is L-fucose-1-phosphate. In some examples according to (or as applied to) any of the examples above, the fucose source is GDP-fucose.

[0039a] In one aspect, the present disclosure refers to an isolated host cell engineered to express a protein in fucosylated and afucosylated forms at a predetermined ratio, wherein

the isolated host cell is a GDP-keto-6-deoxymannose-3,5-epimerase,4-reductase (FX) knockout host cell, wherein the isolated host cell is a FX knockout host cell having FX knocked out in all alleles, and wherein the isolated host cell has substantially no FX activity.

[0040] Also, provided herein are compositions comprising the protein produced by any one of the methods described herein.

[0041] In some examples, there are provided compositions comprising a protein having an enhanced ADCC function mediated both by NK cells and PMN cells, wherein the composition comprise afucosyalted and fucosylated forms of the protein at a ratio that provides the enhanced ADCC function.

[0042] In some examples, the composition comprises a fucosylated form of the protein comprising fucose at the reducing end of a glycan structure. In some examples, the composition is a pharmaceutical composition. In some examples, the composition is a cell culture medium. In some examples, the composition is a cell lysate. In some examples, the composition is a eluate from a protein purification column.

[0043] Also provided herein are cell cultures comprising: a host cell engineered to express a protein, wherein the host cell comprises substantially no FX activity or substantially no GMD activity; and a culture medium comprising a fucose source at about 0.01mM to about 1 mM.

[0043a] In another aspect, the present disclosure refers to a cell culture comprising:

(a) an isolated host cell engineered to express a protein in fucosylated and afucosylated forms at a predetermined ratio, wherein the isolated host cell is a FX knockout host cell, wherein the isolated host cell is a FX knockout host cell having FX knocked out in all alleles, and wherein the isolated host cell comprises substantially no FX activity; and

(b) a culture medium comprising a fucose source at about 0.01 mM to about 1 mM.

[0044] Also provided herein are methods of treating a disease in an individual in need thereof comprising: administering to the individual a pharmaceutical composition described herein. In some examples, the composition is administered parenterally. In some examples, the composition is administered intravenously or subcutaneously. In some examples, the composition is administered locally. In some examples, the composition is administered topically.

[0045] These and other aspects and advantages of the present disclosure will become apparent from the subsequent detailed description and the appended claims. It is to be understood that one, some, or all of the properties of the various examples described herein may be combined to form other examples of the present disclosure.

BRIEF DESCRIPTION OF THE FIGURES

[0046] **FIG. 1** shows an overview of the fucosylation pathway including the de novo and salvage pathways for generating GDP-fucose. GDP-keto-6-deoxymannose-