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(54) **IMMUNOGENIC COMPOSITIONS AND VACCINES FOR EBOLA**

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**A61K 39/12** (2006.01)

(52) **U.S. Cl.** ..... **424/186.1; 424/204.1**

(58) **Field of Classification Search** ..... None  
See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

5,792,462	A	8/1998	Johnston et al.	424/199.1
5,977,316	A	11/1999	Chatterjee et al.	530/387.2
6,340,463	B1	1/2002	Mitchell et al.	424/263.1
6,630,144	B1	10/2003	Hart et al.	424/159
6,713,069	B1*	3/2004	Gallaher	424/218.1
7,267,823	B2*	9/2007	Hart et al.	424/204.1
2004/0053865	A1	3/2004	Hart et al.	
2004/0146859	A1	7/2004	Hart et al.	

**FOREIGN PATENT DOCUMENTS**

WO	WO 96/37616	11/1996
WO	WO 99/32147	7/1999
WO	WO 00/00617	1/2000

**OTHER PUBLICATIONS**

Geisbert et al., Nature Medicine, Dec. 2004, 10(12):S110-S121.\*  
 Jones et al., Nature Medicine, Jul. 2005, 11(7):786-790.\*  
 Olinger et al., Journal of Virology, Nov. 2005, 79(22):14189-14196.\*  
 Warfield et al. Ebola Virus-Like Particle-Based Vaccine Protects Nonhuman Primates against Lethal Ebola Virus Challenge, Journal of Infectious Diseases, 2007, vol. 196, Supplement 2, pp. S430-S437.\*  
 Volchkov et al., "The envelope glycoprotein of Ebola virus contains an immunosuppressive-like domain similar to oncogenic retroviruses", FEBS Letters, vol. 305, No. 3, pp. 181-184 (Jul. 1992).  
 Sanchez et al., "Biochemical Analysis of the Secreted and Virion Glycoproteins of Ebola Virus", J. Virology, Aug. 1998, vol. 72, pp. 6442-6447.  
 Wilson et al. "Epitopes Involved in Antibody-Mediated Protection from Ebola Virus", Science, vol. 387, Mar. 3, 2000, pp. 1664-1666.  
 Ichihashi and Oie, "Neutralizing Epitope on Penetration Protein of Vaccinia Virus", Virology 220, pp. 491-494 (1996).  
 Wolffe et al., "A myristylated membrane protein encoded by the vaccinia virus L1R open reading frame is the target of potent neutralizing monoclonal antibodies", Virology 211, pp. 53-63 (1995).  
 Roper et al., "Extracellular vaccinia virus envelope glycoprotein encoded by the A33R gene", J. Virology, Jun. 1996, vol. 70, No. 6, pp. 3753-3762.  
 Isaacs et al., "Characterization of a vaccinia virus-encoded 42-kilodalton class I membrane glycoprotein component of the extracellular virus envelope", J. Virology, Dec. 1992, vol. 66, No. 12, pp. 7217-7224.  
 Abstract W33-5, "DNA vaccination against poxviruses using combinations of IMV and EEV immunogens", presented Jul. 2000, American Society for Virology Meeting, pp. 113.  
 Abstract P23-6, "DNA immunization with the vaccinia L1R and/or A33R genes", Jul. 1998, poster at American Society for Virology meeting.  
 Meyer et al., "Identification of binding sites for neutralizing monoclonal antibodies on the 14-kDa fusion protein of orthodox viruses", Virology 200, Short Communications, pp. 778-783 (1994).  
 Czerny and Mahnel, "Structural and functional analysis of orthopoxvirus epitope with neutralizing monoclonal antibodies", J. General Virology (1990), vol. 71, pp. 2341-2352.  
 Hooper et al., "DNA vaccination with vaccinia virus L1R and A33R genes protects mice against a lethal poxvirus challenge", Virology 266, pp. 329-339 (2000).  
 Vazquez and Esteban, "Identification of functional domains in the 14-kilodalton envelope protein (A27L) of vaccinia virus", J. Virology, Nov. 1999, vol. 73, No. 11, pp. 9098-9109.  
 Vazquez et al., "The vaccinia virus 14-kilodalton (A27L) fusion protein forms a triple coiled-coil structure and interacts with the 21-kilodalton (A17L) virus membrane protein through a C-terminal of alpha-helix", J. Virology, Dec. 1998, vol. 72, No. 12, pp. 10126-10137.

(Continued)

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(57) **ABSTRACT**

Using CTL epitopes to the Ebola GP, NP, VP24, VP30, VP35 and VP40 virion proteins, a method and composition for use in inducing an immune response which is protective against infection with Ebola virus is described.

**3 Claims, 11 Drawing Sheets**