ultrafiltration column to purify and concentrate the liposomes containing peptide.

A preferred method uses a mixture of 2,4-DODPC and lectin-modified 2,4-ODPEGSu as the polymerizable lipid mixture, dissolved in tert-butanol. After rehydration with a solution of the desired peptide or antigen, the liposomes are sonicated and polymerized using a sodium bisulfite (580 μM) potassium persulfate (127 μM) redox couple initiator.

9. EXAMPLE 5

MEASUREMENT OF THE ABSORPTION OF BIOLOGICALLY ACTIVE SUBSTANCES ENTRAPPED IN POLYMERIZED LIPOSOMES

Polymerized liposomes containing ^{125}I-BSA can be orally administered to rats. The absorption of ^{125}I-BSA into the blood can then be examined. ^{125}I-BSA containing monomeric liposomes and ^{125}I-BSA solution are used as controls. The polymerized liposomes are prepared as described infra.

Each formulation, including the control ^{125}I-BSA solution, is administered intragastrically with a ball-tipped needle and blood is sampled at appropriate intervals from the tail vein. To distinguish between transport of ^{125}I-BSA in the context of liposomes, free ^{125}I-BSA and the radiolabelled degradation product of ^{125}I-BSA, the blood samples are separated into three fractions: 1) cell debris fraction, 2) trichloroacetic acid (TCA) precipitable fraction, and 3) TCA non-precipitable fraction.

Feces of rats are homogenized with water and centrifuged to separate solids. Radioactivity in the whole homogenate and sedimented solid are then compared. In the case of polymerized liposome administered rats, the difference in the amount of total radioactivity observed in the solid, compared with the amount from monomeric liposome administered rats, shows the relative stability of polymerized liposomes in the G-I tract.

Because elimination of the precipitable fraction in blood after intravenous injection can be slow, the TCA non-precipitable fraction is smaller in animals administered material in polymerized liposomes, as compared to material administered in conventional liposomes and significantly less than when material is administered in solution.

The present invention is not to be limited in scope by the specific embodiments described herein. Indeed, various modifications of the invention in addition to those described herein will become apparent to those skilled in the art from the foregoing description. Such modifications are intended to fall within the scope of the appended claims.

Various publications are cited herein, the disclosures of which are incorporated by reference in their entireties.

What is claimed is:

1. A polymerized liposome which comprises from about 1 to about 50% polymerizable fatty acids of the formula:

$$R_4\text{—X-PEG-Y—B}$$

or a pharmaceutically acceptable salt thereof, wherein R_4 is a lipophilic chain containing at least one polymerizable moiety; each of X and Y is independently a chemically stable bond or a linker moiety; and B is —O—C(O)—$(CH_2)_pCO_2H$, $C(O)NHR_6$, $C(O)NH_2$, an aldehyde or an amine; wherein p is an integer from 0 to 12; R_6 is a C_1 to C_5 alkyl group; and PEG is a polyethylene glycol group having an average molecular weight of about 200 to about 2000 grams/mole.

2. The polymerized liposome of claim **1** which further comprises a vaccine, an antigen, or a biologically active drug and optionally cholesterol.

3. A polymerized liposome which comprises one or more polymerizable lipids and a polymerizable fatty acid of the formula:

$$CH_3\text{—}(CH_2)_{12}\text{—CH=CH—CH=CH—C(O)—}(OCH_2CH_2)_n\text{—O—C(O)—}CH_2\text{—}CH_2\text{—}CO_2H$$

wherein n is an average number of —OCH_2CH_2— units from about 6 to about 12.

4. A polymerized liposome which comprises one or more polymerizable lipids and a polymerizable fatty acid covalently bonded to a targeting ligand, the polymerizable fatty acid having the formula:

$$CH_3\text{—}(CH_2)_{12}\text{—CH=CH—CH=CH—C(O)—}(OCH_2CH_2)_n\text{—O—C(O)—}CH_2\text{—}CH_2\text{—}CO_2H$$

wherein n is average number of —OCH_2CH_2— units from about 6 to about 12.

5. A polymerized liposome according to claim **4** wherein the targeting ligand is a lectin.

6. A polymerized liposome according to claim **5** wherein the lectin is EEA, FITC-EEA, UEA or WGA.

7. A polymerized liposome according to claim **3** or **4** wherein the polymerizable lipid is a polymerizable phospholipid.

8. A polymerized liposome according to claim **3** or **4** which further comprises a non-polymerizable compound.

9. A polymerized liposome according to claim **8** wherein the non-polymerizable compound is cholesterol.

10. A polymerized liposome according to claim **3** or **4** which further comprises a vaccine, an antigen or a biologically active drug.

11. The polymerizable liposome of claim **1** wherein the polymerizable fatty acid comprises a targeting ligand covalently bound to the B moiety.

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