Claims

1. An L-nucleic acid molecule capable of binding to human C5a and mouse C5a, wherein the L-nucleic acid molecule comprises a central stretch of nucleotides, wherein the central stretch of nucleotides comprises a nucleotide sequence of

5' AUGn_1GGUGKUn_2n_3RGGGHUGUKGGGn_4Gn_5CGACGCA 3' [SEQ ID NO: 61], wherein

n_1 is U or dU, n_2 is G or dG, n_3 is A or dA, n_4 is U or dU, n_5 is U or dU and

G, A, U, C, H, K, and R are ribonucleotides, and

dU, dG and dA are 2'-deoxyribonucleotides.

2. The L-nucleic acid molecule according to claim 1, wherein the central stretch of nucleotides comprises a nucleotide sequence selected from the group of

a) 5' AUGn_1GGUGUUn_2n_3AGGGUUGUGGGGn_4Gn_5CGACGCA 3' [SEQ ID NO: 62],

b) 5' AUGn_1GGUGUUn_2n_3GGGGUUGUGGGGn_4Gn_5CGACGCA 3' [SEQ ID NO: 63],

c) 5' AUGn_1GGUGUUn_2n_3AGGGUUGUUGGGn_4Gn_5CGACGCA 3' [SEQ ID NO: 64],

d) 5' AUGn_1GGUGGUn_2n_3AGGGUUGUUGGGn_4Gn_5CGACGCA 3' [SEQ ID NO: 65],

e) 5' AUGn_1GGUGGUn_2n_3GGGGUUGUGGGGn_4Gn_5CGACGCA 3' [SEQ ID NO: 66],

f) 5' AUGn_1GGUGGUn_2n_3GGGGAUGUGGGGn_4Gn_5CGACGCA 3'[SEQ ID NO: 67], and

g) 5' AUGn_1GGUGUUn_2n_3GGGGCUGUGGGGn_4Gn_5CGACGCA 3' [SEQ ID NO: 68], wherein

n_1 is U or dU, n_2 is G or dG, n_3 is A or dA, n_4 is U or dU, n_5 is U or dU and

G, A, U and C are ribonucleotides, and

dU, dG and dA are 2'-deoxyribonucleotides.

3. The L-nucleic acid molecule according to any one of claims 1 to 2, wherein the central stretch of nucleotides consists of ribonucleotides and 2'-deoxyribonucleotides.

4. The L-nucleic acid molecule according to any one of claims 1 to 2, wherein the central stretch of nucleotides consists of ribonucleotides.

5. The L-nucleic acid molecule according to any one of claims 1 to 4, wherein the L-nucleic acid molecule comprises in 5'->3' direction a first terminal stretch of nucleotides, the central stretch of nucleotides and a second terminal stretch of nucleotides, wherein

the first terminal stretch of nucleotides comprises one to five nucleotides, and

the second terminal stretch of nucleotides comprises one to five nucleotides,

preferably

the first terminal stretch of nucleotides comprises three to five nucleotides, and

the second terminal stretch of nucleotides comprises three to five nucleotides,

more preferably

the first terminal stretch of nucleotides comprises three nucleotides, and

the second terminal stretch of nucleotides comprises three nucleotides.

6. The L-nucleic acid molecule according to claim 5, wherein the first terminal stretch of nucleotides comprises a nucleotide sequence of 5' $Z_1Z_2Z_3Z_4G$ 3' and the second terminal stretch of nucleotides comprises a nucleotide sequence of 5' $Z_5Z_6Z_7Z_8$ Z_9 3',

wherein
Z_1 is G or absent, Z_2 is S or absent, Z_3 is S or absent, Z_4 is B or absent, Z_5 is C or dC, Z_6 is V or absent, Z_7 is S or absent, Z_8 is S or absent, Z_9 is C or absent, and

G, S, B, C, V are ribonucleotides, and

dC is a 2'-deoxyribonucleotide,

preferably

a) Z_1 is G, Z_2 is S, Z_3 is S, Z_4 is B, Z_5 is C or dC, Z_6 is V, Z_7 is S, Z_8 is S, and Z_9 is C, or
b) Z_1 is absent, Z_2 is S, Z_3 is S, Z_4 is B, Z_5 is C or dC, Z_6 is V, Z_7 is S, Z_8 is S, and Z_9 is absent, or
c) Z_1 is absent, Z_2 is absent, Z_3 is S, Z_4 is B, Z_5 is C or dC, Z_6 is V, Z_7 is S, Z_8 is absent, and Z_9 is absent, or
d) Z_1 is absent, Z_2 is absent, Z_3 is absent, Z_4 is B, Z_5 is C or dC, Z_6 is V, Z_7 is absent, Z_8 is absent, and Z_9 is absent, or
e) Z_1 is absent, Z_2 is S, Z_3 is S, Z_4 is B, Z_5 is C or dC, Z_6 is V, Z_7 is S, Z_8 is S, and Z_9 is C, or
f) Z_1 is absent, Z_2 is absent, Z_3 is S, Z_4 is B, Z_5 is C or dC, Z_6 is V, Z_7 is S, Z_8 is S, and Z_9 is C, or
g) Z_1 is absent, Z_2 is absent, Z_3 is absent, Z_4 is B, Z_5 is C or dC, Z_6 is V, Z_7 is S, Z_8 is S, and Z_9 is C, or
h) Z_1 is absent, Z_2 is absent, Z_3 is absent, Z_4 is absent, Z_5 is C or dC, Z_6 is V, Z_7 is S, Z_8 is S, and Z_9 is C, or
i) Z_1 is absent, Z_2 is absent, Z_3 is S, Z_4 is B, Z_5 is C or dC, Z_6 is V, Z_7 is S, Z_8 is S, and Z_9 is absent, or

j) Z_1 is absent, Z_2 is absent, Z_3 is absent, Z_4 is B, Z_5 is C or dC, Z_6 is V, Z_7 is S, Z_8 is S, and Z_9 is absent, or

k) Z_1 is absent, Z_2 is absent, Z_3 is absent, Z_4 is absent, Z_5 is C or dC, Z_6 is V, Z_7 is S, Z_8 is S, and Z_9 is absent, or

l) Z_1 is absent, Z_2 is S, Z_3 is S, Z_4 is B, Z_5 is C or dC, Z_6 is V, Z_7 is S, Z_8 is absent, and Z_9 is absent, or

m) Z_1 is absent, Z_2 is S, Z_3 is S, Z_4 is B, Z_5 is C or dC, Z_6 is V, Z_7 is absent, Z_8 is absent, and Z_9 is absent, or

n) Z_1 is absent, Z_2 is absent, Z_3 is absent, Z_4 is absent, Z_5 is C, Z_6 is V, Z_7 is S, Z_8 is absent, and Z_9 is absent, or

o) Z_1 is absent, Z_2 is absent, Z_3 is absent, Z_4 is B, Z_5 is C or dC, Z_6 is V, Z_7 is S, Z_8 is absent, and Z_9 is absent, or

p) Z_1 is absent, Z_2 is absent, Z_3 is S, Z_4 is B, Z_5 is C or dC, Z_6 is V, Z_7 is absent, Z_8 is absent, and Z_9 is absent, or

q) Z_1 is absent, Z_2 is absent, Z_3 is S, Z_4 is B, Z_5 is C or dC, Z_6 is absent, Z_7 is absent, Z_8 is absent, and Z_9 is absent.

7. The L-nucleic acid molecule according to any one of claims 1 to 2, and 4 to 6, wherein the L-nucleic acid molecule comprises a nucleotide sequence selected from the group of SEQ ID NO: 3, SEQ ID NO: 4, SEQ ID NO: 5, SEQ ID NO: 6 and SEQ ID NO: 90, or an L-nucleic acid molecule having an identity of at least 85% to the L-nucleic acid molecule comprising a nucleotide sequence selected from the group of SEQ ID NO: 3, SEQ ID NO: 4, SEQ ID NO: 5, SEQ ID NO: 6 and SEQ ID NO: 90, or an L-nucleic acid molecule which is homologous to the L-nucleic acid molecule comprising a nucleotide sequence selected from the group of SEQ ID NO: 3, SEQ ID NO: 4, SEQ ID NO: 5, SEQ ID NO: 6 and SEQ ID NO: 90, wherein the homology is at least 85%.

8. The L-nucleic acid molecule according to any one of claims 1 to 3 and 5 to 6, wherein the L-nucleic acid molecule comprises a nucleotide sequence selected from the group of SEQ ID NO: 14, SEQ ID NO: 21, SEQ ID NO: 24, SEQ ID NO: 25, SEQ ID NO: 26, SEQ ID NO: 27, SEQ ID NO: 37, SEQ ID NO: 57, SEQ ID NO: 59, SEQ ID NO: 60, SEQ ID NO: 91 and SEQ ID NO: 92, or an L-nucleic acid molecule having an identity of at least 85% to the L-

nucleic acid molecule comprising a nucleotide sequence selected from the group of SEQ ID NO: 14, SEQ ID NO: 21, SEQ ID NO: 24, SEQ ID NO: 25, SEQ ID NO: 26, SEQ ID NO: 27, SEQ ID NO: 37, SEQ ID NO: 57, SEQ ID NO: 59, SEQ ID NO: 60, SEQ ID NO: 91 and SEQ ID NO: 92, or an L-nucleic acid molecule which is homologous to the L-nucleic acid molecule comprising a nucleotide sequence selected from the group of SEQ ID NO: 14, SEQ ID NO: 21, SEQ ID NO: 24, SEQ ID NO: 25, SEQ ID NO: 26, SEQ ID NO: 27, SEQ ID NO: 37, SEQ ID NO: 57, SEQ ID NO: 59, SEQ ID NO: 60, SEQ ID NO: 91 and SEQ ID NO: 92, wherein the homology is at least 85%.

9. The L-nucleic acid molecule according to any one of claims 1 to 8, wherein the L-nucleic acid is an antagonist of an activity mediated by human and/or mouse C5a.

10. The L-nucleic acid molecule according to any one of claims 1 to 9, wherein the L-nucleic acid molecule comprises a modification group, wherein excretion rate of the L-nucleic acid molecule comprising the modification group from an organism is decreased compared to an L-nucleic acid not comprising the modification group.

11. The L-nucleic acid molecule according to any one of claims 1 to 9, wherein the L-nucleic acid molecule comprises a modification group, wherein the L-nucleic acid molecule comprising the modification group has an increased retention time in an organism compared to an L-nucleic acid molecule not comprising the modification group.

12. The L-nucleic acid molecule according to any one of claims 10 and 11, wherein the modification group is selected from the group comprising biodegradable and non-biodegradable modifications, preferably the modification group is selected from the group comprising polyethylene glycol, linear polyethylene glycol, branched polyethylene glycol, hydroxyethyl starch, a peptide, a protein, a polysaccharide, a sterol, polyoxypropylene, polyoxyamidate and poly (2-hydroxyethyl)–L-glutamine.

13. The L-nucleic acid molecule according to any one of claims 1 to 12 for use in a method for the treatment and/or prevention of a disease.

14. The L-nucleic acid molecule according to claim 13, wherein the disease is associated with complement activation and C5a-mediated pathogenic mechanisms, and/or is selected from the group comprising autoimmune disease, inflammatory disease, systemic inflammatory response syndrome, disease of the eye, ischemia/reperfusion injuries, delayed graft function, transplant rejection, cardiovascular disease, respiratory disease, acute reactions, infectious disease, neurological disease, neurodegenerative disease, fibrotic disease, hematological disease, metabolic disease, tumors and clinical complications associated with complement activation by biomaterials, preferably the systemic inflammatory response syndrome is selected from the group comprising sepsis and secondary damages of trauma or severe burns.

15. A pharmaceutical composition comprising an L-nucleic acid molecule as defined in any one of claims 1 to 12 and optionally a further constituent, wherein the further constituent is selected from the group comprising a pharmaceutically acceptable excipient, a pharmaceutically acceptable carrier and a pharmaceutically active agent.

16. Use of an L-nucleic acid molecule according to any one of claims 1 to 12 for the manufacture of a medicament.

17. Use of an L-nucleic acid molecule according to any one of claims 1 to 12 for the manufacture of a diagnostic means.

18. Use according to claim 16, wherein the medicament is for the treatment and/or prevention of autoimmune disease, inflammatory disease, systemic inflammatory response syndrome, disease of the eye, ischemia/reperfusion injuries, delayed graft function, transplant rejection, cardiovascular disease, respiratory disease, acute reactions, infectious disease, neurological disease, neurodegenerative disease, fibrotic disease, hematological disease, metabolic disease, tumors and clinical complications associated with complement activation by biomaterials, preferably the systemic inflammatory response syndrome is selected from the group comprising sepsis and secondary damages of trauma or severe burns.

19. A complex comprising an L-nucleic acid molecule according to any one of claims 1 to 12 and C5a, wherein preferably the complex is a crystalline complex.

20. Use of an L-nucleic acid molecule according to any one of claims 1 to 12 for the detection of C5a.

21. A method for the screening of an antagonist of an activity mediated by C5a comprising the following steps:

- providing a candidate antagonist of the activity mediated by C5a,

- providing an L-nucleic acid molecule as defined in any one of claims 1 to 12,

- providing a test system which provides a signal in the presence of an antagonist of the activity mediated by C5a, and

- determining whether the candidate antagonist of the activity mediated by C5a is an antagonist of the activity mediated by C5a.

22. A kit for the detection of C5a, wherein the kit comprises an L-nucleic acid molecule according to any one of claims 1 to 12 and at least an instruction leaflet or a reaction vessel.

23. A method for the detection of an L-nucleic acid as defined in any one of claims 1 to 12 in a sample, wherein the method comprises the steps of:

a) providing a capture probe, wherein the capture probe is at least partially complementary to a first part of the L-nucleic acid molecule as defined in any one of claims 1 to 12, and a detection probe, wherein the detection probe is at least partially complementary to a second part of the L-nucleic acid molecule as defined in any one of claims 1 to 12, or, alternatively, the capture probe is at least partially complementary to a second part of the L-nucleic acid molecule as defined in any one of claims 1 to 12 and the detection probe is at least

partially complementary to a first part of the L-nucleic acid molecule as defined in any one of claims 1 to 12;

b) adding the capture probe and the detection probe separately or combined to a sample containing the L-nucleic acid molecule as defined in any one of claims 1 to 12 or presumed to contain the L-nucleic acid molecule as defined in any one of claims 1 to 12;

c) allowing the capture probe and the detection probe to react either simultaneously or in any order sequentially with the L-nucleic acid molecule as defined in any one of claims 1 to 12 or part thereof;

d) optionally detecting whether or not the capture probe is hybridized to the L-nucleic acid molecule as defined any one of claims 1 to 12 provided in step a); and

e) detecting the complex formed in step c) consisting of the L-nucleic acid molecule as defined in any one of claims 1 to 12 and the capture probe and the detection probe.