

### Claims

1. Fully synthetic, long-chain nucleic acid with at least 4,000 bases, characterised in that the nucleic acid comprises at least two of the four sequence parts A-D in any arrangement, wherein
  - i) Sequence part A comprises
    - a) a sequence as defined in SEQ. ID. 50 or a sequence having at least 98.5% sequence identity to the sequence as defined in SEQ. ID. 50; or
    - b) a sequence as defined in SEQ. ID. 3;
  - ii) Sequence part B comprises
    - a) a sequence as defined in SEQ. ID. 48 or a sequence having at least 98.3% sequence identity to the sequence as defined in SEQ. ID. 48; or
    - b) a sequence as defined in SEQ. ID. 7;
  - iii) Sequence part C comprises
    - a) a sequence as defined in SEQ. ID. 49 or a sequence having at least 97.2% sequence identity to the sequence as defined in SEQ. ID. 49; or
    - b) a sequence as defined in SEQ. ID. 11;
  - iv) Sequence part D comprises a sequence as defined in SEQ. ID. 17 or a sequence having at least 98.5 % sequence identity to the sequence as defined in SEQ. ID. 17; orencompasses a ribonucleic acid sequence corresponding to the deoxyribonucleic acid sequence according to the sequence parts A-D.
2. The nucleic acid according to claim 1, characterized in that it has at least 8'000 bases, preferably at least 20'000 bases, in a defined sequence.
3. The nucleic acid according to one of the preceding claims, wherein the nucleic acid additionally comprises
  - a) 1.) an ORF1ab sequence defined by the SEQ. ID. 51 or a sequence having at least 98,5% sequence identity to SEQ. ID. 51; or

- 2.) i) an ORF1b sequence defined by the SEQ. ID. 59 or a sequence having at least 98,5% sequence identity to SEQ. ID. 59; and
  - ii) a n ORF1a sequence defined by the SEQ. ID. 58 or a sequence having at least 98,6% sequence identity to SEQ. ID. 58;
- b) an ORF3a sequence defined by the SEQ. ID. 52 or a sequence having at least 99% sequence identity to SEQ. ID 52; and
- c) an ORF7a sequence defined by the SEQ. ID. 54 or a sequence having at least 99,5% sequence identity to SEQ. ID. 54;
4. The nucleic acid according to claim 3, wherein the nucleic acid additionally comprises
  - a) an ORF6 sequence defined by the SEQ. ID. 53 or a sequence having at least 94,1% sequence identity to SEQ. ID 53; and/or
  - b) an ORF8 sequence defined by the SEQ. ID. 55 or a sequence having at least 99% sequence identity to SEQ. ID 55.
5. The nucleic acid according to one of the preceding claims, characterized in that sequence parts A to C correspond to the sequence according to SEQ. ID. 19 or the corresponding ribonucleic acid sequence.
6. The nucleic acid according to any of the preceding claims, characterized in that the nucleic acid comprises in any arrangement at least three of the four sequence parts A-D or at least three of four sequence parts with a ribonucleic acid sequence corresponding to the deoxyribonucleic acid sequence according to the sequence parts A-D.
7. The nucleic acid according to any of the preceding claims, characterized in that the nucleic acid comprises in any arrangement the four sequence parts A-D or four sequence parts with a ribonucleic acid sequence corresponding to the deoxyribonucleic acid sequence according to the sequence parts A-D.
8. The nucleic acid according to one of the preceding claims, characterized in that the nucleic acid additionally comprises at least one sequence consisting of  
SEQ. ID. 15

SEQ. ID. 28

SEQ. ID. 29 and

SEQ. ID. 30

or comprises one of the deoxyribonucleic acid sequences according to the sequence parts SEQ. ID. 15, SEQ. ID. 28, SEQ. ID. 29 and SEQ. ID. 30 or the corresponding ribonucleic acid sequence.

9. The nucleic acid according to one of the preceding claims, characterized in that it has a maximum size of 1'000'000 bases, preferably a maximum size of 200'000 bases.
10. A vector comprising the nucleic acid according to one of the preceding claims.
11. The vector according to claim 10, wherein the vector comprises the sequences defined by the SEQ. ID. 46 and SEQ. ID. 47.
12. The vector according to any one of the claims 10 to 11, wherein the vector is a plasmid vector.
13. A kit comprising two or more nucleic acids according to one of claims 1 to 9.
14. The kit according to claim 13, wherein the nucleic acids are present in at least one plasmid, preferably in two or more plasmids.
15. A biotechnological production unit comprising at least one vector according to claims 10 to 12.
16. A virus envelope, a fragment of a virus envelope and/or virus envelope protein obtainable by gene expression using at least one nucleic acid according to one of claims 1 to 9, using the vector according to one of claims 10 to 12, using the kit according to one of claims 13 or 14, or the biotechnological production unit according to claim 15, wherein the virus envelope, the fragment of a virus envelope and/or the virus envelope protein package the at least one nucleic acid according to one of claims 1 to 9.
17. A vaccine against the coronavirus SARS-CoV-2 comprising at least one nucleic acid according to one of claims 1 to 9 and products obtainable by gene expression using at least one nucleic acid according to one of the claims 1 to 9, using the vector according to one of claims 10 to 12, using the kit according to one of the claims 13 or 14 in a production organism, in particular comprising

the virus envelope, the fragment of a virus envelope and/or the virus envelope protein according to claim 16.

18. The vaccine according to claim 17 comprising at least two molecularly precisely defined protein components selected from the group consisting of the protein components a, b1, b2, c1, c2, d1 or d2, wherein

(i) the protein component a comprises

a) the sequence according to SEQ. ID. 14 analogous to the S protein of SARS-CoV-2 or a sequence having at least 90% sequence identity to SEQ. ID. 14; or

b) the sequence according to SEQ. ID. 18 analogous to the S protein of SARS-CoV-2 or sequence having at least 90% sequence identity to SEQ. ID.18;

(ii) the protein component b1 comprises

a) the sequence according to SEQ. ID. 6 analogous to the envelope protein E of SARS-CoV-2 or a sequence having at least 90% sequence identity to SEQ. ID.6; or

b) the sequence according to SEQ. ID. 21 analogous to the envelope protein E of SARS-CoV-2 or a sequence having at least 90% sequence identity to SEQ. ID.21; and

the protein component b2 comprises the sequence according to SEQ. ID. 8 analogous to the envelope protein E of MHV59A or an equivalent protein comprising a sequence having at least 90% sequence identity to SEQ. ID.8;

(iii) the protein component c1 comprises

a) the sequence according to SEQ. ID. 10 analogous to the envelope protein M of SARS-CoV-2 or a sequence having at least 90% sequence identity to SEQ. ID. 10; or

b) the sequence according to SEQ. ID. 22 analogous to the membrane protein M of SARS-CoV-2 or a sequence having at least 90% sequence identity to SEQ. ID.22; and

the protein component c2 comprises the sequence according to SEQ. ID. 12 analogous to membrane protein M of MHV59A or an equivalent protein

comprising a sequence having at least 90% sequence identity to SEQ. ID. 12; and

(iv) the protein component d1 comprises

a) the sequence according to SEQ. ID. 2 analogous to the nucleocapsid phosphoprotein N of SARS-CoV-2 or a sequence having at least 90% sequence identity to SEQ. ID. 2; or

b) the sequence according to SEQ. ID. 26 analogous to the nucleocapsid phosphoprotein N of SARS-CoV-2 or a sequence having at least 90% sequence identity to SEQ. ID. 26; and

the protein component d2 the sequence according to SEQ. ID. 4 analogous to the nucleocapsid phosphoprotein N of MHV59A or an equivalent protein comprising a sequence having at least 90% sequence identity to SEQ. ID. 4.

19. A method for the production of the vaccine a vaccine against the coronavirus SARS-CoV-2 comprising the successive steps of

a) introducing the nucleotide acid sequence according to one of claims 1 to 9 into a biotechnological production unit, in particular a cell line,

wherein, the nucleic acid-based mRNA coding for at least two of the protein components selected from the group consisting of the protein components a, b1, b2, c1, c2, d1 or d2 are prepared by translation;

b) obtaining protein components from the biotechnological production unit in step a); and

c) purifying the obtained protein components to obtain the vaccine against the coronavirus SARS-CoV-2.

20. A method for the production of a vaccine against the coronavirus SARS-CoV-2 comprising the virus envelope, the fragment of a virus envelope and/or the virus envelope protein according to claim 16 comprising the successive steps of:

a) introducing the nucleotide acid sequence according to one of claims 1 to 9 into a biotechnological production unit, wherein the biotechnological production unit comprises a nucleotide acid coding for at least one of the

protein components selected from the group consisting of the protein components a, b1, c1, and d1.

b) obtaining a fragment of a virus envelope and/or virus envelope protein from the biotechnological production unit in step a); and

c) purifying the obtained protein components to obtain the vaccine against the coronavirus SARS-CoV-2 comprising the virus envelope, the fragment of a virus envelope and/or the virus envelope protein according to claim 16.

21. A method for the production of a vaccine against the coronavirus SARS-CoV-2 comprising the successive steps of:

a) introducing the vector according to one of claims 10 to 12 into an amplifying biotechnological production unit;

b) amplifying the nucleotide acid according to one of claims 1 to 9 in the amplifying biotechnological production unit;

c) obtaining the nucleotide acid amplified in step b);

d) obtaining the vaccine against the coronavirus SARS-CoV-2 by using method according to claim 19 or 20.