ethoxymethyl-1H-imidazo[4,5-c]quinoline-1-ethanol); SAF-1™ ("Syntex adjuvant formulation"); Sendai proteoliposomes and Sendai-containing lipid matrices; Span-85 (sorbitan trioleate); Specol (emulsion of Marcol 52, Span 85 and Tween 85); squalene or Robane® (2,6,10,15,19,23-hexamethyltetracosan and 2,6,10,15,19,23-hexamethyl-2,6,10,14,18,22-tetracosahexane); stearyltyrosine (octadecyltyrosine hydrochloride); Theramid® (N-acetylglucosaminyl-N-acetylmuramyl-L-Ala-D-isoGlu-L-Ala-dipalmitoxypropylamide); Theronyl-MDP (Termurtide™ or [thr 1]-MDP; N-acetylmuramyl-L-threonyl-D-isoglutamine); Ty particles (Ty-VLPs or virus-like particles); Walter-Reed liposomes (liposomes containing lipid A adsorbed on aluminium hydroxide), and lipopeptides, including Pam3Cys,
in particular aluminium salts, such as Adju-phos, Alhydrogel, Rehydragel, etc.; emulsions, such as CFA, SAF, IFA, MF59, Provax, TiterMax, Montanide, Vaxfectin, etc.; copolymers, such as Optivax (CRL1005), L121, Poloaxmer4010), etc.; liposomes, such as Stealth, etc., cochleates, such as BIORAL, etc.; plant derived adjuvants, such as QS21, Quil A, Iscomatrix, ISCOM, etc.; preferred adjuvants suitable for costimulation may include e.g. Tomatine, biopolymers, such as PLG, PMM, Inulin, etc.; microbe derived adjuvants, such as Romurtide, DETOX, MPL, CWS, Mannose, CpG7909, ISS-1018, IC31, Imidazoquinolines, Ampligen, Ribi529, IMOxinc, IRIVs, VLPs, cholera toxin, heat-labile toxin, Pam3Cys, Flagellin, GPI anchor, LNFPIII/Lewis X, antimicrobial peptides, UC-1V150,

RSV fusion protein, cdiGMP, etc.; preferred adjuvants suitable as antagonists may e.g. include CGRP neuropeptide, or from cationic or polycationic compounds which are suitable for depot and delivery, including protamine, nucleoline, spermin or spermidine, or other cationic peptides or proteins, including poly-L-lysine (PLL), poly-arginine, basic polypeptides, cell penetrating peptides (CPPs), including HIV-binding peptides, Tat, HIV-1 Tat (HIV), Tat-derived peptides, Penetratin, VP22 derived or analog peptides, HSV VP22 (Herpes simplex), MAP, KALA or protein transduction domains (PTDs, PpT620, prolin-rich peptides, arginine-rich peptides, lysine-rich peptides, MPGpeptide(s), Pep-1, L-oligomers, Calcitonin peptide(s), Antennapedia-derived peptides (particularly from *Drosophila antennapedia*), pAntp, plsl; FGF, Lactoferrin, Transportan, Buforin-2, Bac715-24, SynB, SynB(1), pVEC, hCT-derived peptides, SAP, protamine, spermine, spermidine, or histones. Additionally, preferred cationic or polycationic proteins or peptides may be selected from following proteins or peptides having the following total formula: $(Arg)_l;(Lys)_m;(His)_n;(Om)_o;(Xaa)_x$, wherein l + m + n + o + x = 8-15, and l, m, n or o independently of each other may be any number selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 or 15, provided that the overall content of Arg, Lys, His and Orn represents at least 50% of all amino acids of the oligopeptide; and Xaa may be any amino acid selected from native (= naturally occurring) or non-native amino acids except of Arg, Lys, His or Om; and x may be any number selected from 0, 1, 2, 3 or 4, provided, that the overall content of Xaa does not exceed 50 % of all amino acids of the oligopeptide, cationic polysaccharides, for example chitosan, polybrene, cationic polymers, including polyethyleneimine (PEI), cationic lipids, including DOTMA: [1-(2,3-sioleyloxy)propyl)]-N,N,N-trimethylammonium chloride, DMRIE, di-C14-amidine, DOTIM, SAINT, DC-Chol, BGTC, CTAP, DOPC, DODAP, DOPE: Dioleyl phosphatidylethanol-amine, DOSPA, DODAB, DOIC, DMEPC, DOGS: Dioctadecylamidoglicylspermin, DIMRI: Dimyristo-oxypropyl dimethyl hydroxyethyl ammonium bromide, DOTAP: dioleoyloxy-3-(trimethylammonio)propane, DC-6-14: O,O-ditetradecanoyl-N-(α-trimethylammoniacetyl)diethanolamine chloride, CLIP1: rac-[(2,3-dioctadecyloxypropyl)(2-hydroxyethyl)]-dimethylammonium chloride, CLIP6: rac-[2(2,3-dihexadecyloxypropyl-oxymethyloxy)ethyl]trimethylammonium, CLIP9: rac-[2(2,3-dihexadecyloxypropyl-oxysuccinyloxy)ethyl]-trimethylammonium, oligofectamine, or cationic or polycationic polymers, including modified polyaminoacids, including β-aminoacid-polymers or reversed polyamides, modified polyehylenes, including PVP (poly(N-ethyl-4-vinylpyridinium bromide)), , modified acrylates, including pDMAEMA (poly(dimethylaminoethyl methylacrylate)), , modified Amidoamines including pAMAM (poly(amidoamine)), , modified polybetaaminoester (PBAE), including diamine end modified 1,4 butanediol diacrylate-co-5-amino-1-pentanol polymers,, dendrimers, including polypropylamine dendrimers or pAMAM based dendrimers, , polyimine(s), including PEI: poly(ethyleneimine), poly(propyleneimine), , polyallylamine, sugar backbone based polymers, including cyclodextrin based polymers, dextran based polymers, Chitosan, , silan backbone based polymers, including PMOXA-PDMS copolymers, , blockpolymers consisting of a combination of one or more cationic blocks (including selected og a cationic polymer as mentioned above) and of one or more hydrophilic- or hydrophobic blocks (e.g polyethyleneglycole);

or may be selected from nucleic acids of formule (IV: $G_lX_mG_n$, wherein: G is guanosine, uridine or an analogue of guanosine or uridine; X is guanosine, uridine, adenosine, thymidine, cytidine or an analogue of the above-mentioned nucleotides; l is an integer from 1 to 40, wherein when l = 1 G is guanosine or an analogue thereof, when l > 1 at least 50% of the nucleotides are guanosine or an analogue thereof; m is an integer and is at least 3; wherein when m = 3 X is uridine or an analogue thereof, when m ≥ 3 at least 3 successive uridines or analogues of uridine occur; n is an integer from 1 to 40, wherein when n =1 G is guanosine or an analogue thereof, when n > 1 at least 50% of the nucleotides are guanosine or an analogue thereof;

or from nucleic acids of formula (V): $C_lX_mC_n$, wherein: C is cytidine, uridine or an analogue of cytidine or uridine; X is guanosine, uridine, adenosine, thymidine, cytidine or an analogue of the above-mentioned nucleotides; l is an integer from 1 to 40, wherein when l = 1 C is cytidine or an analogue thereof, when l > 1 at least 50% of the nucleotides are cytidine or an analogue thereof; m is an integer and is at least 3; wherein when m = 3 X is uridine or an analogue thereof, when m > 3 at least 3 successive uridines or analogues of uridine occur; n is an integer from 1 to 40, wherein when n = 1 C is cytidine or an analogue thereof, when n > 1 at least 50% of the nucleotides are cytidine or an analogue thereof.

6. Pharmaceutical composition according to any one of claims 3 to 5, **characterized in that** the pharmaceutical composition is a vaccine.

7. RNA molecule according to claim 1 for use in the treatment of cancer diseases, autoimmune disease, allergies or infectious diseases,

wherein the cancer diseases are preferably selected from colon carcinomas, melanomas, renal carcinomas, lymphomas, acute myeloid leukaemia (AML), acute lymphoid leukaemia (ALL), chronic myeloid leukaemia (CML), chronic lymphocytic leukaemia (CLL), gastrointestinal tumours, pulmonary carcinomas, gliomas, thyroid tumours, mammary carcinomas, prostate tumours, hepatomas, various virus-induced tumours such as, for example, papilloma virus-induced carcinomas (e.g. cervical carcinoma), adenocarcinomas, herpes virus-induced tumours (e.g. Burkitt's lymphoma, EBV-induced B-cell lymphoma), heptatitis B-induced tumours (hepatocell carcinoma), HTLV-1- and HTLV-2-induced lymphomas, acoustic neuro-mas/neurinomas, cervical cancer, lung cancer, pharyngeal cancer, anal carcinomas, glioblastomas, lymphomas, rectal carcinomas, astrocytomas, brain tumours, stomach cancer, retinoblastomas, basaliomas, brain metastases, medulloblastomas, vaginal cancer, pancreatic cancer, testicular

cancer, melanomas, thyroidal carcinomas, bladder cancer, Hodgkin's syndrome, meningiomas, Schneeberger disease, bronchial carcinomas, hypophysis tumour, Mycosis fungoides, oesophageal cancer, breast cancer, carcinolds, neurinomas, spinaliomas, Burkitt's lymphomas, laryngeal cancer, renal cancer, thymomas, corpus carcinomas, bone cancer, non-Hodgkin's lymphomas, urethral cancer, CUP syndrome, head/neck tumours, oligodendrogliomas, vulval cancer, intestinal cancer, colon carcinomas, oesophageal carcinomas, wart involvement, tumours of the small intestine, craniopharyngeomas, ovarian carcinomas, soft tissue tumours/sarcomas, ovarian cancer, liver cancer, pancreatic carcinomas, cervical carcinomas, endometrial carcinomas, liver metastases, penile cancer, tongue cancer, gall bladder cancer, leukaemia, plasmocytomas, uterine cancer, lid tumour and prostate cancer, and

wherein the infectious diseases are preferably selected from influenza, malaria, SARS, yellow fever, AIDS, Lyme borreliosis, Leishmaniasis, anthrax, meningitis, viral infectious diseases such as AIDS, Condyloma acuminata, hollow warts, Dengue fever, three-day fever, Ebola virus, cold, early summer meningoencephalitis (FSME), flu, shingles, hepatitis, herpes simplex type I, herpes simplex type II, Herpes zoster, influenza, Japanese encephalitis, Lassa fever, Marburg virus, measles, foot-and-mouth disease, mononucleosis, mumps, Norwalk virus infection, Pfeiffer's glandular fever, smallpox, polio (childhood lameness), pseudo-croup, fifth disease, rabies, warts, West Nile fever, chickenpox, cytomegalic virus (CMV), from bacterial infectious diseases such as miscarriage (prostate inflammation), anthrax, appendicitis, bomeliosis, botulism, Camphylobacter, Chlamydia trachomatis (inflammation of the urethra, conjunctivitis), cholera, diphtheria, donavanosis, epiglottitis, typhus fever, gas gangrene, gonorrhoea, rabbit fever, Heliobacter pylori, whooping cough, climatic bubo, osteomyelitis, Legionnaire's disease, leprosy, listeriosis, pneumonia, meningitis, bacterial meningitis, anthrax, otitis media, Mycoplasma hominis, neonatal sepsis (Chorioamnionitis), noma, paratyphus, plague, Reiter's syndrome, Rocky Mountain spotted fever, Salmonella paratyphus, Salmonella typhus, scarlet fever, syphilis, tetanus, tripper, tsutsugamushi disease, tuberculosis, typhus, vaginitis (colpitis), soft chancre, and from infectious diseases caused by parasites, protozoa or fungi, such as amoebiasis, bilharziosis, Chagas disease, athlete's foot, yeast fungus spots, scabies, malaria, onchocercosis (river blindness), or fungal diseases, toxoplasmosis, trichomoniasis, trypanosomiasis (sleeping sickness), visceral Leishmaniosis, nappy/diaper dermatitis, schistosomiasis, fish poisoning (Ciguatera), candidosis, cutaneous Leishmaniosis, lambliasis (giardiasis), or sleeping sickness, or from infectious diseases caused by Echinococcus, fish tapeworm, fox tapeworm, canine tapeworm, lice, bovine tapeworm, porcine tapeworm and miniature tapeworm, and

wherein the autoimmune diseases are preferably selected from the group consisting of type I autoimmune diseases or type II autoimmune diseases or type III autoimmune diseases or type IV autoimmune diseases, such as, for example, multiple sclerosis (MS), rheumatoid arthritis, diabetes, type I diabetes (Diabetes mellitus), systemic lupus erythematosus (SLE), chronic polyarthritis, Basedow's disease, autoimmune forms of chronic hepatitis, colitis ulcerosa, type I allergy diseases, type II allergy diseases, type III allergy diseases, type IV allergy diseases, fibromyalgia, hair loss, Bechterew's disease, Crohn's disease, Myasthenia gravis, neurodermitis, Polymyalgia rheumatica, progressive systemic sclerosis (PSS), psoriasis, Reiter's syndrome, rheumatic arthritis, psoriasis, vasculitis, etc, or type II diabetes, and

wherein the allergies are preferably selected from the group consisting of allergic asthma (leading to swelling of the nasal mucosa), allergic conjunctivitis (leading to redness and itching of the conjunctive), allergic rhinitis ("hay fever"), anaphylaxis, angiodema, atopic dermatitis (eczema), urticaria (hives), eosinophilia, respiratory, allergies to insect stings, skin allergies (leading to and including various rashes, such as eczema, hives (urticaria) and (contact) dermatitis), food allergies, and allergies to medicine.

SEQUENCE LISTING

<110> CureVac GmbH

<120> Nucleic acids of formula (I) (NuGlXmGnNv)a and derivatives thereof as an immune-stimulating agent/adjuvant

<130> CU01P072WO

<140>
<141>

<150> EP 08001827.8
<151> 2008-01-31

<160> 119

<170> PatentIn version 3.5

<210> 1
<211> 20
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<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 1
ggguuuuuuu uuuuuuuggg 20

<210> 2
<211> 20
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 2
gggggguuuu uuuuuggggg 20

<210> 3
<211> 40
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 3
gggggguuuu uuuuuuuuuu uuuuuuuuuu uuuuuggggg 40

<210> 4
<211> 39
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 4
gugugugugu guuuuuuuuu uuuuuuugug ugugugugu 39

<210> 5
<211> 39
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 5
gguugguugg uuuuuuuuuu uuuuuuuggu ugguugguu 39

<210> 6
<211> 20
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 6
gggggggggu uugggggggg 20

<210> 7
<211> 20
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 7
gggggggguu uugggggggg 20

<210> 8
<211> 20
<212> DNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 8
ggggggguuu uugggggggg 20

<210> 9
<211> 20
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 9
ggggggguuu uuuggggggg 20

<210> 10
<211> 20

<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 10
gggggguuuu uuuugggggg 20

<210> 11
<211> 20
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 11
gggggguuuu uuuuuggggg 20

<210> 12
<211> 20
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 12
gggggguuuu uuuuuugggg 20

<210> 13
<211> 20
<212> DNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 13
gggggguuuu uuuuuugggg 20

<210> 14
<211> 20
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 14
gggggguuuu uuuuuuuggg 20

<210> 15
<211> 20
<212> RNA
<213> Artificial

<220>

<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 15
ggggguuuuu uuuuuuuggg 20

<210> 16
<211> 20
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 16
ggggguuuuu uuuuuuugg 20

<210> 17
<211> 20
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 17
gguuuuuuuu uuuuuuugg 20

<210> 18
<211> 20
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 18
guuuuuuuuu uuuuuuuug 20

<210> 19
<211> 22
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 19
ggggggggg uuuggggggg gg 22

<210> 20
<211> 22
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 20

ggggggggu uuuggggggg gg 22

<210> 21
<211> 22
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 21
gggggggguu uuuuggggggg gg 22

<210> 22
<211> 22
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 22
ggggggggguu uuuuuggggg gg 22

<210> 23
<211> 22
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 23
gggggggguuu uuuuuggggg gg 22

<210> 24
<211> 22
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 24
gggggggguuu uuuuuugggg gg 22

<210> 25
<211> 22
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 25
gggggggguuu uuuuuuuggg gg 22

<210> 26

<211> 22
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 26
gggggguuuu uuuuuuuggg gg 22

<210> 27
<211> 22
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 27
gggggguuuu uuuuuuuugg gg 22

<210> 28
<211> 22
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 28
ggggguuuuu uuuuuuuugg gg 22

<210> 29
<211> 22
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 29
ggggguuuuu uuuuuuuuug gg 22

<210> 30
<211> 22
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 30
gggguuuuuu uuuuuuuuug gg 22

<210> 31
<211> 22
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 31
ggauuuuuuu uuuuuuuuuu gg 22

<210> 32
<211> 24
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 32
gggggggggg guuugggggg gggg 24

<210> 33
<211> 24
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 33
gggggggggg uuuugggggg gggg 24

<210> 34
<211> 24
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 34
gggggggggu uuuuuggggg gggg 24

<210> 35
<211> 24
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 35
gggggggggu uuuuuugggg gggg 24

<210> 36
<211> 24
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 36
gggggggguu uuuuuugggg gggg 24

<210> 37
<211> 24
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 37
gggggggguu uuuuuuuggg gggg 24

<210> 38
<211> 24
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 38
gggggggguu uuuuuuuugg gggg 24

<210> 39
<211> 24
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 39
ggggggguuu uuuuuuuugg gggg 24

<210> 40
<211> 24
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 40
ggggggguuu uuuuuuuuug gggg 24

<210> 41
<211> 24
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 41
ggggggguuu uuuuuuuuug gggg 24

<210> 42
<211> 24
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 42
gggggguuuu uuuuuuuuuu gggg 24

<210> 43
<211> 24
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 43
ggggguuuuu uuuuuuuuuu gggg 24

<210> 44
<211> 24
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 44
ggguuuuuuu uuuuuuuuuu uggg 24

<210> 45
<211> 32
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 45
guuuuuuuuu uuuuuuuuuu uuuuuuuuuu ug 32

<210> 46
<211> 34
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 46
gguuuuuuuu uuuuuuuuuu uuuuuuuuuu uugg 34

<210> 47
<211> 36
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 47
ggguuuuuuu uuuuuuuuuu uuuuuuuuuu uuuggg 36

<210> 48
<211> 37
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 48
gggguuuuuu uuuuuuuuuu uuuuuuuuuu uuuuggg 37

<210> 49
<211> 39
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 49
ggggguuuuu uuuuuuuuuu uuuuuuuuuu uuuuugggg 39

<210> 50
<211> 41
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 50
gggggguuuu uuuuuuuuuu uuuuuuuuuu uuuuuugggg g 41

<210> 51
<211> 43
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 51
ggggggguuu uuuuuuuuuu uuuuuuuuuu uuuuuuuggg ggg 43

<210> 52
<211> 45
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 52
gggggggguu uuuuuuuuuu uuuuuuuuuu uuuuuuuugg ggggg 45

<210> 53
<211> 47
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 53
gggggggggu uuuuuuuuuu uuuuuuuuuu uuuuuuuuug ggggggg 47

<210> 54
<211> 7
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 54
gguuugg 7

<210> 55
<211> 8
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 55
gguuuugg 8

<210> 56
<211> 9
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 56
gguuuuugg 9

<210> 57
<211> 10
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 57
gguuuuuugg 10

<210> 58
<211> 11
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 58
gguuuuuuug g 11

<210> 59
<211> 12
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 59
gguuuuuuuu gg 12

<210> 60
<211> 13
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 60
gguuuuuuuu ugg 13

<210> 61
<211> 14
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 61
gguuuuuuuu uugg 14

<210> 62
<211> 15
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 62
gguuuuuuuu uuugg 15

<210> 63
<211> 16
<212> RNA

<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 63
gguuuuuuuu uuuugg 16

<210> 64
<211> 17
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 64
gguuuuuuuu uuuuugg 17

<210> 65
<211> 18
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 65
gguuuuuuuu uuuuuugg 18

<210> 66
<211> 19
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 66
gguuuuuuuu uuuuuuugg 19

<210> 67
<211> 9
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 67
ggguuuggg 9

<210> 68
<211> 10
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure

"GlXmGn"

<400> 68
gggguuuggg 10

<210> 69
<211> 11
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 69
ggguuuuugg g 11

<210> 70
<211> 12
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 70
ggguuuuuug gg 12

<210> 71
<211> 13
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 71
ggguuuuuuu ggg 13

<210> 72
<211> 14
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 72
ggguuuuuuu uggg 14

<210> 73
<211> 15
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 73
ggguuuuuuu uuggg 15

<210> 74
<211> 16
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 74
gggguuuuuu uuuggg 16

<210> 75
<211> 17
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 75
gggguuuuuu uuuuggg 17

<210> 76
<211> 18
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 76
gggguuuuuu uuuuuggg 18

<210> 77
<211> 19
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 77
gggguuuuuu uuuuuuggg 19

<210> 78
<211> 57
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 78
gggguuuuuu uuuuuuuugg guuuuuuuuu uuuuuugggu uuuuuuuuuu uuuuggg 57

<210> 79
<211> 42

<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 79
ggguuuuuuu uuuuuuuugg gggguuuuuu uuuuuuuuug gg 42

<210> 80
<211> 51
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "GlXmGn"

<400> 80
ggguuugggu uuggguuugg guuuggguuu ggguuugggu uuggguuugg g 51

<210> 81
<211> 57
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "ClXmCn"

<400> 81
cccuuuuuuu uuuuuuuucc cuuuuuuuuu uuuuuucccu uuuuuuuuuu uuuuccc 57

<210> 82
<211> 51
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "ClXmCn"

<400> 82
cccuuucccu uucccuuucc cuuucccuuu cccuuucccu uucccuuucc c 51

<210> 83
<211> 42
<212> RNA
<213> Artificial

<220>
<223> Description of artificial sequence: Exemplary core structure "ClXmCn"

<400> 83
cccuuuuuuu uuuuuuuucc ccccuuuuuu uuuuuuuuuc cc 42

<210> 84
<211> 60
<212> RNA
<213> Artificial

<220>

<223> Description of sequence: Exemplary sequence according to formula (I)

<400> 84
uagcgaagcu cuuggaccua gguuuuuuuu uuuuuuuggg ugcguuccua gaaguacacg 60

<210> 85
<211> 60
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: Exemplary sequence according to formula (I)

<220>
<221> misc_feature
<222> (1)..(60)
<223> sequence is double-stranded RNA

<400> 85
uagcgaagcu cuuggaccua gguuuuuuuu uuuuuuuggg ugcguuccua gaaguacacg 60

<210> 86
<211> 60
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: Exemplary sequence according to formula (Ia)

<400> 86
uagcgaagcu cuuggaccua ccuuuuuuuu uuuuuuuccc ugcguuccua gaaguacacg 60

<210> 87
<211> 60
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: Exemplary sequence according to formula (Ia)

<220>
<221> misc_feature
<222> (1)..(60)
<223> sequence is double-stranded RNA

<400> 87
uagcgaagcu cuuggaccua ccuuuuuuuu uuuuuuuccc ugcguuccua gaaguacacg 60

<210> 88
<211> 40
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: Exemplary sequence according to general formula (II)

<400> 88
cccccccccc cccccccccc gguuuuuuuu uuuuuuuggg 40

<210> 89
<211> 40
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: Exemplary sequence according to general formula (II)

<220>
<221> misc_feature
<222> (1)..(20)
<223> sequence is ds RNA (poly(I:C))

<400> 89
ccccccccccc ccccccccccc gguuuuuuuu uuuuuuuggg 40

<210> 90
<211> 40
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: Exemplary sequence according to general formula (II)

<220>
<221> misc_feature
<222> (23)..(37)
<223> sequence is double stranded ((A:U)

<400> 90
ccccccccccc ccccccccccc gguuuuuuuu uuuuuuuggg 40

<210> 91
<211> 40
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: Exemplary sequence according to general formula (II)

<220>
<221> misc_feature
<222> (1)..(40)
<223> sequence is double-stranded RNA

<400> 91
ccccccccccc ccccccccccc gguuuuuuuu uuuuuuuggg 40

<210> 92
<211> 80
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: Exemplary sequence according to general formula (II)

<400> 92

ccccccccccc ccccccccccc uagcgaagcu cuuggaccua gguuuuuuuu uuuuuuuggg 60

ugcguuccua gaaguacacg 80

<210> 93
<211> 80
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: Exemplary sequence according to general formula (II)

<220>
<221> misc_feature
<222> (1)..(80)
<223> sequence is double-stranded RNA

<400> 93
ccccccccccc ccccccccccc gguuuuuuuu uuuuuuuggg ugcguuccua gaaguacacg 60

uagcgaagcu cuuggaccua 80

<210> 94
<211> 80
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: Exemplary sequence according to general formula (II)

<220>
<221> misc_feature
<222> (21)..(80)
<223> sequence is double stranded RNA

<400> 94
ccccccccccc ccccccccccc gguuuuuuuu uuuuuuuggg ugcguuccua gaaguacacg 60

uagcgaagcu cuuggaccua 80

<210> 95
<211> 20
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: exemplary sequence of stem 1 (sequence is palindromic to SEQ ID NO: 96)

<400> 95
uagcgaagcu cuuggaccua 20

<210> 96
<211> 20
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: exemplary sequence of stem 2 (sequence is palindromic to SEQ ID NO: 95)

<400> 96
uagguccaag agcuucgcua 20

<210> 97
<211> 11
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: exemplary sequence of stem 1 (sequence is palindromic to SEQ ID NO: 98)

<400> 97
gccgcgggcc g 11

<210> 98
<211> 11
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: exemplary sequence of stem 2 (sequence is palindromic to SEQ ID NO: 97)

<400> 98
cggcccgcgg c 11

<210> 99
<211> 10
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: exemplary sequence of stem 1 (sequence is palindromic to SEQ ID NO: 100)

<400> 99
gacacggugc 10

<210> 100
<211> 10
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: exemplary sequence of stem 2 (sequence is palindromic to SEQ ID NO: 99)

<400> 100
gcaccgugca 10

<210> 101
<211> 8
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: exemplary sequence of either stem 1/stem2 (sequence is intrinsic palindromic)

<400> 101
accuaggu 8

<210> 102
<211> 8
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: exemplary sequence of either stem 1/stem2 (sequence is intrinsic palindromic)

<400> 102
uggaucca 8

<210> 103
<211> 5
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: exemplary sequence of stem 1 (sequence is palindromic to SEQ ID NO: 104)

<400> 103
ccugc 5

<210> 104
<211> 5
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: exemplary sequence of stem 2 (sequence is palindromic to SEQ ID NO: 103)

<400> 104
gcagg 5

<210> 105
<211> 5
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: exemplary sequence of stem 1 (sequence is palindromic to SEQ ID NO: 106)

<400> 105
gcagg 5

<210> 106
<211> 5
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: exemplary sequence of stem 2 (sequence is palindromic to SEQ ID NO: 105)

<400> 106
ccugc 5

<210> 107
<211> 60
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: inventive nucleic acid according to either formula (IIIa) or (IIIb)

<400> 107
uagcgaagcu cuuggaccua gguuuuuuuu uuuuuuuggg uaggucCaag agcuucgcua 60

<210> 108
<211> 122
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: inventive nucleic acid according to either formula (IIIa) or (IIIb)

<400> 108
uagcgaagcu cuuggaccua gguuuuuuuu uuuuuuuggg ugcguuccua gaaguacacg 60

gccgcgggcc gugcguuccu agaaguacac gcggcccgcg gcugcguucc uagaaguaca 120

cg 122

<210> 109
<211> 18
<212> PRT
<213> Unknown

<220>
<223> Description of sequence: sequence of protamin P1

<400> 109

Ser Arg Ser Arg Tyr Tyr Arg Gln Arg Gln Arg Ser Arg Arg Arg Arg
1 5 10 15

Arg Arg

<210> 110
<211> 21
<212> PRT
<213> Unknown

<220>
<223> Description of sequence: sequence of protamin P2

<400> 110

Arg Arg Arg Leu His Arg Ile His Arg Arg Gln His Arg Ser Cys Arg
1 5 10 15

Arg Arg Lys Arg Arg
20

<210> 111
<211> 13
<212> RNA
<213> Unknown

<220>
<223> Description of sequence: Kozak sequence

<400> 111
gccgccacca ugg 13

<210> 112
<211> 15
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: generic stabilizing sequence of the formula (C/U)CCANxCCC(U/A)PyxUC(C/U)CC

<220>
<221> variation
<222> (1)..(1)
<223> /replace="cytidine (cytosine)"

/replace="uridine (uracile)"

<220>
<221> misc_feature
<222> (1)..(1)
<223> nucleic acid = cytidine (cytosine) or uridine (uracile)

<220>
<221> misc_feature
<222> (5)..(5)
<223> Nx = a, g, c or u or any other nucleic acid

<220>
<221> variation
<222> (5)..(5)
<223> /replace="cytidine (cytosine)"

/replace="uridine (uracile)"

/replace="guanosine"

/replace="adenosine", or any othe nucleic acid

<220>
<221> repeat_unit
<222> (5)..(5)
<223> x = any number

<220>
<221> misc_feature
<222> (9)..(9)
<223> nucleic acid = uridine (uracile) or adenosine

<220>
<221> variation
<222> (9)..(9)
<223> /replace="uridine (uracile)"

/replace="adonosine"

<220>
<221> misc_feature
<222> (10)..(10)
<223> Py = pyrimidine

<220>
<221> repeat_unit
<222> (10)..(10)
<223> x = any number

<220>
<221> variation
<222> (10)..(10)
<223> /replace="pyrimidine"

<220>
<221> misc_feature
<222> (13)..(13)
<223> nucleic acid = cytidine (cytosine) or uridine (uracile)

<220>
<221> variation
<222> (13)..(13)
<223> /replace="cytidine (cytosine)"

/replace="uridine (uracile)"

<400> 112
nccancccnn ucncc 15

<210> 113
<211> 20
<212> RNA
<213> Artificial

<220>
<223> Description of sequence: immune-stimulating oligo RNA40

<400> 113
gcccgucugu ugugugacuc 20

<210> 114
<211> 229
<212> RNA
<213> Artificial Sequence

<220>
<223> Description of sequence: Exemplary sequence according to formula (I)

<400> 114
gggagaaagc ucaagcuugg agcaaugccc gcacauugag gaaaccgagu ugcauaucuc 60

agaguauugg cccccgugua gguuauucuu gacagacagu ggagcuuauu cacucccagg 120

auccgagucg cauacuacgg uacuggugac agaccuaggu cgucaguuga ccaguccgcc 180

acuagacgug aguccgucaa agcaguuaga uguuacacuc uauuagauc 229

<210> 115
<211> 547
<212> RNA
<213> Artificial Sequence

<220>
<223> Description of sequence: Exemplary sequence according to formula (I)

<400> 115
gggagaaagc ucaagcuugg agcaaugccc gcacauugag gaaaccgagu ugcauaucuc 60

agaguauugg cccccgugua gguuauucuu gacagacagu ggagcuuauu cacucccagg 120

auccgagucg cauacuacgg uacuggugac agaccuaggu cgucaguuga ccaguccgcc 180

acuagacgug aguccgucaa agcaguuaga uguuacacuc uauuagaucu cggauuacag 240

cuggaaggag caggaguagu guucuugcuc uaaguaccga gugugcccaa uacccgauca 300

gcuuauuaac gaacggcucc uccucuuaga cugcagcgua agugcggaau cuggggauca 360

aauuacugac ugccuggauu acccucggac auauaaccuu guagcacgcu guugcuguau 420

aggugaccaa cgcccacucg aguagaccag cucucuuagu ccggacaaug auaggaggcg 480

cggucaaucu acuucuggcu aguuaagaau aggcugcacc gaccucuaua aguagcgugu 540

ccucuag 547

<210> 116
<211> 1083
<212> RNA
<213> Artificial Sequence

<220>
<223> Description of sequence: Exemplary sequence according to formula (I)

<400> 116
gggagaaagc ucaagcuugg agcaaugccc gcacauugag gaaaccgagu ugcauaucuc 60

agaguauugg cccccgugua gguuauucuu gacagacagu ggagcuuauu cacucccagg 120

<220>
<223> Description of sequence: Exemplary sequence according to formula (I)

<400> 117
gggagaaagc ucaagcuuau ccaaguaggc uggucaccug uacaacguag ccgguauuuu 60

uuuuuuuuuu uuuuuuuuga ccgucucaag guccaaguua gucugccuau aaaggugcgg 120

auccacagcu gaugaaagac uugugcggua cgguuaaucu ccccuuuuuu uuuuuuuuuu 180

uuuuuaguaa augcgucuac ugaauccagc gaugaugcug gcccagauc 229

<210> 118
<211> 546
<212> RNA
<213> Artificial Sequence

<220>
<223> Description of sequence: Exemplary sequence according to formula (I)

<400> 118
gggagaaagc ucaagcuuau ccaaguaggc uggucaccug uacaacguag ccgguauuuu 60

uuuuuuuuuu uuuuuuuuga ccgucucaag guccaaguua gucugccuau aaaggugcgg 120

guggaguguc acugcucucg aggucucacg agagcgcucg auacaguccu uggaagaauc 480
uuuuuuuuuu uuuuuuuuuu uugugcgacg aucacagaga acuucuauuc augcaggucu 540
gcucuagaac gaacugaccu gacgccugaa cuuaugagcg ugcguauuuu uuuuuuuuuu 600
uuuuuuuuuc cucccaacaa augucgauca auagcugggc uguuggagac gcgucagcaa 660
augccguggc uccauaggac guguagacuu cuauuuuuuu uuuuuuuuuu uuuucccggg 720
accacaaaua auauucuugc uugguugggc gcaagggccc cguaucaggu cauaaacggg 780
uacauguugc acaggcuccu uuuuuuuuuu uuuuuuuuuu uucgcugagu uauuccgguc 840
ucaaaagacg gcagacguca gucgacaaca cggucuaaag cagugcuaca aucugccgug 900
uucguguuuu uuuuuuuuuu uuuuuuguga accuacacgg cgugcacugu aguucgcaau 960
ucauagggua ccggcucaga guuaugccuu gguugaaaac ugcccagcau acuuuuuuuu 1020
uuuuuuuuuu uucauauucc caugcuaagc aagggaugcc gcgagucaug uuaagcuuga 1080
auu 1083