modified isoprenoid lipid, or a physiologically acceptable salt thereof, the method comprising contacting the virus with the alkyne-modified fatty acid, the alkyne-modified carbohydrate, the alkyne-modified isoprenoid lipid, or physiologically acceptable salt thereof thereby producing the labeled virus, wherein the labeled virus has increased infectivity.

[006] In another aspect, a method is provided for producing a virus labeled with an alkyne-modified fatty acid, an alkyne-modified carbohydrate, an alkyne-modified isoprenoid lipid, or a physiologically acceptable salt thereof, the method comprising contacting a cell that is infected with a virus with the alkyne-modified fatty acid, the alkyne-modified carbohydrate, the alkyne-modified isoprenoid lipid, or physiologically acceptable salt thereof so that the alkyne-modified fatty acid, the alkyne-modified carbohydrate, the alkyne-modified isoprenoid lipid, or physiologically acceptable salt thereof enters the cell is incorporated into a protein of the virus, thereby producing the labeled virus.

[007] In yet another aspect, a method is provided for increasing the infectivity of a transfection virus, the method comprising contacting a cell that is infected with a virus with an alkyne-modified fatty acid, an alkyne-modified carbohydrate, an alkyne-modified isoprenoid lipid, or physiologically acceptable salt thereof in an amount effective to increase the infectivity of the virus.

[008] In yet another aspect, a method is provided for increasing the infectivity of a virus, the method comprising contacting a cell that is infected with a virus with an alkyne-modified fatty acid, an alkyne-modified carbohydrate, an alkyne-modified isoprenoid lipid, or physiologically acceptable salt thereof in an amount effective to increase the infectivity of the virus; wherein the virus is not a human immunodeficiency virus.

[009] In some embodiments, the the alkyne-modified fatty acid or physiologically acceptable salt thereof, has the formula:

$$Y\text{-}CH_2\text{-}X\text{-}CO_2H \qquad [I]$$

wherein, Y is H or an ethynyl group; and when Y is an ethynyl group, X is a linear or branched carbon chain comprising 6 to 28 carbons, wherein one or more of said carbons may be independently replaced by an oxygen, selenium, silicon, sulfur, SO, SO_2 or NR_1, or wherein one or more pairs of said carbons adjacent to one another may be attached to one another by a double or triple bond; or when Y is H, X is a linear or branched carbon chain comprising 6 to 28 carbons, wherein at least one hydrogen on one of said carbons is

replaced with an ethynyl group and wherein one or more of said carbons not having an the ethynyl group attached thereto may be independently replaced by an oxygen, selenium, silicon, sulfur, SO, SO_2 or NR_1, or wherein one or more pairs of said carbons

[0052] In some embodiments, the virus is a non-naturally occurring virus. In some of these, the virus is an adenovirus, a parvovirus, a togavirus, a herpes virus, a retrovirus, or a poxvirus; in others, the virus is an adenovirus, an adeno-associated virus, an alphavirus, a herpes simplex virus, a retrovirus, a vaccinia virus or a canarypox virus; in others, the virus is an adenovirus, a paramyoxovirus, a retrovirus or a baculovirus; and in others, the virus is a BacMam virus, a lentivirus or a Sendai virus.

[0053] In some embodiments, the contacting is performed in a solution comprising at least one of animal serum, amino acids, buffers, fatty acids, glucose, hormones, inorganic salts, lipids, metal ion chelators, peptides, surfactants, trace metals, and vitamins.

[0054] Another aspect of the present invention is a virus comprising an alkyne-modified fatty acid moiety, an alkyne-modified carbohydrate moiety, or an alkyne-modified isoprenoid lipid moiety; wherein the moiety is non-naturally occurring, wherein the virus has increased infectivity and wherein the virus is not a human immunodeficiency virus.

[0055] In some embodiments, the alkyne-modified fatty acid moiety has the formula:

$$Y\text{-}CH_2\text{-}X\text{-}CO\text{-} \qquad [IV]$$

wherein, Y is H or an ethynyl group; and when Y is an ethynyl group, X is a linear or branched carbon chain comprising 6 to 28 carbons, wherein one or more of said carbons may be independently replaced by an oxygen, selenium, silicon, sulfur, SO, SO_2 or NR_1, or wherein one or more pairs of said carbons adjacent to one another may be attached to one another by a double or triple bond; or when Y is H, X is a linear or branched carbon chain comprising 6 to 28 carbons, wherein at least one hydrogen on one of said carbons is replaced with an ethynyl group and wherein one or more of said carbons not having an the ethynyl group attached thereto may be independently replaced by an oxygen, selenium, silicon, sulfur, SO, SO_2 or NR_1, or wherein one or more pairs of said carbons adjacent to one another and not having an ethynyl group attached thereto may be attached to one another by a double or triple bond; wherein, R_1 is H or an alkyl comprising 1 to 6 carbons.

[0056] In certain embodiments comprising [IV], Y is an ethynyl group.

[0057] In certain embodiments comprising [IV], X is a linear carbon chain.

[0058] In certain embodiments comprising [IV], X is a carbon chain comprising 8 to 15 carbons.

CLAIMS

1. A method of producing a virus labeled with an alkyne-modified fatty acid, an alkyne-modified carbohydrate, an alkyne-modified isoprenoid lipid, or a physiologically acceptable salt thereof, the method comprising contacting the virus with the alkyne-modified fatty acid, the alkyne-modified carbohydrate, the alkyne-modified isoprenoid lipid, or physiologically acceptable salt thereof thereby producing the labeled virus, wherein the labeled virus has increased infectivity.

2. The method of claim 1, wherein the alkyne-modified fatty acid or physiologically acceptable salt thereof, has the formula:

$$Y\text{-}CH_2\text{-}X\text{-}CO_2H$$

wherein,

Y is H or an ethynyl group; and

when Y is an ethynyl group, X is a linear or branched carbon chain comprising 6 to 28 carbons, wherein one or more of said carbons may be independently replaced by an oxygen, selenium, silicon, sulfur, SO, SO_2 or NR_1, or wherein one or more pairs of said carbons adjacent to one another may be attached to one another by a double or triple bond; or

when Y is H, X is a linear or branched carbon chain comprising 6 to 28 carbons, wherein at least one hydrogen on one of said carbons is replaced with an ethynyl group and wherein one or more of said carbons not having an the ethynyl group attached thereto may be independently replaced by an oxygen, selenium, silicon, sulfur, SO, SO_2 or NR_1, or wherein one or more pairs of said carbons adjacent to one another and not having an ethynyl group attached thereto may be attached to one another by a double or triple bond; wherein, R_1 is H or an alkyl comprising 1 to 6 carbons.

3. The method of claim 2, wherein Y is an ethynyl group.

4. The method of claim 2, wherein X is a linear carbon chain.

5. The method of claim 2, wherein X is a carbon chain comprising 8 to 15 carbons.

6. The method of claim 2, wherein X is a carbon chain in which all of the carbons of the carbon chain are carbon.

63. The method of claim 61, wherein the virus is an adenovirus, an adeno-associated virus, an alphavirus, a herpes simplex virus, a retrovirus, a vaccinia virus or a canarypox virus.

64. The method of claim 61, wherein the virus is an adenovirus, a paramyoxovirus, a retrovirus or a baculovirus.

65. The method of claim 61, wherein the virus is a BacMam virus, a lentivirus or a Sendai virus.

66. The method of claim 46, wherein the contacting is performed in a solution comprising at least one of animal serum, amino acids, buffers, fatty acids, glucose, hormones, inorganic salts, lipids, metal ion chelators, peptides, surfactants, trace metals, and vitamins.

67. A virus comprising an alkyne-modified fatty acid moiety, an alkyne-modified carbohydrate moiety, or an alkyne-modified isoprenoid lipid moiety;
wherein the moiety is non-naturally occurring, wherein the virus has increased infectivity, and wherein the virus is not a human immunodeficiency virus.

68. The virus of claim 67, wherein the alkyne-modified fatty acid moiety has the formula:

$Y\text{-}CH_2\text{-}X\text{-}CO\text{-}$

wherein,

Y is H or an ethynyl group; and

when Y is an ethynyl group, X is a linear or branched carbon chain comprising 6 to 28 carbons, wherein one or more of said carbons may be independently replaced by an oxygen, selenium, silicon, sulfur, SO, SO_2 or NR_1, or wherein one or more pairs of said carbons adjacent to one another may be attached to one another by a double or triple bond; or

when Y is H, X is a linear or branched carbon chain comprising 6 to 28 carbons, wherein at least one hydrogen on one of said carbons is replaced with an ethynyl group and wherein one or more of said carbons not having an the ethynyl group attached thereto

88. A composition comprising the virus of claim 67.

89. The composition of claim 88, further comprising a pharmaceutically acceptable excipient.

90. A method of producing a virus labeled with an alkyne-modified fatty acid, an alkyne-modified carbohydrate, an alkyne-modified isoprenoid lipid, or a physiologically acceptable salt thereof, the method comprising contacting a cell that is infected with a virus with the alkyne-modified fatty acid, the alkyne-modified carbohydrate, the alkyne-modified isoprenoid lipid, or physiologically acceptable salt thereof so that the alkyne-modified fatty acid, the alkyne-modified carbohydrate, the alkyne-modified isoprenoid lipid, or physiologically acceptable salt thereof enters the cell and is incorporated into a protein of the virus, thereby producing the labeled virus.

91. The method of claim 90, wherein the alkyne-modified fatty acid or physiologically acceptable salt thereof, has the formula:

$$Y\text{-}CH_2\text{-}X\text{-}CO_2H$$

wherein,

Y is H or an ethynyl group; and

when Y is an ethynyl group, X is a linear or branched carbon chain comprising 6 to 28 carbons, wherein one or more of said carbons may be independently replaced by an oxygen, selenium, silicon, sulfur, SO, SO_2 or NR_1, or wherein one or more pairs of said carbons adjacent to one another may be attached to one another by a double or triple bond; or

when Y is H, X is a linear or branched carbon chain comprising 6 to 28 carbons, wherein at least one hydrogen on one of said carbons is replaced with an ethynyl group and wherein one or more of said carbons not having an the ethynyl group attached thereto may be independently replaced by an oxygen, selenium, silicon, sulfur, SO, SO_2 or NR_1, or wherein one or more pairs of said carbons adjacent to one another and not having an ethynyl group attached thereto may be attached to one another by a double or triple bond; wherein, R_1 is H or an alkyl comprising 1 to 6 carbons.

92. The method of claim 90, wherein the alkyne-modified fatty acid is 15-ethynylpentadecanoic acid, 12-ethynyldodecanoic acid, or physiologically acceptable salt thereof.