

unexpectedly diminished by IFX-1 treatment. This is very surprising, since there is no known mechanism which would suggest an involvement of C5a in virus replication.

The results suggest that complement inhibition is a highly promising strategy for an adjunctive treatment of severe viral pneumonia. The therapeutic effects associated with the administration of a C5a inhibitor are so preeminent that even a monotherapy for viral pneumonia based on a C5a inhibitor appears to be feasible.

The above overview does not necessarily describe all advantages associated with and problems solved by the present invention.

SUMMARY

In a first aspect, the present invention refers to the use of an inhibitor of C5a in the preparation of a pharmaceutical composition for the reduction of viral load in a subject suffering from viral pneumonia, wherein the inhibitor of C5a is a binding moiety specifically binding to human C5a, wherein said binding moiety is selected from the group consisting of (a) antibodies or antigen-binding fragments thereof; (b) oligonucleotides; (c) antibody-like proteins; and (d) peptidomimetics. In another aspect, the present invention refers to the use of an inhibitor of C5a in the preparation of a pharmaceutical composition for the treatment of viral pneumonia in a subject, wherein the inhibitor is for use as a monotherapy, wherein the inhibitor of C5a is a binding moiety specifically binding to human C5a, wherein said binding moiety is selected from the group consisting of (a) antibodies or antigen-binding fragments thereof; (b) oligonucleotides; (c) antibody-like proteins; and (d) peptidomimetics. In still another aspect, the present invention refers to the use of an inhibitor of C5a in the preparation of a pharmaceutical composition for the treatment of viral pneumonia in a subject, wherein the viral pneumonia in the subject is caused by an H7N9 virus, wherein the inhibitor of C5a is a binding moiety specifically binding to human C5a, wherein said binding moiety is selected from the group consisting of (a) antibodies or antigen-binding fragments thereof; (b) oligonucleotides; (c) antibody-like proteins; and (d) peptidomimetics. In one other aspect, the present invention refers to the use of an inhibitor of C5a in the preparation of a pharmaceutical composition for the treatment of viral pneumonia in a subject, wherein the subject is a primate, preferably an ape, more preferably a human, wherein the inhibitor of C5a is a binding moiety specifically binding to human C5a, wherein said binding moiety is selected from the group consisting of (a) antibodies or antigen-binding fragments thereof; (b) oligonucleotides; (c) antibody-like proteins; and (d) peptidomimetics. Also described herein is an inhibitor of C5a for use in the reduction of viral load and/or reduction of acute lung injury (ALI) in a subject suffering from viral pneumonia.

In one example the present invention relates to an inhibitor of C5a for use in the treatment of pneumonia (preferably viral pneumonia) in a subject, wherein the inhibitor is for use as a monotherapy.

In another example the present invention relates to an inhibitor of C5a for use in the treatment of viral pneumonia in a subject, wherein the viral pneumonia in the subject is caused by an H7N9 virus.

In one example the present invention relates to an inhibitor of C5a for use in the treatment of pneumonia (preferably viral pneumonia) in a subject, wherein the subject is a primate, preferably an ape, more preferably a human.

This summary of the invention does not necessarily describe all features of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Definitions

Before the present invention is described in detail below, it is to be understood that this invention is not limited to the particular methodology, protocols and reagents described herein as these may vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to limit the scope of the present invention which will be limited only by the appended claims. Unless defined

CLAIMS

1. Use of an inhibitor of C5a in the preparation of a pharmaceutical composition for the reduction of viral load in a subject suffering from viral pneumonia,
5 wherein the inhibitor of C5a is a binding moiety specifically binding to human C5a, wherein said binding moiety is selected from the group consisting of
 - (a) antibodies or antigen-binding fragments thereof;
 - (b) oligonucleotides;
 - (c) antibody-like proteins; and
 - 10 (d) peptidomimetics.
2. Use of an inhibitor of C5a in the preparation of a pharmaceutical composition for the treatment of viral pneumonia in a subject, wherein the inhibitor is for use as a monotherapy,
15 wherein the inhibitor of C5a is a binding moiety specifically binding to human C5a, wherein said binding moiety is selected from the group consisting of
 - (a) antibodies or antigen-binding fragments thereof;
 - (b) oligonucleotides;
 - (c) antibody-like proteins; and
 - 20 (d) peptidomimetics.
3. The use according to any one of claims 1 to 2, wherein the pneumonia in the subject is caused by an HxNx virus.
- 25 4. The use according to claim 3, wherein the HxNx virus is selected from the group consisting of H1N1, H1N3, H2N2, H3N2, H5N1, H7N2, H7N3, H7N7, H7N9, H9N2, H10N7, and H10N8.
5. Use of an inhibitor of C5a in the preparation of a pharmaceutical composition for the treatment of viral pneumonia in a subject, wherein the viral pneumonia in the subject
30 is caused by an H7N9 virus, wherein the inhibitor of C5a is a binding moiety specifically binding to human C5a, wherein said binding moiety is selected from the group consisting of
 - (a) antibodies or antigen-binding fragments thereof;

- (b) oligonucleotides;
- (c) antibody-like proteins; and
- (d) peptidomimetics.

- 5 6. The use according to any one of claims 1 to 5, wherein the subject is a primate, preferably an ape, more preferably a human.
7. Use of an inhibitor of C5a in the preparation of a pharmaceutical composition for the treatment of viral pneumonia in a subject, wherein the subject is a primate, preferably an ape, more preferably a human,
10 wherein the inhibitor of C5a is a binding moiety specifically binding to human C5a, wherein said binding moiety is selected from the group consisting of
- (a) antibodies or antigen-binding fragments thereof;
 - (b) oligonucleotides;
 - 15 (c) antibody-like proteins; and
 - (d) peptidomimetics.
8. The use according to claim 7, wherein the pneumonia in the subject is caused by an HxNx virus.
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9. The use according to claim 8, wherein the HxNx virus is selected from the group consisting of H1N1, H1N3, H2N2, H3N2, H5N1, H7N2, H7N3, H7N7, H7N9, H9N2, H10N7, and H10N8.
- 25 10. The use according to any one of claims 1 to 9, wherein said binding moiety specifically binds to a conformational epitope formed by amino acid sequences NDETCEQRA (SEQ ID NO: 2) and SHKDMQL (SEQ ID NO: 3) of human C5a, and wherein the binding moiety binds to at least one amino acid within the amino acid
30 sequence according to SEQ ID NO: 2 and to at least one amino acid within the amino acid sequence according to SEQ ID NO: 3.
11. The use according to any one of claims 1 to 10, wherein said binding moiety is an antibody or an antigen-binding fragment thereof,

wherein said antibody or antigen-binding fragment thereof comprises a set of heavy chain CDR3, heavy chain CDR2, and heavy chain CDR1 sequences selected from one of the following sets:

- (i) a heavy chain CDR3 sequence as set forth in SEQ ID NO: 6, a heavy chain CDR2 sequence according to SEQ ID NO: 10, and a heavy chain CDR1 sequence according to SEQ ID NO: 14; or
- (ii) a heavy chain CDR3 sequence as set forth in SEQ ID NO: 7, a heavy chain CDR2 sequence according to SEQ ID NO: 11, and a heavy chain CDR1 sequence according to SEQ ID NO: 15;

wherein the heavy chain CDR3 sequence optionally comprises 1 amino acid exchange, preferably conservative amino acid exchange, 1 amino acid deletion, and/or 1 amino acid addition;

wherein the heavy chain CDR2 sequence optionally comprises 1 amino acid exchange, preferably conservative amino acid exchange, 1 amino acid deletion, and/or 1 amino acid addition; and

wherein the heavy chain CDR1 sequence optionally comprises 1 amino acid exchange, preferably conservative amino acid exchange, 1 amino acid deletion, and/or 1 amino acid additions.

12. The use according to any one of claims 1 to 11, wherein said binding moiety is an antibody or an antigen-binding fragment thereof,

wherein said antibody or antigen-binding fragment thereof comprises a set of light chain CDR3, light chain CDR2, and light chain CDR1 sequences selected from one of the following sets:

- (iii) a light chain CDR3 sequence as set forth in SEQ ID NO: 8, a light chain CDR2 sequence according to SEQ ID NO: 12, and a light chain CDR1 sequence according to SEQ ID NO: 16; or
- (iv) a light chain CDR3 sequence as set forth in SEQ ID NO: 9, a light chain CDR2 sequence according to SEQ ID NO: 13, and a light chain CDR1 sequence according to SEQ ID NO: 17;

wherein the light chain CDR3 sequence optionally comprises 1 amino acid exchange, preferably conservative amino acid exchange, 1 amino acid deletion, and/or 1 amino acid addition;

wherein the light chain CDR2 sequence optionally comprises 1 amino acid exchange, preferably conservative amino acid exchange, 1 amino acid deletion, and/or 1 amino acid addition;

wherein the light chain CDR2 sequence optionally comprises 1 amino acid exchange, preferably conservative amino acid exchange, 1 amino acid deletion, and/or 1 amino acid addition.

13. The use according to any one of claims 1 to 12, wherein said binding moiety is an antibody or an antigen-binding fragment thereof,

wherein said antibody or antigen-binding fragment thereof comprises:

(i) a heavy chain CDR3 sequence according to SEQ ID NO: 6, a heavy chain CDR2 sequence according to SEQ ID NO: 10, a heavy chain CDR1 sequence according to SEQ ID NO: 14, a light chain CDR3 sequence according to SEQ ID NO: 8, a light chain CDR2 sequence according to SEQ ID NO: 12, and a light chain CDR1 sequence according to SEQ ID NO: 16; or

(ii) a heavy chain CDR3 sequence according to SEQ ID NO: 7, a heavy chain CDR2 sequence according to SEQ ID NO: 11, a heavy chain CDR1 sequence according to SEQ ID NO: 15, a light chain CDR3 sequence according to SEQ ID NO: 9, a light chain CDR2 sequence according to SEQ ID NO: 13, and a light chain CDR1 sequence according to SEQ ID NO: 17;

wherein the heavy chain CDR3 sequence optionally comprises 1 amino acid exchange, preferably conservative amino acid exchange, 1 amino acid deletion, and/or 1 amino acid addition;

wherein the light chain CDR3 sequence optionally comprises 1 amino acid exchange, preferably conservative amino acid exchange, 1 amino acid deletion, and/or 1 amino acid addition;

wherein the heavy chain CDR2 sequence optionally comprises 1 amino acid exchange, preferably conservative amino acid exchange, 1 amino acid deletion, and/or 1 amino acid addition;

wherein the light chain CDR2 sequence optionally comprises 1 amino acid exchange, preferably conservative amino acid exchange, 1 amino acid deletion, and/or 1 amino acid addition;

wherein the heavy chain CDR1 sequence optionally comprises 1 amino acid exchange, preferably conservative amino acid exchange, 1 amino acid deletion, and/or 1 amino acid addition; and

5 wherein the light chain CDR1 sequence optionally comprises 1 amino acid exchange, preferably conservative amino acid exchange, 1 amino acid deletion, and/or 1 amino acid addition.