Hemagglutinin protein is the receptor-binding and membrane fusion glycoprotein of influenza virus and the target for infectivity-neutralizing antibodies. The entire hemagglutinin protein (HA) from the H5N1 is composed of 568 amino acids, with a molecular weight of 56 kDa. The HA molecule consists of HA1 and HA2 subunits, with the HA1 subunit mediating initial contact with the cell membrane and HA2 being responsible for membrane fusion (*Chizmadzhev, Bioelectrochemistry 2004, 63(1–2):129-136*).

Baculovirus/insect cell systems have been used to express hemagglutinin genes isolated from avian influenza subtypes (*Babai et al., Vaccine 1999, 17(9–10):1223-1238; Crawford et al., Vaccine 1999, 17(18):2265-2274; Johansson et al., Vaccine 1999, 17(15–16):2073-2080); Nwe et al., BMC Mircobiology 2006, 6(16):doi:10.1186/1471-2180-6-16*). However, the those recombinant proteins seems not to be protective in any case, or only less effective at least for some species (Treanor et al., Vaccine 2001, 19: 1732-1737).

Thus, there is a need to increase availability of improved vaccines and new vaccination approaches to provide better approaches to control influenza infections and to have a positive impact on disease load.

SUMMARY

In a first aspect, there is provided a haemagglutinin protein of influenza virus subtype 5 (H5 protein) comprising an amino acid sequence of SEQ ID NO: 1, wherein the amino acid sequence of SEQ ID NO: 1 is modified in the H5 protein to include an amino acid 223N and a modification 328K+, wherein the modification 328K+ means that at amino acid position 328 of H5 protein a second Lysine (K+) is inserted.

In a second aspect, there is provided a nucleic acid molecule, coding for the H5 protein as defined herein.

In a third aspect, there is provided a vector comprising the nucleic acid molecule as defined herein.

In a fourth aspect, there is provided a method for producing the H5 protein as defined herein, wherein said method comprises the steps:

a. isolating or amplifying the nucleic acid that codes for such H5 protein;
b. cloning the H5 encoding nucleic acid in an expression vector;
c. expressing the H5 protein.

In a fifth aspect, there is provided the H5 protein as defined herein for use as a medicine.

In a sixth aspect, there is provided the nucleic acid molecule as defined herein for use as a medicine.

In a seventh aspect, there is provided the vector as defined herein for use as a medicine.

In an eighth aspect, there is provided the use of the H5 protein as defined herein for the preparation of a pharmaceutical composition for the prophylaxis or treatment of infections caused by viral influenza.

In a ninth aspect, there is provided the use of the nucleic acid molecule as defined herein for the preparation of a pharmaceutical composition for the prophylaxis or treatment of infections caused by viral influenza.

In a tenth aspect, there is provided the use of the vector as defined herein for the preparation of a pharmaceutical composition for the prophylaxis or treatment of infections caused by viral influenza.

In an eleventh aspect, there is provided a kit of parts, comprising:

a. the H5 protein as defined herein, the nucleic acid molecule as defined herein, or the vector as defined herein; and
b. a package leaflet indicating the use of such H5 protein, nucleic acid molecule, or vector of a) for the treatment or prophylaxis of infections caused by influenza virus.

DESCRIPTION OF THE INVENTION

Before the embodiments of the present invention it shall be noted that as used herein and in the appended claims, the singular forms "a", "an", and "the" include plural reference unless the context clearly dictates otherwise. Thus, for example, reference to "a preparation" includes a plurality of such preparations; reference to the "carrier" is a reference to one or more carriers and equivalents thereof known to those skilled in the art, and so forth. Unless defined otherwise, all technical and scientific terms used herein have the same meanings as commonly understood by one of ordinary skill in the art to which this invention belongs. All given ranges and values may vary by 1 to 5 % unless indicated otherwise or known otherwise by the person skilled in the art, therefore, the term "about" was omitted from the description. Although any methods and materials similar or equivalent to those described herein can be used in the practice or testing of the present invention, the preferred methods, devices, and materials are now described. All publications mentioned herein are incorporated herein by reference for the purpose of describing and disclosing the substances, excipients, carriers, and methodologies as reported in the publications which might be used in connection with the invention. Nothing