WHAT IS CLAIMED IS:

1. A method for conjugating a peptide immunogen comprising Aβ peptide or fragments of Aβ or analogs thereof via a reactive group of an amino acid residue of the peptide immunogen to a protein/polypeptide carrier having one or more functional groups, the method comprising the steps of:

(a) derivatizing one or more of the functional groups of the protein/polypeptide carrier or optionally to a polypeptide linker attached to the protein/polypeptide carrier to generate a derivatized carrier with reactive sites;

(b) reacting the derivatized protein/polypeptide carrier of step (a) with a reactive group of an amino acid of the peptide immunogen comprising Aβ peptide or fragments of Aβ or analogs thereof under reaction conditions such that the peptide immunogen is conjugated to the derivatized protein/polypeptide carrier via at least one of the reactive sites, thereby forming a conjugate; and

(c) further reacting the conjugate with a capping reagent to inactive free, reactive unreacted reactive sites on the derivatized protein/polypeptide carrier, whereby the conjugate elicits a desired immune against the Aβ peptide.

2. The method of claim 1, wherein the carrier is selected from the group consisting of human serum albumin, keyhole limpet hemocyanin (KLH), immunoglobulin molecules, thyroglobulin, ovalbumin, influenza hemagglutinin, PADRE polypeptide, malaria circumsporozite (CS) protein, hepatitis B surface antigen (HBSAg19-28), Heat Shock Protein (HSP) 65, Mycobacterium tuberculosis, cholera toxin, cholera toxin mutants with reduced toxicity, diphtheria toxin, CRM197 protein that is cross-reactive with diphtheria toxin, recombinant Streptococcal C5a peptidase, Streptococcus pyogenes ORF1224, Streptococcus pyogenes ORF1664, Streptococcus pyogenes ORF2452, Streptococcus pneumoniae pneumolysin, pneumolysin mutants with reduced toxicity, Chlamydia pneumoniae ORF T367, Chlamydia pneumoniae ORF T858, Tetanus toxoid, HIV gp120 T1, components recognizing microbial surface adhesive matrix molecules (MSCRAMMS), growth factors, hormones, cytokines and chemokines.

3. The method according to claim 1, wherein the carrier contains a T-cell epitope.

4. The method according to claim 3, wherein the carrier is a bacterial toxoid.

5. The method according to claim 3, wherein the carrier is influenza hemagglutinin.

6. The method according to claim 3, wherein the carrier is the PADRE polypeptide.

7. The method according to claim 3, wherein the carrier is malaria circumsporozite (CS) protein.

8. The method according to claim 3, wherein the carrier is Hepatitis B surface antigen (HBSAg19-28).

9. The method according to claim 3, wherein the carrier is heat shock protein 65 (HSP 65).

10. The method according to claim 3, wherein the carrier is a polypeptide from Mycobacterium tuberculosis (BCG).

11. The method according to claim 4, wherein the carrier is tetanus toxoid.

12. The method according to claim 4, wherein the bacterial toxoid is CRM 197.

13. The method according to claim 3, wherein the carrier is recombinant Streptococcal C5a peptidase.

14. The method according to claim 3, wherein the carrier is Streptococcus pyogenes ORF 1224.

15. The method according to claim 3, wherein the carrier is Streptococcus pyogenes ORF 1664.

16. The method according to claim 3, wherein the carrier is Streptococcus pyogenes ORF 2452.

17. The method according to claim 3, wherein the carrier is Chlamydia pneumoniae ORF T367.

18. The method according to claim 3, wherein the carrier is Chlamydia pneumoniae ORF T858.

19. The method according to claim 1, wherein the carrier is a growth factor or hormone, which stimulates or enhances immune response.

20. The method according to claim 19, wherein the growth factor or hormone is selected from the group consisting of IL-1, IL-2, γ-interferon, IL-10, GM-CSF, MIP-1α, MIP-1β, and RANTES.

21. The method according to claim 1, wherein the peptide immunogen is an Aβ fragment.

22. The method according to claim 21, wherein the Aβ fragment is from the N-terminal half of Aβ.

23. The method according to claim 22, wherein the Aβ fragment is selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-9, 1-10, 1-11, 1-12, 1-16, 3-6, and 3-7.

24. The method according to claim 23, wherein the Aβ fragment is selected from the group consisting of Aβ1-5, 1-7, 1-9, and 1-12.

25. The method according to claim 21, wherein the Aβ fragment is from the C-terminal half of Aβ.

26. The method according to claim 25, wherein the Aβ fragment is from the group consisting of Aβ33-42, 35-40, and 35-42.

27. The method according to claim 21, wherein the Aβ fragment is from the internal portion of Aβ.

28. The method according to claim 27, wherein the Aβ fragment is selected from the group consisting of Aβ13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, and 25-35.

29. The method according to claim 21, wherein the Aβ fragment is selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-10, 1-11, 1-12, 1-16, 1-28 3-6, 3-7, 13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, 25-35, 33-42, 35-40, and 35-42.

30. The method according to claim 21, wherein the peptide immunogen further comprises at least one additional copy of the Aβ fragment.

31. The method according to claim 22, wherein the peptide immunogen further comprises at least one additional copy of the N-terminal fragment of Aβ.

32. The method according to claim 31, wherein the peptide immunogen comprises from N-terminus to C-terminus, a plurality of additional copies of the N-terminal fragment of Aβ.

33. The method according to claim 32, wherein the peptide immunogen is (Aβ1-7)3.

34. The method according to claim 32, wherein the peptide immunogen is (Aβ1-7)5.

35. The method according to claim 21, wherein the peptide immunogen further comprises at least one additional copy of a different Aβ fragment.

36. The method according to claim 30, wherein the Aβ peptide immunogen is a fragment of Aβ selected from the group consisting of Aβ 7-11, 17-28, 1-28, 25-35, 35-40 and 35-42.

37. The method according to claim 21, 22, 29, or 30, wherein the peptide immunogen is linked at its C-terminus to the N-terminus of a carrier molecule to form a heterologous peptide.

38. The method according to claim 21, 22, 29, or 30, wherein the peptide immunogen is linked at its N-terminus to the C-terminus of a carrier molecule to form a heterologous peptide.

39. The method according to claim 21, 22, 29, or 30, wherein the peptide immunogen comprises from N-terminus to C-terminus, a first carrier molecule linked at its C-terminus to the N-terminus of the Aβ fragment linked at its C-terminus to the N-terminus of a second carrier molecule to form a heterologous peptide.

40. The method of claim 37, further comprising at least one additional copy of the carrier molecule.

41. The method of claim 37, further comprising at least one additional copy of the carrier molecule.

42. The method of claim 37, further comprising at least one copy of a different carrier molecule.

43. The method of claim 38, further comprising at least one additional copy of the carrier molecule.

44. The method of claim 38, further comprising at least one copy of a different carrier molecule.

45. The method of claim 39, wherein the first carrier and the second carrier are the same carrier molecule.

46. The method of claim 39, wherein the first carrier and the second carrier are different carrier molecules.

47. The method according to claim 37, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

48. The method according to claim 38, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

49. The method according to claim 38, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

50. The method according to claim 39, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

51. The method according to claim 21, wherein the peptide immunogen is further comprised of one or more molecules of the Aβ fragment are linked together in a multiple antigenic peptide (MAP) configuration.

52. The method according to claim 51, wherein the one or more Aβ fragments are selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-10, 1-11, 1-12, 1-16, 1-28 3-6, 3-7, 13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, 25-35, 33-42, 35-40, and 35-42.

53. The method according to claim 51, wherein the peptide immunogen is Aβ1-7 and the MAP configuration is a MAP4 configuration.

54. The method according to claim 51, wherein the peptide immunogen is (Aβ1-7)3 and the MAP configuration is a MAP4 configuration

55. The method according to claim 51, wherein the peptide immunogen is (Aβ1-7)5 and the MAP configuration is a MAP4 configuration.

56. The method according to claim 1, wherein the functional group of one or more amino acid molecules of the protein/polypeptide carrier or of the optionally attached polypeptide linker is derivatized using a cross-linking reagent.

57. The method of claim 56, wherein the derivatizing reagent is a zero-length cross-linking reagent.

58. The method of claim 56, wherein the derivatizing reagent is a homobifunctional cross-linking reagent.

59. The method of claim 56, wherein the derivatizing reagent is a heterobifunctional cross-linking reagent.

60. The method of claim 56, wherein the protein/polypeptide carrier is reacted with a haloacetylating agent.

61. The method of claim 59, wherein the heterobifunctional reagent is a reagent which reacts with a primary or an ϵ-amine functional group of one or more amino acid residues of the protein/polypeptide carrier and a pendant thiol group of one or more amino acid residues of the peptide immunogen.

62. The method of claim 61, wherein the heterobifunctional reagent is N-succinimdyl bromoacetate, N-succinimidyl-3-(2-pyridyl-thio) propionate (SPDP) and succinimidyl 4-(N-maleimidomehyl) cyclohexane-1-carboxylate (SMCC).

63. The method of claim 62, wherein the primary or ϵ-amine functional group is lysine.

64. The method according to claim 61, wherein the pendant thiol group is a cysteine residue of the peptide immunogen.

65. The method according to claim 64, wherein the cysteine residue is localized at the amino-terminus of the peptide immunogen.

66. The method according to claim 64, wherein the cysteine residue is localized at carboxy-terminus of the peptide immunogen.

67. The method according to claim 64, wherein the cysteine residue is localized internally in the peptide immunogen.

68. The method according to claim 64, wherein the pendant thiol group is generated by a thiolating reagent.

69. The method according to claim 68, wherein the thiolating reagent is N-acetyl homocysteinethio lactone.

70. The method according to claim 1, wherein the capping reagent that is used to inactivate free reactive, functional groups on the activated protein/polypeptide carrier is selected from the reagent group consisting of cysteamine, N-acetylcysteamine, and ethanolamine.

71. The method according to claim 1, wherein the capping reagent that is used to inactivate free reactive, functional groups on the activated protein/polypeptide carrier

is selected from the reagent group consisting of sodium hydroxide, sodium carbonate, ammonium bicarbonate and ammonia.

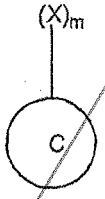
72. The method of claim 1, wherein the reactive group of the amino acid residue of the peptide immunogen is a free sulfhydryl group.

73. The method of claim 1, wherein one or more of the functional groups are on a linker, which is optionally attached to the protein/polypeptide carrier.

74. The method of claim 72, wherein the linker is a peptide linker.

75. The method of claim 73, wherein the peptide linker is polylysine.

76. A method for conjugating a peptide immunogen comprising Aβ peptide or fragments of Aβ or analogs thereof to a protein/polypeptide carrier having the structure:



wherein,

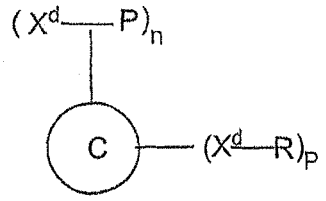
C is a protein/polypeptide carrier and X is a derivatizable functional group of an amino acid residue of the protein/polypeptide carrier or optionally of an amino acid residue of a peptide linker covalently attached to the protein/polypeptide carrier, and wherein m is an integer greater than 0, but less than or equal to 85, the method comprising the steps of:

(a). derivatizing one or more of the functional groups of the protein/polypeptide carrier or of the optionally attached linker molecule to generate a derivatized molecule with reactive sites;

(b). reacting the derivatized protein/polypeptide carrier of step (a) with a reactive group of an amino acid residue of the peptide immunogen comprising Aβ peptide or fragments of Aβ or analogs thereof to form a covalently coupled peptide immunogen-protein/polypeptide carrier conjugate; and

(c). further reacting the said conjugate with a capping reagent to inactivate the free reactive functional groups on the activated protein/polypeptide carrier, such that the

capped groups are not free to react with other molecules, thereby preserving the functionality of the carrier, such that it retains its ability to elicit the desired immune responses against the peptide immunogen that would otherwise not occur without a carrier, so as to generate a capped peptide immunogen-protein/polypeptide carrier conjugate having the formula:



wherein,

C is the protein/polypeptide carrier and Xd is a derivatized functional group of an amino acid residue of the protein/polypeptide carrier or optionally of an amino acid residue of a peptide linker covalently attached to the protein/polypeptide carrier, and, wherein,

P is a peptide immunogen molecule comprising Aβ peptide or fragments of Aβ or analogs thereof covalently attached to the derivatized functional group of the amino acid residue of the protein carrier or optionally of an amino acid residue of a peptide linker covalently attached to a protein/polypeptide carrier,

R is a capping molecule covalently attached to the derivatized functional group of an amino acid residue of the protein/polypeptide carrier or optionally of an amino acid residue of a peptide linker covalently attached to a protein/polypeptide carrier,

n is an integer greater than 0, but less than or equal to 85, and

p is an integer greater than 0, but less than 85.

77. The method of claim 76, wherein the carrier is selected from a group consisting of serum albumin, keyhole limpet hemocyanin (KLH), immunoglobulin molecules, thyroglobulin, ovalbumin, influenza hemagglutinin, PADRE polypeptide, malaria circumsporozite (CS) protein, hepatitis B surface antigen (HBSAg19-28) Heat Shock Protein (HSP) 65, Mycobacterium tuberculosis, cholera toxin, cholera toxin mutants with reduced toxicity, diphtheria toxin, CRM197 protein that is cross-reactive with diphtheria toxin, recombinant Streptococcal C5a peptidase, Streptococcus pyogenes ORF1224, Streptococcus pyogenes ORF1664, Streptococcus pyogenes ORF2452, Streptococcus pneumoniae pneumolysin, pneumolysin mutants with reduced toxicity, Chlamydia pneumoniae ORF T367, Chlamydia pneumoniae ORF T858, Tetanus toxoid, HIV gp120 T1, components

recognizing microbial surface adhesive matrix molecules (MSCRAMMS), growth factors, hormones, cytokines and chemokines.

78. The method according to claim 77, wherein the carrier contains a T cell epitope.

79. The method according to claim 78, wherein the carrier is a bacterial toxoid.

80. The method according to claim 79, wherein the carrier is influenza hemagglutinin.

81. The method according to claim 78, wherein the carrier is PADRE polypeptide.

82. The method according to claim 78, wherein the carrier is malaria circumsporozite (CS) protein.

83. The method according to claim 78, wherein the carrier is Hepatitis B surface antigen (HSBAg19-28).

84. The method according to claim 78, wherein the carrier is heat shock protein 65 (HSP 65).

85. The method according to claim 78, wherein the carrier is a polypeptide from Mycobacterium tuberculosis (BCG).

86. The method according to claim 78, wherein the carrier is tetanus toxoid.

87. The method according to claim 78, wherein the bacterial toxoid is CRM 197.

88. The method according to claim 78, wherein the carrier is Streptococcal rC5a peptidase.

89. The method according to claim 78, wherein the carrier is Streptococcus pyogenes ORF1224.

90. The method according to claim 78, wherein the carrier is Streptococcus pyogenes ORF1664.

91. The method according to claim 78, wherein the carrier is Streptococcus pyogenes ORF2452.

92. The method according to claim 78, wherein the carrier is Chlamydia pneumoniae ORF T367.

93. The method according to claim 78, wherein the carrier is Chlamydia pneumoniae ORF T858.

94. The method according to claim 76, wherein the carrier is a growth factor or hormone, which stimulates or enhances immune response.

95. The method according to claim 94, wherein the growth factor or hormone is selected from a group consisting of IL-1, IL-2, γ-interferon, IL-10, GM-CSF, MIP-1α, MIP-1β, and RANTES.

96. The method according to claim 76, wherein the peptide immunogen is an Aβ fragment.

97. The method according to claim 96, wherein the Aβ fragment is from the N-terminal half of Aβ.

98. The method according to claim 97, wherein the Aβ fragment is selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-9, 1-10, 1-11, 1-12, 1-16, 3-6, and 3-7.

99. The method according to claim 98, wherein the Aβ fragment is selected from the group consisting of Aβ1-5, 1-7, 1-9, and 1-12.

100. The method according to claim 96, wherein the Aβ fragment is from the C-terminal half of Aβ.

101. The method according to claim 100, wherein the Aβ fragment is from the group consisting of Aβ33-42, 35-40, and 35-42.

102. The method according to claim 96, wherein the Aβ fragment is from the internal portion of Aβ.

103. The method according to claim 102, wherein the Aβ fragment is selected from the group consisting of Aβ13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, and 25-35.

104. The method according to claim 96, wherein the Aβ fragment is selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-10, 1-11, 1-12, 1-16, 1-28, 3-6, 3-7, 13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, 25-35, 33-42, 35-40, and 35-42.

105. The method according to claim 96, wherein the peptide immunogen further comprises at least one additional copy of the Aβ fragment.

106. The method according to claim 97, wherein the peptide immunogen further comprises at least one additional copy of the N-terminal fragment of Aβ.

107. The method according to claim 106, wherein the peptide immunogen comprises from N-terminus to C-terminus, a plurality of additional copies of the N-terminal fragment of Aβ.

108. The method according to claim 107, wherein the peptide immunogen is (Aβ1-7)3.

109. The method according to claim 107, wherein the peptide immunogen is (Aβ1-7)5.

110. The method according to claim 96, wherein the peptide immunogen further comprises at least one additional copy of a different Aβ fragment.

111. The method according to claim 105, wherein the Aβ peptide immunogen is a fragment of Aβ selected from the group consisting of Aβ 7-11, 17-28, 1-28, 25-35, 35-40 and 35-42.

112. The method according to claim 96, 97, 104, or 105, wherein the peptide immunogen is linked at its C-terminus to the N-terminus of a carrier molecule to form a heterologous peptide.

113. The method according to claim 96, 97, 104, or 105, wherein the peptide immunogen is linked at its N-terminus to the C-terminus of a carrier molecule to form a heterologous peptide.

114. The method according to claim 96, 97, 104, or 105, wherein the peptide immunogen comprises from N-terminus to C-terminus, a first carrier molecule linked at its C-terminus to the N-terminus of the Aβ fragment linked at its C-terminus to the N-terminus of a second carrier molecule to form a heterologous peptide.

115. The method of claim 112, further comprising at least one additional copy of the carrier molecule.

116. The method of claim 112, further comprising at least one additional copy of the carrier molecule.

117. The method of claim 112, further comprising at least one copy of a different carrier molecule.

118. The method of claim 113, further comprising at least one additional copy of the carrier molecule.

119. The method of claim 113, further comprising at least one copy of a different carrier molecule.

120. The method of claim 114, wherein the first carrier and the second carrier are the same carrier molecule.

121. The method of claim 114, wherein the first carrier and the second carrier are different carrier molecules.

122. The method according to claim 112, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

123. The method according to claim 113, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

124. The method according to claim 113, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

125. The method according to claim 114, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

126. The method according to claim 96, wherein the peptide immunogen is further comprised of one or more molecules of the Aβ fragment are linked together in a multiple antigenic peptide (MAP) configuration.

127. The method according to claim 126, wherein the one or more Aβ fragments are selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-10, 1-11, 1-12, 1-16, 1-28, 3-6, 3-7, 13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, 25-35, 33-42, 35-115, and 35-42.

128. The method according to claim 126, wherein the peptide immunogen is Aβ1-7 and the MAP configuration is a MAP4 configuration.

129. The method according to claim 126, wherein the peptide immunogen is (Aβ1-7)3 and the MAP configuration is a MAP4 configuration

130. The method according to claim 126, wherein the peptide immunogen is (Aβ1-7)5 and the MAP configuration is a MAP4 configuration.

131. The method according to claim 76, wherein the functional group of one or more amino acid molecules of the protein/polypeptide carrier or of the optionally attached polypeptide linker is derivatized using a cross-linking reagent.

132. The method of claim 131, wherein the derivatizing reagent is a zero-length cross-linking reagent.

133. The method of claim 131, wherein the derivatizing reagent is a homobifunctional cross-linking reagent.

134. The method of claim 131, wherein the derivatizing reagent is a heterobifunctional cross-linking reagent.

135. The method of claim 131, wherein the protein/polypeptide carrier is reacted with a haloacetylating agent.

136. The method of claim 135, wherein the heterobifunctional reagent is a reagent which reacts with a primary or an ϵ-amine functional group of one or more amino acid residues of the protein/polypeptide carrier and a pendant thiol group of one or more amino acid residues of the peptide immunogen.

137. The method of claim 136, wherein the heterobifunctional reagent is M-N-succinimdyl bromoacetate.

138. The method of claim 136, wherein the primary or ϵ-amine functional group is lysine.

139. The method according to claim 138, wherein derivatization of the primary or ϵ-amine functional group of the amino acid residue lysine of the protein/polypeptide carrier with N-succinimidyl bromo acetate results in the bromoacetylation of the primary or ϵ-amine residues on lysine residues on the protein/polypeptide carrier.

140. The method according to claim 136, wherein the pendant thiol group is a cysteine residue of the peptide immunogen.

141. The method according to claim 140, wherein the cysteine residue is localized at the amino-terminus of the peptide immunogen.

142. The method according to claim 140, wherein the cysteine residue is localized at carboxy-terminus of the peptide immunogen.

143. The method according to claim 140, wherein the cysteine residue is localized internally in the peptide immunogen.

144. The method according to claim 76, wherein the pendant thiol group is generated by a thiolating reagent.

145. The method according to claim 144, wherein the thiolating reagent is N-acetyl homocysteinethio lactone.

146. The method according to claim 76, wherein the capping reagent that is used to inactivate free reactive, functional groups of the activated protein/polypeptide carrier is selected from the reagent group consisting of cysteamine, N-acetylcysteamine, and ethanolamine.

147. The method according to claim 76, wherein the capping reagent that is used to inactivate free reactive, functional groups on the activated protein/polypeptide carrier is selected from the reagent group consisting of sodium hydroxide, sodium carbonate, ammonium bicarbonate and ammonia.

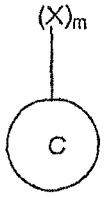
148. The method of claim 76, wherein the reactive group of the amino acid residue of the peptide immunogen is a free sulfhydryl group.

149. The method of claim 76, wherein one or more of the functional groups are on a linker optionally attached to the protein/polypeptide carrier.

150. The method of claim 149, wherein the linker is a peptide linker.

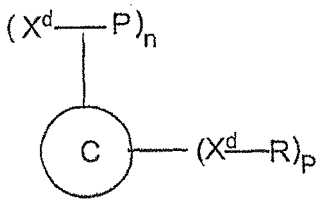
151. The method of claim 150, wherein the peptide linker is polylysine.

152. A composition comprising a peptide immunogen-protein/polypeptide carrier conjugate wherein the protein/polypeptide carrier has the formula:



wherein,

C is a protein/polypeptide carrier and X is a derivatizable functional group of an amino acid residue on the protein/polypeptide carrier or optionally of an amino acid residue of a peptide linker covalently attached to the protein/polypeptide carrier, and, wherein m is an integer greater than 0, but less than or equal to 85, and wherein the peptide immunogen-protein/polypeptide carrier conjugate has the formula:



wherein,

C is the protein/polypeptide carrier and Xd is a derivatized functional group of an amino acid residue of the protein/polypeptide carrier or optionally of an amino acid residue of a peptide linker covalently attached to the protein/polypeptide carrier, and, wherein, P is a peptide immunogen comprising Aβ peptide or fragments of Aβ or analogs thereof covalently attached to the derivatized functional group of the amino acid residue of the protein carrier or optionally of an amino acid residue of a peptide linker covalently attached to a protein/polypeptide carrier, R is a capping molecule covalently attached to the derivatized functional group of an amino acid residue of the protein/polypeptide carrier or optionally of an amino acid residue of a peptide linker covalently attached to a protein/polypeptide carrier, thereby preserving the functionality of the carrier such that it retains its ability to elicit the desired immune responses against the peptide immunogen comprising the Aβ peptide or fragments of Aβ or analogs thereof that would otherwise not occur without a carrier, n is an integer greater than 0, but less than or equal to 85, and p is an integer greater than 0, but less than 85.

153. The conjugate according to claim 150, wherein the carrier is selected from a group consisting of serum albumin, keyhole limpet hemocyanin (KLH), immunoglobulin molecules, thyroglobulin, ovalbumin, influenza hemagglutinin, PADRE polypeptide, malaria circumsporozite (CS) protein, hepatitis B surface antigen (HBSAg19-28), eat Shock Protein (HSP) 65, Mycobacterium tuberculosis, cholera toxin, cholera toxin mutants with reduced toxicity, diphtheria toxin, CRM197 protein that is cross-reactive with diphtheria toxin, recombinant Streptococcal C5a peptidase, Streptococcus pyogenes

ORF1224, Streptococcus pyogenes ORF1664, Streptococcus pyogenes ORF2452, Streptococcus pneumoniae pneumolysin, pneumolysin mutants with reduced toxicity, Chlamydia pneumoniae ORF T367, Chlamydia pneumoniae ORF T858, Tetanus toxoid, HIV gp120 T1, components recognizing microbial surface adhesive matrix molecules (MSCRAMMS), growth factors, hormones, cytokines and chemokines.

154. The conjugate according to claim 150, wherein the carrier contains a T-cell epitope.

155. The conjugate according to claim 154, wherein the carrier is a bacterial toxoid.

156. The conjugate according to claim 154, wherein the carrier is influenza hemagglutinin.

157. The conjugate according to claim 154, wherein the carrier is PADRE polypeptide.

158. The conjugate according to claim 154, wherein the carrier is malaria circumsporozite (CS) protein.

159. The conjugate according to claim 154, wherein the carrier is Hepatitis B surface antigen (HBSAg19-28).

160. The conjugate according to claim 154, wherein the carrier is heat shock protein 65 (HSP 65).

161. The conjugate according to claim 154, wherein the carrier is a polypeptide from Mycobacterium tuberculosis (BCG).

162. The conjugate according to claim 154, wherein the carrier is tetanus toxoid.

163. The conjugate according to claim 154, wherein the bacterial toxoid is CRM 197.

164. The conjugate according to claim 154, wherein the carrier is Streptococcal rC5a peptidase.

165. The conjugate according to claim 154, wherein the carrier is Streptococcus pyogenes ORF1224.

166. The conjugate according to claim 154, wherein the carrier is Streptococcus pyogenes ORF1664.

167. The conjugate according to claim 154, wherein the carrier is Streptococcus pyogenes ORF2452.

168. The conjugate according to claim 154, wherein the carrier is Chlamydia pneumoniae ORF T367.

169. The conjugate according to claim 154, wherein the carrier is Chlamydia pneumoniae ORF T858.

170. The conjugate according to claim 150, wherein the carrier is a growth factor or hormone, which stimulates or enhances immune response.

171. The conjugate according to claim 170, wherein the growth factor or hormone is selected from a group consisting of IL-1, IL-2, γ-interferon, IL-10, GM-CSF, MIP-1α, MIP-1β, and RANTES.

172. The conjugate according to claim 152, wherein the peptide immunogen is an Aβ fragment.

173.. The conjugate according to claim 172, wherein the Aβ fragment is from the N-terminal half of Aβ.

174. The conjugate according to claim 173, wherein the Aβ fragment is selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-9, 1-10, 1-11, 1-12, 1-16, 3-6, and 3-7.

175. The conjugate according to claim 174, wherein the Aβ fragment is selected from the group consisting of Aβ1-5, 1-7, 1-9, and 1-12.

176. The conjugate according to claim 172, wherein the Aβ fragment is from the C-terminal half of Aβ.

177. The conjugate according to claim 176, wherein the Aβ fragment is from the group consisting of Aβ33-42, 35-40, and 35-42.

178. The conjugate according to claim 172, wherein the Aβ fragment is from the internal portion of Aβ.

179. The conjugate according to claim 178, wherein the Aβ fragment is selected from the group consisting of Aβ13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, and 25-35.

180. The conjugate according to claim 172, wherein the Aβ fragment is selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-10, 1-11, 1-12, 1-16, 1-28 3-6, 3-7, 13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, 25-35, 33-42, 35-40, and 35-42.

181. The conjugate according to claim 172, wherein the peptide immunogen further comprises at least one additional copy of the Aβ fragment.

182. The conjugate according to claim 173, wherein the peptide immunogen further comprises at least one additional copy of the N-terminal fragment of Aβ.

183. The conjugate according to claim 182, wherein the peptide immunogen comprises from N-terminus to C-terminus, a plurality of additional copies of the N-terminal fragment of Aβ.

184. The conjugate according to claim 183, wherein the peptide immunogen is (Aβ1-7)3.

185. The conjugate according to claim 183, wherein the peptide immunogen is (Aβ1-7)5.

186. The conjugate according to claim 172, wherein the peptide immunogen further comprises at least one additional copy of a different Aβ fragment.

187. The conjugate according to claim 181, wherein the Aβ peptide immunogen is a fragment of Aβ selected from the group consisting of Aβ 7-11, 17-28, 1-28, 25-35, 35-40 and 35-42.

188. The conjugate according to claim 172, 173, 180, or 181, wherein the peptide immunogen is linked at its C-terminus to the N-terminus of a carrier molecule to form a heterologous peptide.

189. The conjugate according to claim 172, 173, 180, or 181, wherein the peptide immunogen is linked at its N-terminus to the C-terminus of a carrier molecule to form a heterologous peptide.

190. The conjugate according to claim 172, 173, 180, or 181, wherein the peptide immunogen comprises from N-terminus to C-terminus, a first carrier molecule linked at its C-terminus to the N-terminus of the Aβ fragment linked at its C-terminus to the N-terminus of a second carrier molecule to form a heterologous peptide.

191. The conjugate of claim 188, further comprising at least one additional copy of the carrier molecule.

192. The conjugate of claim 188, further comprising at least one additional copy of the carrier molecule.

193. The conjugate of claim 188, further comprising at least one copy of a different carrier molecule.

194. The conjugate of claim 189, further comprising at least one additional copy of the carrier molecule.

195. The conjugate of claim 189, further comprising at least one copy of a different carrier molecule.

196. The conjugate of claim 190, wherein the first carrier and the second carrier are the same carrier molecule.

197. The conjugate of claim 190, wherein the first carrier and the second carrier are different carrier molecules.

198. The conjugate according to claim 188, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

199. The conjugate according to claim 189, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

200. The conjugate according to claim 189, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

201. The conjugate according to claim 190, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

202. The conjugate according to claim 172, wherein the peptide immunogen is further comprised of one or more molecules of the Aβ fragment are linked together in a multiple antigenic peptide (MAP) configuration.

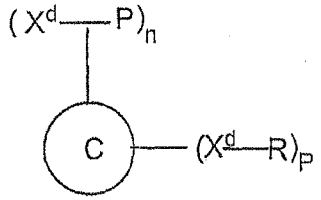
203. The conjugate according to claim 202, wherein the one or more Aβ fragments are selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-10, 1-11, 1-12, 1-16, 1-28 3-6, 3-7, 13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, 25-35, 33-42, 35-40, and 35-42.

204. The conjugate according to claim 202, wherein the peptide immunogen is Aβ1-7 and the MAP configuration is a MAP4 configuration.

205. The conjugate according to claim 202, wherein the peptide immunogen is (Aβ1-7)3 and the MAP configuration is a MAP4 configuration

206. The conjugate according to claim 202, wherein the peptide immunogen is (Aβ1-7)5 and the MAP configuration is a MAP4 configuration.

207. A peptide immunogen-protein/polypeptide carrier conjugate generated according to the method of claim 75 and having the formula:



wherein,

C is the protein/polypeptide carrier and Xd is a derivatized functional group of an amino acid residue of the protein/polypeptide carrier or optionally of an amino acid residue of a peptide linker covalently attached to the protein/polypeptide carrier, and, wherein, P is a peptide immunogen molecule comprising Aβ peptide or fragments of Aβ or analogs thereof covalently attached to the derivatized functional group of the amino acid residue of the protein carrier or optionally of an amino acid residue of a peptide linker covalently attached to a protein/polypeptide carrier, R is a capping molecule covalently attached to the derivatized functional group of an amino acid residue of the protein/polypeptide carrier or optionally of an amino acid residue of a peptide linker covalently attached to a protein/polypeptide carrier, which preserves the functionality of the carrier, such that it retains its ability to elicit the desired immune responses against the peptide immunogen that would otherwise not occur without a carrier, n is an integer greater than 0, but less than or equal to 85, and p is an integer greater than 0, but less than 85.

208. The conjugate according to claim 207 wherein the carrier is selected from the group consisting of human serum albumin, keyhole limpet hemocyanin (KLH), immunoglobulin molecules, thyroglobulin, ovalbumin, influenza hemagglutinin, PADRE polypeptide, malaria circumsporozite (CS) protein, hepatitis B surface antigen (HBSAg19-28), Heat Shock Protein (HSP) 65, Mycobacterium tuberculosis, cholera toxin, cholera toxin mutants with reduced toxicity, diphtheria toxin, CRM197 protein that is cross-reactive with diphtheria toxin, recombinant Streptococcal C5a peptidase, Streptococcus pyogenes ORF1224, Streptococcus pyogenes ORF1664, Streptococcus pyogenes ORF2452, Streptococcus pneumoniae pneumolysin, pneumolysin mutants with reduced toxicity, Chlamydia pneumoniae ORF T367, Chlamydia pneumoniae ORF T858, Tetanus toxoid, HIV gp120 T1, components recognizing microbial surface adhesive matrix molecules (MSCRAMMS), growth factors, hormones, cytokines and chemokines.

209. The conjugate according to claim 207 wherein the carrier contains a T-cell epitope.

210. The conjugate according to claim 209, wherein the carrier is a bacterial toxoid.

211. The conjugate according to claim 209, wherein the carrier is influenza hemagglutinin.

212. The conjugate according to claim 209, wherein the carrier is PADRE polypeptide.

213. The conjugate according to claim 209, wherein the carrier is malaria circumsporozite (CS) protein.

214. The conjugate according to claim 220, wherein the carrier is Hepatitis B surface antigen (HSBAg19-28).

215. The conjugate according to claim 209, wherein the carrier is heat shock protein 65 (HSP 65).

216. The conjugate according to claim 209, wherein the carrier is a polypeptide from Mycobacterium tuberculosis (BCG).

217. The conjugate according to claim 209, wherein the carrier is tetanus toxoid.

218. The conjugate according to claim 209, wherein the bacterial toxoid is CRM 197.

219. The conjugate according to claim 209, wherein the carrier is Streptococcal rC5a peptidase.

220. The conjugate according to claim 209, wherein the carrier is Streptococcus pyogenes ORF1224.

221. The conjugate according to claim 209, wherein the carrier is Streptococcus pyogenes ORF1664.

222. The conjugate according to claim 209, wherein the carrier is Streptococcus pyogenes ORF2452.

223. The conjugate according to claim 209, wherein the carrier is Chlamydia pneumoniae ORF T367.

224. The conjugate according to claim 209, wherein the carrier is Chlamydia pneumoniae ORF T858.

225. The conjugate according to claim 209, wherein the carrier is a growth factor or hormone, which stimulates or enhances immune response.

226. The conjugate according to claim 225, wherein the growth factor or hormone is selected from a group consisting of IL-1, IL-2, γ-interferon, IL-10, GM-CSF, MIP-1α, MIP-1β, and RANTES.

227. The conjugate according to 207, wherein the peptide immunogen is an Aβ fragment.

228. The conjugate according to claim 227, wherein the Aβ fragment is from the N-terminal half of Aβ.

229. The conjugate according to claim 228, wherein the Aβ fragment is selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-9, 1-10, 1-11, 1-12, 1-16, 3-6, and 3-7.

230. The conjugate according to claim 229, wherein the Aβ fragment is selected from the group consisting of Aβ1-5, 1-7, 1-9, and 1-12.

231. The conjugate according to claim 227, wherein the Aβ fragment is from the C-terminal half of Aβ.

232. The conjugate according to claim 231, wherein the Aβ fragment is from the group consisting of Aβ33-42, 35-40, and 35-42.

233. The conjugate according to claim 227, wherein the Aβ fragment is from the internal portion of Aβ.

234. The conjugate according to claim 233, wherein the Aβ fragment is selected from the group consisting of Aβ13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, and 25-35.

235. The conjugate according to claim 227, wherein the Aβ fragment is selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-10, 1-11, 1-12, 1-16, 1-28

3-6, 3-7, 13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, 25-35, 33-42, 35-40, and 35-42.

236. The conjugate according to claim 227, wherein the peptide immunogen further comprises at least one additional copy of the Aβ fragment.

237. The conjugate according to claim 228, wherein the peptide immunogen further comprises at least one additional copy of the N-terminal fragment of Aβ.

238. The conjugate according to claim 237, wherein the peptide immunogen comprises from N-terminus to C-terminus, a plurality of additional copies of the N-terminal fragment of Aβ.

239. The conjugate according to claim 238, wherein the peptide immunogen is (Aβ1-7)3.

240. The conjugate according to claim 238, wherein the peptide immunogen is (Aβ1-7)5.

241. The conjugate according to claim 227, wherein the peptide immunogen further comprises at least one additional copy of a different Aβ fragment.

242. The conjugate according to claim 236, wherein the Aβ peptide immunogen is a fragment of Aβ selected from the group consisting of Aβ 7-11, 17-28, 1-28, 25-35, 35-40 and 35-42.

243. The conjugate according to claim 227, 228, 235, or 236, wherein the peptide immunogen is linked at its C-terminus to the N-terminus of a carrier molecule to form a heterologous peptide.

244. The conjugate according to claim 227, 228, 235, or 236, wherein the peptide immunogen is linked at its N-terminus to the C-terminus of a carrier molecule to form a heterologous peptide.

245. The conjugate according to claim 227, 228, 235, or 236, wherein the peptide immunogen comprises from N-terminus to C-terminus, a first carrier molecule linked at its C-terminus to the N-terminus of the Aβ fragment linked at its C-terminus to the N-terminus of a second carrier molecule to form a heterologous peptide.

246. The conjugate of claim 243, further comprising at least one additional copy of the carrier molecule.

247. The conjugate of claim 243, further comprising at least one additional copy of the carrier molecule.

248. The conjugate of claim 243, further comprising at least one copy of a different carrier molecule.

249. The conjugate of claim 244, further comprising at least one additional copy of the carrier molecule.

250. The conjugate of claim 244, further comprising at least one copy of a different carrier molecule.

251. The conjugate of claim 245, wherein the first carrier and the second carrier are the same carrier molecule.

252. The conjugate of claim 245, wherein the first carrier and the second carrier are different carrier molecules.

253. The conjugate according to claim 243, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

254. The conjugate according to claim 244, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

255. The conjugate according to claim 244, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

256. The conjugate according to claim 245, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

257. The conjugate according to claim 227, wherein the peptide immunogen is further comprised of one or more molecules of the Aβ fragment are linked together in a multiple antigenic peptide (MAP) configuration.

258. The conjugate according to claim 257, wherein the one or more Aβ fragments are selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-10, 1-11, 1-12, 1-16, 1-28 3-6, 3-7, 13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, 25-35, 33-42, 35-40, and 35-42.

259. The conjugate according to claim 257, wherein the peptide immunogen is Aβ1-7 and the MAP configuration is a MAP4 configuration.

260. The conjugate according to claim 257, wherein the peptide immunogen is (Aβ1-7)3 and the MAP configuration is a MAP4 configuration

261. The conjugate according to claim 257, wherein the peptide immunogen is (Aβ1-7)5 and the MAP configuration is a MAP4 configuration.

262. An immunogenic composition, comprising a conjugate of a peptide immunogen with a protein/polypeptide carrier generated by the method of claim 79, together with one or more pharmaceutically acceptable excipients, diluents, and /or adjuvants.

263. The immunogenic composition according to claim 262, wherein the carrier is selected from the group consisting of human serum albumin, keyhole limpet hemocyanin (KLH), immunoglobulin molecules, thyroglobulin, ovalbumin, influenza hemagglutinin, PADRE polypeptide, malaria circumsporozite (CS) protein, hepatitis B surface antigen (HBSAg19-28), Heat Shock Protein (HSP) 65, Mycobacterium tuberculosis, cholera toxin, cholera toxin mutants with reduced toxicity, diphtheria toxin, CRM197 protein that is cross-reactive with diphtheria toxin, recombinant Streptococcal C5a peptidase, Streptococcus pyogenes ORF1224, Streptococcus pyogenes ORF1664, Streptococcus pyogenes ORF2452, Streptococcus pneumoniae pneumolysin, pneumolysin mutants with reduced toxicity, Chlamydia pneumoniae ORF T367, Chlamydia pneumoniae ORF T858, Tetanus toxoid, HIV gp120 T1, components recognizing microbial surface adhesive matrix molecules (MSCRAMMS), growth factors, hormones, cytokines and chemokines.

264. The immunogenic composition according to claim 262, wherein the carrier contains a T-cell epitope.

265. The immunogenic conjugate according to claim 264 wherein the carrier is a bacterial toxoid.

266. The immunogenic composition according to claim 264, wherein the carrier is influenza hemagglutinin.

267. The immunogenic composition according to claim 264, wherein the carrier is PADRE polypeptide.

268. The immunogenic composition according to claim 264, wherein the carrier is malaria circumsporozite (CS) protein.

269. The immunogenic composition according to claim 264, wherein the carrier is Hepatitis B surface antigen (HSBAg19-28).

270. The immunogenic composition according to claim 264, wherein the carrier is heat shock protein 65 (HSP 65).

271. The immunogenic composition according to claim 264, wherein the carrier is a polypeptide from Mycobacterium tuberculosis (BCG).

272. The immunogenic composition according to claim 264, wherein the bacterial toxoid is tetanus toxoid.

273. The immunogenic composition according to claim 264, wherein the bacterial toxoid is CRM 197.

274. The immunogenic composition according to claim 264, wherein the carrier is Streptococcal rC5a peptidase.

275. The immunogenic composition according to claim 264, wherein the carrier is Streptococcus pyogenes ORF1224.

276. The immunogenic composition according to claim 264, wherein the carrier is Streptococcus pyogenes ORF1664.

277. The immunogenic composition according to claim 264, wherein the carrier is Streptococcus pyogenes ORF2452.

278. The immunogenic composition according to claim 264, wherein the carrier is Chlamydia pneumoniae ORF T367.

279. The immunogenic composition according to claim 264, wherein the carrier is Chlamydia pneumoniae ORF T858.

280. The immunogenic composition according to claim 262, wherein the carrier is a growth factor or a hormone, which stimulates or enhances immune response.

281. The immunogenic composition according to claim 280, wherein the growth factor or hormone is selected from a group consisting of IL-1, IL-2, γ-interferon, IL-10, GM-CSF, MIP-1α, MIP-1β, and RANTES.

282. The method according to claim 1, wherein the peptide immunogen is an Aβ fragment.

283. The method according to claim 282, wherein the Aβ fragment is from the N-terminal half of Aβ.

284. The method according to claim 283, wherein the Aβ fragment is selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-9, 1-10, 1-11, 1-12, 1-16, 3-6, and 3-7.

285. The method according to claim 284, wherein the Aβ fragment is selected from the group consisting of Aβ1-5, 1-7, 1-9, and 1-12.

286. The method according to claim 282, wherein the Aβ fragment is from the C-terminal half of Aβ.

287. The method according to claim 286, wherein the Aβ fragment is from the group consisting of Aβ33-42, 35-40, and 35-42.

288. The method according to claim 282, wherein the Aβ fragment is from the internal portion of Aβ.

289. The method according to claim 288, wherein the Aβ fragment is selected from the group consisting of Aβ13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, and 25-35.

290. The method according to claim 282, wherein the Aβ fragment is selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-10, 1-11, 1-12, 1-16, 1-28 3-6, 3-7, 13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, 25-35, 33-42, 35-40, and 35-42.

291. The method according to claim 282, wherein the peptide immunogen further comprises at least one additional copy of the Aβ fragment.

292. The method according to claim 283, wherein the peptide immunogen further comprises at least one additional copy of the N-terminal fragment of Aβ.

293. The method according to claim 292, wherein the peptide immunogen comprises from N-terminus to C-terminus, a plurality of additional copies of the N-terminal fragment of Aβ.

294. The method according to claim 293, wherein the peptide immunogen is (Aβ1-7)3.

295. The method according to claim 293, wherein the peptide immunogen is (Aβ1-7)5.

296. The method according to claim 282, wherein the peptide immunogen further comprises at least one additional copy of a different Aβ fragment.

297. The method according to claim 291, wherein the Aβ peptide immunogen is a fragment of Aβ selected from the group consisting of Aβ 7-11, 17-28, 1-28, 25-35, 35-40 and 35-42.

298. The method according to claim 282, 283, 290, or 291, wherein the peptide immunogen is linked at its C-terminus to the N-terminus of a carrier molecule to form a heterologous peptide.

299. The method according to claim 282, 283, 290, or 291, wherein the peptide immunogen is linked at its N-terminus to the C-terminus of a carrier molecule to form a heterologous peptide.

300. The method according to claim 282, 283, 290, or 291, wherein the peptide immunogen comprises from N-terminus to C-terminus, a first carrier molecule linked

at its C-terminus to the N-terminus of the Aβ fragment linked at its C-terminus to the N-terminus of a second carrier molecule to form a heterologous peptide.

301. The method of claim 298, further comprising at least one additional copy of the carrier molecule.

302. The method of claim 298, further comprising at least one additional copy of the carrier molecule.

303. The method of claim 298, further comprising at least one copy of a different carrier molecule.

304. The method of claim 299, further comprising at least one additional copy of the carrier molecule.

305. The method of claim 299, further comprising at least one copy of a different carrier molecule.

306. The method of claim 300, wherein the first carrier and the second carrier are the same carrier molecule.

307. The method of claim 300, wherein the first carrier and the second carrier are different carrier molecules.

308. The method according to claim 298, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

309. The method according to claim 299, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

310. The method according to claim 299, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

311. The method according to claim 300, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

312. The method according to claim 282, wherein the peptide immunogen is further comprised of one or more molecules of the Aβ fragment are linked together in a multiple antigenic peptide (MAP) configuration.

313. The method according to claim 312, wherein the one or more Aβ fragments are selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-10, 1-11, 1-12, 1-16, 1-28 3-6, 3-7, 13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, 25-35, 33-42, 35-40, and 35-42.

314. The method according to claim 312, wherein the peptide immunogen is Aβ1-7 and the MAP configuration is a MAP4 configuration.

315. The method according to claim 312, wherein the peptide immunogen is (Aβ1-7)3 and the MAP configuration is a MAP4 configuration

316. The method according to claim 312, wherein the peptide immunogen is (Aβ1-7)5 and the MAP configuration is a MAP4 configuration.

317. The immunogenic composition according to claim 262, wherein one or more adjuvants are selected from the group consisting of GM-CSF, 529 SE, IL-12, aluminum phosphate, aluminum hydroxide, Mycobacterium tuberculosis, Bordetella pertussis, bacterial lipopolysaccharides, aminoalkyl glucosamine phosphate compounds, MPL™ (3-O-deacylated monophosphoryl lipid A), a polypeptide, Quil A, STIMULON™ QS-21, a pertussis toxin (PT), an E.coli heat-labile toxin (LT), IL-1 α, IL-1 β, IL-2, IL-4, IL-5, IL-6, IL-7, IL-8, IL-10, IL-13, IL-14, IL-15, IL-16, IL-17, IL-18, interferon- α, interferon- β, interferon-γ, G-CSF, TNF- α and TNF- β.

318. The immunogenic composition of claim 317, wherein the peptide immunogen is Aβ, the carrier is CRM197, and the adjuvant is 529 SE.

319. A method for inducing an immune response in a mammalian subject, which comprises administering an effective amount of the immunogenic composition of claim 262 to the subject.

320. The method according to claim 319, wherein the carrier is selected from the group consisting of human serum albumin, keyhole limpet hemocyanin (KLH), immunoglobulin molecules, thyroglobulin, ovalbumin, influenza hemagglutinin, PADRE polypeptide, malaria circumsporozite (CS) protein, hepatitis B surface antigen (HBSAg19-28), Heat Shock Protein (HSP) 65, Mycobacterium tuberculosis, cholera toxin, cholera toxin mutants with reduced toxicity, diphtheria toxin, CRM197 protein that is cross-reactive with diphtheria toxin, recombinant Streptococcal C5a peptidase, Streptococcus pyogenes ORF1224, Streptococcus pyogenes ORF1664, Streptococcus pyogenes ORF2452, Streptococcus pneumoniae pneumolysin, pneumolysin mutants with reduced toxicity, Chlamydia pneumoniae ORF T367, Chlamydia pneumoniae ORF T858, Tetanus toxoid, HIV gp120 T1, components recognizing microbial surface adhesive matrix molecules (MSCRAMMS), growth factors, hormones, cytokines and chemokines.

321. The method according to claim 319, wherein the carrier contains a T-cell epitope.

322. The method according to claim 321, wherein the carrier is a bacterial toxoid.

323. The method according to claim 321, wherein the bacterial toxoid is tetanus toxoid.

324. The method according to claim 321, wherein the carrier is influenza hemagglutinin.

325. The method according to claim 321, wherein the carrier is PADRE polypeptide.

326. The method according to claim 321, wherein the carrier is malaria circumsporozite (CS) protein.

327. The method according to claim 321, wherein the carrier is Hepatitis B surface antigen.

328. The method according to claim 321, wherein the carrier is heat shock protein 65 (HSP 65).

329. The method according to claim 321, wherein the carrier is a polypeptide from Mycobacterium tuberculosis (BCG).

330. The method according to claim 321, wherein the bacterial toxoid is tetanus toxoid.

331. The method according to claim 321, wherein the bacterial toxoid is CRM 197.

332. The method according to claim 321, wherein the carrier is Streptococcal rC5a peptidase.

333. The method according to claim 321, wherein the carrier is Streptococcus pyogenes ORF1224.

334. The method according to claim 321, wherein the carrier is Streptococcus pyogenes ORF1664.

335. The method according to claim 321, wherein the carrier is Streptococcus pyogenes ORF2452.

336. The method according to claim 321, wherein the carrier is Chlamydia pneumoniae ORF T367.

337. The method according to claim 321, wherein the carrier is Chlamydia pneumoniae ORF T858.

338. The method according to claim 319, wherein the carrier is a growth factor or hormone, which stimulates or enhances immune response.

339. The method according to claim 338, wherein the growth factor or hormone is selected from a group consisting of IL-1, IL-2, γ-interferon, IL-10, GM-CSF, MIP-1α, MIP-1β, and RANTES.

340. The method according to claim 262, wherein one or more adjuvants are selected from the group consisting of GM-CSF, 529SE, IL-12, aluminum phosphate, aluminum hydroxide, Mycobacterium tuberculosis, Bordetella pertussis, bacterial lipopolysaccharides, aminoalkyl glucosamine phosphate compounds, MPL™ (3-O-

deacylated monophosphoryl lipid A), a polypeptide, Quil A, STIMULON™ QS-21, a pertussis toxin (PT), an E. coli heat-labile toxin (LT), IL-1 α, IL-1 β, IL-2, IL-4, IL-5, IL-6, IL-7, IL-8, IL-10, IL-13, IL-14, IL-15, IL-16, IL-17, IL-18, interferon- α, interferon- β, interferon- γ, G-CSF, TNF- α and TNF- β.

341. The method according to claim 340, wherein the peptide immunogen is Aβ, the carrier is CRM197, and the adjuvant is 529 SE.

342. The method according to claim 1, wherein the peptide immunogen is an Aβ fragment.

343. The method according to claim 342, wherein the Aβ fragment is from the N-terminal half of Aβ.

344. The method according to claim 343, wherein the Aβ fragment is selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-9, 1-10, 1-11, 1-12, 1-16, 3-6, and 3-7.

345. The method according to claim 344, wherein the Aβ fragment is selected from the group consisting of Aβ1-5, 1-7, 1-9, and 1-12.

346. The method according to claim 342, wherein the Aβ fragment is from the C-terminal half of Aβ.

347. The method according to claim 346, wherein the Aβ fragment is from the group consisting of Aβ33-42, 35-40, and 35-42.

348. The method according to claim 342, wherein the Aβ fragment is from the internal portion of Aβ.

349. The method according to claim 348, wherein the Aβ fragment is selected from the group consisting of Aβ13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, and 25-35.

350. The method according to claim 342, wherein the Aβ fragment is selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-10, 1-11, 1-12, 1-16, 1-28 3-6, 3-7, 13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, 25-35, 33-42, 35-40, and 35-42.

351. The method according to claim 342, wherein the peptide immunogen further comprises at least one additional copy of the Aβ fragment.

352. The method according to claim 343, wherein the peptide immunogen further comprises at least one additional copy of the N-terminal fragment of Aβ.

353. The method according to claim 352, wherein the peptide immunogen comprises from N-terminus to C-terminus, a plurality of additional copies of the N-terminal fragment of Aβ.

354. The method according to claim 353, wherein the peptide immunogen is (Aβ1-7)3.

355. The method according to claim 353, wherein the peptide immunogen is (Aβ1-7)5.

356. The method according to claim 342, wherein the peptide immunogen further comprises at least one additional copy of a different Aβ fragment.

357. The method according to claim 351, wherein the Aβ peptide immunogen is a fragment of Aβ selected from the group consisting of Aβ 7-11, 17-28, 1-28, 25-35, 35-40 and 35-42.

358. The method according to claim 342, 343, 350, or 351, wherein the peptide immunogen is linked at its C-terminus to the N-terminus of a carrier molecule to form a heterologous peptide.

359. The method according to claim 342, 343, 350, or 351, wherein the peptide immunogen is linked at its N-terminus to the C-terminus of a carrier molecule to form a heterologous peptide.

360. The method according to claim 342, 343, 350, or 351, wherein the peptide immunogen comprises from N-terminus to C-terminus, a first carrier molecule linked at its C-terminus to the N-terminus of the Aβ fragment linked at its C-terminus to the N-terminus of a second carrier molecule to form a heterologous peptide.

361. The method of claim 358, further comprising at least one additional copy of the carrier molecule.

362. The method of claim 358, further comprising at least one additional copy of the carrier molecule.

363. The method of claim 358, further comprising at least one copy of a different carrier molecule.

364. The method of claim 359, further comprising at least one additional copy of the carrier molecule.

365. The method of claim 359, further comprising at least one copy of a different carrier molecule.

366. The method of claim 360, wherein the first carrier and the second carrier are the same carrier molecule.

367. The method of claim 360, wherein the first carrier and the second carrier are different carrier molecules.

368. The method according to claim 358, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

369. The method according to claim 359, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

370. The method according to claim 359, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

371. The method according to claim 360, wherein the carrier molecule is selected from the group consisting of a T-cell epitope, a B-cell epitope and combinations thereof.

372. The method according to claim 342, wherein the peptide immunogen is further comprised of one or more molecules of the Aβ fragment are linked together in a multiple antigenic peptide (MAP) configuration.

373. The method according to claim 372, wherein the one or more Aβ fragments are selected from the group consisting of Aβ1-3, 1-4, 1-5, 1-6, 1-7, 1-10, 1-11, 1-12, 1-16, 1-28 3-6, 3-7, 13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, 25-35, 33-42, 35-40, and 35-42.

374. The method according to claim 372, wherein the peptide immunogen is Aβ1-7 and the MAP configuration is a MAP4 configuration.

375. The method according to claim 372, wherein the peptide immunogen is (Aβ1-7)3 and the MAP configuration is a MAP4 configuration.

376. The method according to claim 372, wherein the peptide immunogen is (Aβ1-7)5 and the MAP configuration is a MAP4 configuration.

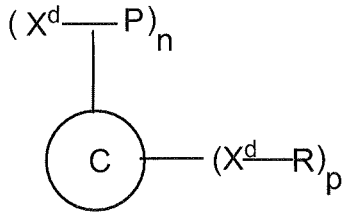
377. The use of the conjugate of any one of claims 152 or 207 in the manufacture of a medicament for use in the treatment, prophylaxis, or amelioration of an amyloidogenic disease.

378. The use of claim 377, where the disease is Alzheimer's disease.

379. The use of claim 377, wherein the disease is Down's syndrome.

Claims:

1. A peptide immunogen-protein/polypeptide carrier conjugate having the formula:



wherein,

C is a CRM_{197} protein/polypeptide carrier,

X^d is a derivatized functional group of an amino acid residue of the protein/polypeptide carrier,

P is a peptide immunogen molecule comprising a fragment of Aβ covalently attached to the derivatized functional group of the amino acid residue of the protein/polypeptide carrier, wherein the Aβ fragment is selected from the group consisting of residues 1-3, 1-4, 1-5, 1-6, 1-7, 1-9, 1-10, 1-11, 1-12, 1-16, 1-28, 3-6, 3-7, 13-28, 15-24, 16-22, 16-23, 17-23, 17-24, 18-24, 18-25, 17-28, 25-35, 33-42, 35-40, and 35-42 of Aβ (SEQ ID NO:21),

R is a capping molecule covalently attached to the derivatized functional group of an amino acid residue of the protein/polypeptide carrier, thereby preserving the functionality of the carrier such that it retains its ability to elicit the desired immune responses against the peptide immunogen that would otherwise not occur without a carrier,

n is an integer greater than 0, but less than or equal to 85, and

p is an integer greater than 0, but less than 85.

2. The conjugate of claim 1, wherein the peptide immunogen further comprises a terminal cysteine residue and the peptide immunogen is covalently attached to the derivatized functional group of the amino acid residue of the protein/polypeptide carrier via the terminal cysteine residue.

3. The conjugate of claim 2, wherein the terminal cysteine residue is located at the carboxy-terminus or the amino-terminus of the peptide immunogen.

4. The conjugate of claim 3, wherein the terminal cysteine residue is located at the carboxy-terminus of the peptide immunogen.

5. The conjugate of any one of claims 1-4, wherein the Aβ fragment comprises residues 1-7 of Aβ (SEQ ID NO:21).

6. The conjugate of any one of claims 1-5, wherein the capping molecule is formed by reaction of the conjugate with a capping reagent selected from the group consisting of cysteamine, N-acetylcysteamine, ethanolamine, ammonia, ammonium bicarbonate, sodium hydroxide and sodium carbonate.

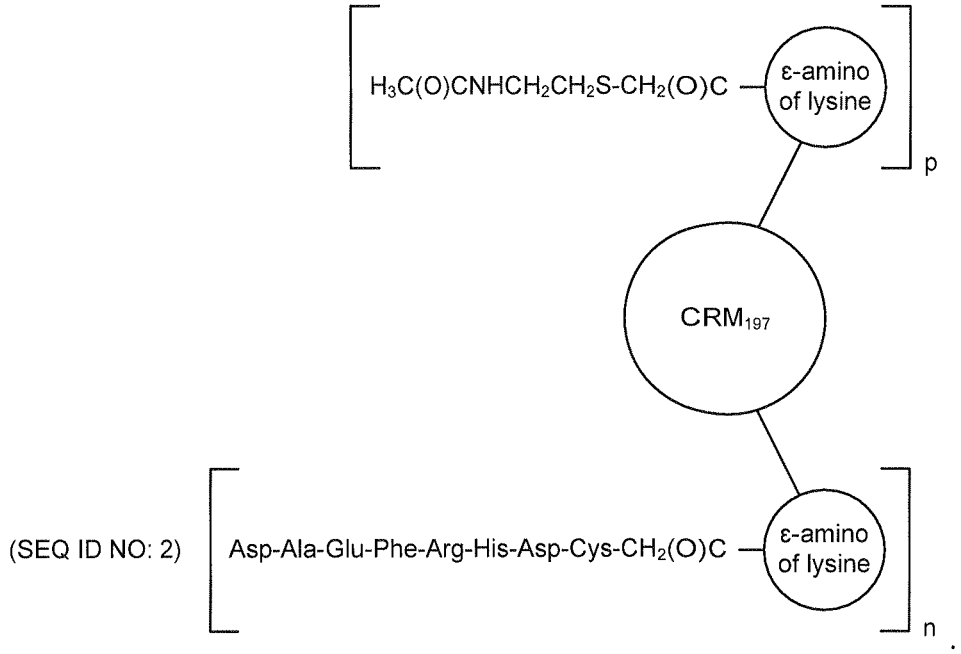
7. The conjugate of claim 5, wherein the Aβ fragment is residues 1-7 of Aβ (SEQ ID NO:21).

8. The conjugate of claim 7, wherein the peptide immunogen is DAEFRHD-C (SEQ ID NO:2).

9. The conjugate of any one of claims 1-8, wherein the capping molecule is formed by reaction of the conjugate with N-acetylcysteamine.

10. The conjugate of any one of claims 1-9, wherein X^d is a derivatized functional group of a lysine residue.

11. The conjugate of claim 1 having the formula:



12. The conjugate of claim 11, wherein n is 12, 14 or 15.

13. An immunogenic composition, comprising a conjugate of a peptide immunogen with a protein/polypeptide carrier according to any one of the preceding claims, together with one or more pharmaceutically acceptable excipients, diluents, and/or adjuvants.

14. The immunogenic composition of claim 13, wherein one or more adjuvants are selected from the group consisting of GM-CSF, 529 SE, IL-12, aluminum phosphate, aluminum hydroxide, *Mycobacterium tuberculosis*, *Bordetella pertussis*, bacterial lipopolysaccharides, aminoalkyl glucosamine phosphate compounds, MPL™ (3-O-deacylated monophosphoryl lipid A), a polypeptide, Quil A, STIMULON™ QS-21, a pertussis toxin (PT), an *E. coli* heat-labile toxin (LT), IL-1 α, IL-1 β, IL-2, IL-4, IL-5, IL-6, IL-7, IL-8, IL-10, IL-13, IL-14, IL-15, IL-16, IL-17, IL-18, interferon-α, interferon-β, interferon-γ, G-CSF, TNF-α and TNF-β.