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(54) **Title:** METHODS FOR MODIFYING VIRUS SURFACES

(57) **Abstract:** Nucleic acid delivery vehicles and methods of their use are provided. One embodiment provides a virus having a lipid-polymer conjugate intercalated into the virus's membrane. The lipid-polymer conjugate includes a biocompatible polymer having first and second ends, a lipid conjugated to the first end, and a targeting moiety conjugated to the second end. The lipid is preferably a multi-chain lipid. The virus encodes one or more polypeptides that can help reduce or mitigate one or more symptoms of a disease or pathology. The lipid-polymer conjugate advantageously reduces non-specific binding of the virus while the targeting moiety enhances binding to specific cells or tissues.



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A. CLASSIFICATION OF SUBJECT MATTER IPC: C12N 15/00 (2006.01);A01N 43/04 (2006.01);A61K 31/70(2006.01) USPC: 435/320. 1;5 14/44 According to International Patent Classification (IPC) or to both national classification and IPC														
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C. DOCUMENTS CONSIDERED TO BE RELEVANT														
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.												
X --- Y	US PGPUB 2006/01 10736 (Donnelly, et al.) 25 May 2006 (25.05.2006), abstract, paragraphs [0079], [01 15], [01 16], and [0127].	1-3, 5, 8, 10, 13-15, 17, and 20-22 ----- 4, 6, 7, 9, 11, 12, 16, 18, and 19												
Y	Chams et al., Influenza hemagglutinin mediated fusion of membranes containing poly(ethylene-glycol) grafted lipids: new insight into the fusion mechanism, FEBS Letters, 1999, vol. 448, pages 28-32	4, 6, 9, 11, 16, and 18												
Y	US 6,004,798 (Anderson et al.) 21 Dec. 1999 (21.12.1999), lines 28-45, column 6.	7, 12, and 19												
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.														
<table border="0"> <tr> <td colspan="2">* Special categories of cited documents</td> <td>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td>"E" earlier application or patent published on or after the international filing date</td> <td>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td>"&" document member of the same patent family</td> <td></td> </tr> </table>			* Special categories of cited documents		"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"A" document defining the general state of the art which is not considered to be of particular relevance	"E" earlier application or patent published on or after the international filing date	"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"O" document referring to an oral disclosure, use, exhibition or other means	"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family	
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Name and mailing address of the ISA/US Mail Stop PCT, Attn ISA/US Commissioner for Patents P O Box 1450 Alexandria, Virginia 2231 3-1450 Facsimile No. (571) 273-3201		Authorized officer /Thaian N. Ton/ for Wu-Cheng Winston Shen Telephone No. 571-272-3157												