

WHAT IS CLAIMED IS:

1. A vaccine composition comprising a pharmaceutically acceptable excipient and an effective amount of a vaccine that comprises at least 10 and preferably from about 10 to about 40 oligomeric- β -(1 $\rightarrow$ 6)-glucosamine groups linked units onto a tetanus toxoid carrier via a linker said oligomer comprises from 3 to 12 repeating β -(1 $\rightarrow$ 6)-glucosamine units provided that less than about 40 number percent of the total number of such units are N-acetylated

wherein said vaccine composition comprises less than about 3 percent of detectable impurities having a molecular weight of less than about 100,000;

further wherein said composition comprises monomeric and dimeric toxoid with less than 5 percent of detectable higher oligomers,

still further wherein said composition is maintained at a temperature sufficient to inhibit oligomerization of the toxoid in the vaccine while not inducing denaturation.

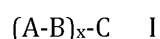
2. A vaccine composition comprising a pharmaceutically acceptable excipient and an effective amount of a vaccine that comprises at least 25 and preferably from about 30 to about 40 oligomeric- β -(1 $\rightarrow$ 6)-glucosamine groups linked units onto a tetanus toxoid carrier via a linker said oligosaccharide groups comprise from 3 to 12 repeating β -(1 $\rightarrow$ 6)-glucosamine units provided that less than about 40 number percent of the total number of such units are N-acetylated

wherein said vaccine composition comprises less than 3 percent of detectable impurities having a molecular weight of less than 50,000;

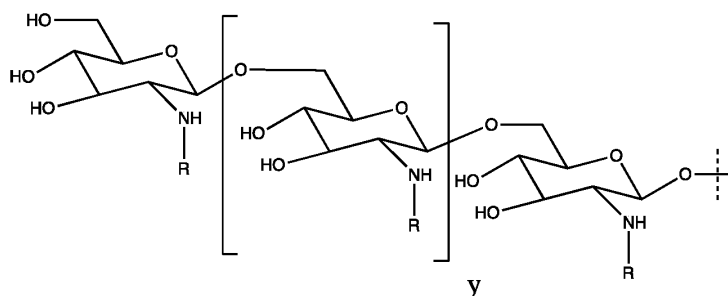
further wherein said composition comprises monomeric and dimeric toxoid with less than 5 percent of detectable higher oligomers,

still further wherein said composition is maintained at a temperature sufficient to inhibit oligomerization of the toxoid while not inducing denaturation.

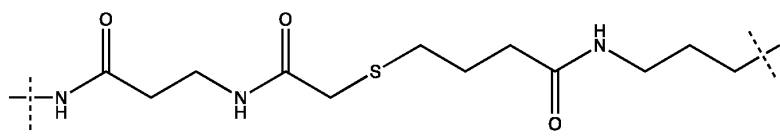
3. A vaccine composition comprising a pharmaceutically acceptable excipient and an effective amount of a vaccine compound of formula I:



where A comprises from 3 to 12 repeating β -(1 $\rightarrow$ 6)-glucosamine units or mixtures thereof having the formula:



B is of the formula:



where the left side of the formula is attached to C and the right side is attached to A;
and C is tetanus toxoid;

x is an integer from about 10 to about 40;

y is an integer from 1 to 10; and

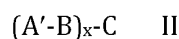
R is hydrogen or acetyl provided that no more than 40% of the R groups are acetyl,
wherein said composition comprises less than 3 percent of detectable impurities

having a molecular weight of about 100,000 or less wherein said weight percent is based on the weight of vaccine compound, and

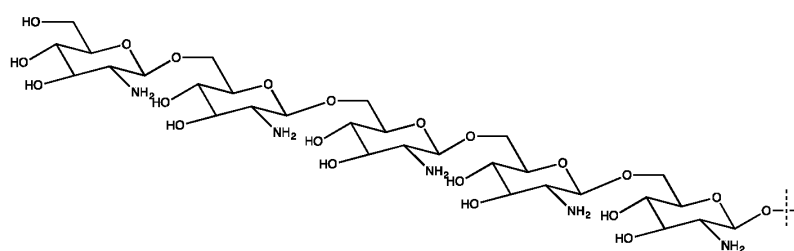
further wherein said composition comprises monomeric and dimeric toxoid with less than about 5 percent of detectable higher oligomers,

still further wherein said composition is maintained at a temperature sufficient to inhibit oligomerization of the toxoid while not inducing denaturation.

4. The vaccine composition according to claim 3, wherein the compound of formula I is represented by formula II:



where A' is a penta- β -(1 $\rightarrow$ 6)-glucosamine (carbohydrate ligand) group of the formula:



and B, C and x are as defined above.