

Summary

It is surprisingly shown herein that monovalent ISVDs can have strong neutralization activity against both RSV serotypes (A and B). This is unexpected, as literature suggests that multivalent constructs are needed for potent inhibition of both serotypes of RSV. Accordingly, it is an object of the invention to provide ISVDs directed against epitopes of the RSV F protein that are unique to the prefusion conformation and thereby provide highly potent ISVDs for the treatment and/or prevention of RSV infections. Thus, in one aspect, the present disclosure refers to an immunoglobulin single variable domain (ISVD) that binds exclusively to the prefusion form of the fusion (F) protein of respiratory syncytial virus (RSV), characterized in that said ISVD shows in monovalent format a similar neutralization activity of RSV serotypes A and B, and in that the ISVD binds to a conformational epitope of RSV prefusion F protein comprising amino acids 50-52, 180, 184, 185, 265-270, 305, 307, 308, 345-347, 421, 425, 427-431, 451, 453, 454, 456 and 458 as depicted in SEQ ID NO: 17. In yet another aspect, the present disclosure refers to a RSV binding construct, characterized in that said RSV binding construct comprises at least one ISVD as disclosed herein. In a further aspect, the present disclosure refers to a nucleic acid, characterized in that said nucleic acid encodes at least one ISVD as disclosed herein. In yet another aspect, the present disclosure refers to a host cell, characterized in that said host cell is transformed or transfected with the nucleic acid as disclosed herein. In another aspect, the present disclosure refers to use of the host cell as disclosed herein, for the production of said ISVD. In a further aspect, the present disclosure refers to a pharmaceutical composition, characterized in that said pharmaceutical composition comprises at least one ISVD as disclosed herein.

In one example, there is disclosed an ISVD that binds specifically to the prefusion form of the F protein of RSV, characterized in that said ISVD shows in monovalent format a similar neutralization activity of RSV serotypes A and B.

In another example, there is described an ISVD that comprises a CDR1 sequence selected from the group consisting of SEQ ID NO: 1 and SEQ ID NO: 2, a CDR2 sequence selected from the group consisting of SEQ ID NO: 3 and SEQ ID NO: 4 and a CDR3 sequence selected from the group consisting of SEQ ID NO: 5 and SEQ ID NO: 6 and wherein CDR1, CDR2 and/or CDR3 have a 1-, 2- or 3-amino acid difference with any of said foregoing respective SEQ ID NOs.

According to another example, there is further described a RSV binding construct that comprises at least one ISVD as described above.

According to another example, there is described a nucleic acid that encodes at least one ISVD as described above.

According to yet another example there is described a host cell that is transformed or transfected with the nucleic acid as described above. Also described is the use of the above described host cell for the production of the ISVD as described above.

Also described is the ISVD as described above or the RSV binding construct as described above, for use as a medicament, in particular for use in therapeutic treatment or prevention of a RSV infection.

According to another example, there is disclosed a pharmaceutical composition that comprises at least one ISVD as described above. Further disclosed is the use of said pharmaceutical composition as a medicament, in particular in therapeutic treatment or prevention of a RSV infection.

Objects of the present invention will be clear from the description that follows.

Claims

1. An immunoglobulin single variable domain (ISVD) that binds exclusively to the prefusion form of the fusion (F) protein of respiratory syncytial virus (RSV), characterized in that said ISVD shows in monovalent format a similar neutralization activity of RSV serotypes A and B, and in that the ISVD binds to a conformational epitope of RSV prefusion F protein comprising amino acids 50-52, 180, 184, 185, 265-270, 305, 307, 308, 345-347, 421, 425, 427-431, 451, 453, 454, 456 and 458 as depicted in SEQ ID NO: 17.
2. The ISVD according to claim 1, characterized in that said ISVD comprises: a CDR1 sequence SEQ ID NO: 1, a CDR2 sequence SEQ ID NO: 3 and a CDR3 sequence SEQ ID NO: 5, or the ISVD comprises a CDR1, CDR2, and CDR3 sequence SEQ ID NO: 2, SEQ ID NO: 4, and SEQ ID NO: 6, respectively.
3. A RSV binding construct, characterized in that said RSV binding construct comprises at least one ISVD according to claim 1 or 2.
4. A nucleic acid, characterized in that said nucleic acid encodes at least one ISVD according to claim 1 or 2.
5. A host cell, characterized in that said host cell is transformed or transfected with the nucleic acid according to claim 4.
6. The use of the host cell according to claim 5, for the production of said ISVD.
7. The ISVD according to claim 1 or 2 or the RSV binding construct according to claim 3, for use as a medicament.
8. The ISVD according to claim 1 or 2 or the RSV binding construct according to claim 3, for use in therapeutic treatment or prevention of a RSV infection.
9. A pharmaceutical composition, characterized in that said pharmaceutical composition comprises at least one ISVD according to claim 1 or 2.
10. The pharmaceutical composition according to claim 9, for use as a medicament.
11. The pharmaceutical composition according to claim 9, for use in therapeutic treatment or prevention of a RSV infection.