

CLAIMS

1. A process for designing a recombinant poxvirus, said recombinant poxvirus comprising one or more expression cassettes, each for expression of a fusion of one or a plurality of peptides, characterized in that it comprises performing by processing means (11) of a server (1) the steps of:
 - (a) selecting a first subset of candidate peptides, wherein said peptides present transmembrane scores below a TMS threshold;
 - (b) determining an optimal distribution of the candidate peptides from said first subset to the expression cassette(s) among a plurality of possible distributions, wherein said optimal distribution presents, if there are at least two expression cassettes, the lowest range between the hydropathy scores of at least two expression cassettes;
 - (c) for each expression cassette, determining an optimal slot assignment of the candidate peptides as function of cassette slot occupancy rule so as to select the peptide fusion with the lowest TM score;
 - (d) determining a DNA transfer sequence comprising the nucleotide sequence of the one or more expression cassette(s) for generation of said recombinant poxvirus.
2. The process of claim 1, wherein said peptides of step (a) present continuous regions below a homology threshold.
3. The process of claim 2, wherein step (a) comprises discarding peptides if they present transmembrane scores above a TMS threshold and/or an homologous region with a higher ranked candidate according to a predicted immunogenic potential above an homology threshold, and selecting a second subset of the identified set of candidate peptides as candidate peptides neither disclosed nor selected in the first subset.
4. The process of any one of claims 1 to 3, wherein step (b) comprises, if the number of possible distributions exceeds a given maximum number function of resources of the processing means (11) of the server (1), attempting to determine said optimal distribution of the candidate peptides from said first subset to the expression cassette(s) among at least one iteration of said maximum number of possible distributions among the plurality of possible distributions.

5. The process of claim 4, wherein step (b) comprises, if for each possible distribution of an iteration of said maximum number of possible distributions, at least one expression cassette presents an hydropathy score above a given threshold, either considering another iteration of said maximum number of possible distributions; or
5 replacing the candidate peptide from the first subset of candidate peptides presenting the highest hydropathy score by a candidate peptide from the second subset, and proceeding again with the peptide selection of step (a).
6. The process of any one of claims 1 to 5, wherein step (c) further comprises discarding
10 any peptide fusion that displays at least one TM patch with a score above a TMSK7 threshold.
7. The process of claim 6, wherein step (c) comprises, if at least one transmembrane domain is detected in any possible slot assignment of the candidate peptides in an
15 expression cassette, replacing the candidate peptide from the first subset of candidate peptides presenting the highest transmembrane score, by a candidate peptide from the second subset, and repeating steps (b) then (c).
8. The process of any one of claims 1 to 7, wherein said cassette slot occupancy rule
20 defines possible slot positions of candidate peptides within a cassette according to transmembrane scores of the peptides, and, in case of equal transmembrane scores, according to their hydropathy scores.
9. The process of claim 8, wherein the candidates peptides distributed to an expression
25 cassette are classified according to at least three classes of risk of not generating or producing any recombinant poxvirus, wherein said cassette slot occupancy rule defining, for each slot positions of a cassette, what class a candidate peptide shall have to be assigned to this slot position.
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10. The process of any one of claims 1 to 9, wherein there is/are a single expression cassette if the number of selected candidate peptides is below 10, two expression cassettes if the number of selected candidate peptides is between 10 and 14, and three expression cassettes if the number of selected candidate peptides is between
35 15 and 30.

11. A process for preparing a therapeutic vaccine comprising a recombinant poxvirus, comprising:
- performing the process of any one of claims 1 to 10 for designing said recombinant poxvirus;
 - generating said recombinant poxvirus.
12. The process according to claim 11, wherein said process further comprises a manufacturing step of said recombinant poxvirus, wherein said manufacturing step comprises an amplification step in a suitable producer cell to a suitable scale, a step of recovery of the produced recombinant poxvirus from the cell culture and an optional step of purification of the recovered recombinant poxvirus.
13. The process according to any one of claims 11 and 12, wherein said recombinant poxvirus encodes neopeptides and is for use in a subject in need thereof for treating a cancer or preventing its relapse in a subject.