**CLAIMS**

1. A method for the manufacture of an oil-in-water emulsion comprising:

passing a first emulsion having a first average oil droplet size through a microfluidization device to form a second emulsion having a second average oil droplet size which is less than the first average oil droplet size; and

filtration of the second emulsion;

wherein the microfluidization device comprises an interaction chamber which comprises a plurality of Z-type channels and a back pressure chamber comprising at least one channel; and

wherein the back pressure chamber is positioned downstream of the interaction chamber.

2. The method of claim 1, wherein the first emulsion is introduced into the interaction chamber at a first pressure and the second emulsion exits the back pressure chamber at a second pressure which is lower than the first pressure; and wherein between 80 and 95 % of the pressure difference between the first and the second pressures is dropped across the interaction chamber and 5 to 20 % of the pressure difference between the first and the second pressures is dropped across the back pressure chamber.

3. The method of any one of the preceding claims, wherein the back pressure chamber comprises a plurality of channels.

4. A method for the manufacture of an oil-in-water emulsion comprising the step of passing a first emulsion having a first average oil droplet size through a microfluidization device to form a second emulsion having a second average oil droplet size which is less than the first average oil droplet size; and filtration of the second emulsion; wherein the microfluidization device comprises an interaction chamber comprising a plurality of channels and a back pressure chamber comprising a plurality of channels.

5. The method of claim 4, wherein the first emulsion either:

(i) is introduced into the interaction chamber at a first pressure and the second emulsion exits the back pressure chamber at a second pressure which is lower than the first pressure; or

(ii) is introduced into the back pressure chamber at a first pressure and the second emulsion exits the interaction chamber at a second pressure which is lower than the first pressure; and

wherein between 80 and 95 % of the pressure difference between the first and the second pressures is dropped across the interaction chamber and 5 to 20 % of the

pressure difference between the first and the second pressures is dropped across the back pressure chamber.

6. The method of any one of the preceding claims, wherein the channel or channels of the back pressure chamber are Z-type channels.

7. The method of any of the preceding claims, comprising the step of formation of the first emulsion using a homogenizer.

8. The method of any one of the preceding claims, wherein the first average oil droplet size is 5000 nm or less.

9. The method according to any one of the preceding claims, wherein the number of oil droplets having a size of > 1.2 μm in the first emulsion is $5 \times 10^{11}$ /ml or less.

10. The method of any one of the preceding claims, wherein the second average oil droplet size is 500 nm or less.

11. The method according to any one of the preceding claims, wherein the number of oil droplets having a size of > 1.2 μm in the second emulsion is $5 \times 10^{10}$ /ml or less.

12. A method for preparing a vaccine composition, comprising preparing an emulsion according to any one of claims 1 to 11 and combining the emulsion with an antigen.

13. A method for preparing a vaccine kit comprising preparing an emulsion according to any one of claims 1 to 11 and packaging the emulsion into a kit as a kit component together with an antigen component.

14. The method of claim 13, wherein the kit components are in separate vials.

15. The method of claim 14, wherein the vials are made from borosilicate glass.

16. The method of any of claims 13 to 15, wherein the adjuvant is a bulk adjuvant and the method comprises extracting unit doses from the bulk adjuvant for packaging as kit components.

17. The method of any one of claims 12 to 16, wherein the antigen is an influenza virus antigen.

18. The method of claim 17, wherein the combination of the emulsion and the antigen forms a vaccine composition and wherein the vaccine composition includes about 15μg, about 10μg, about 7.5μg, about 5μg, about 3.8μg, about 1.9μg, about 1.5μg of hemagglutinin per influenza virus strain.

19. The method of claim 17 or claim 18, wherein the combination of the emulsion and the antigen forms a vaccine composition and wherein the vaccine composition includes a thiomersal or 2-phenoxyethanol preservative.

20. The method of any preceding claim, wherein: the interaction chamber has a plurality of fixed geometry channels into which the emulsion passes and in which the emulsion is accelerated under pressure to reduce the emulsion's oil droplet size and reduce the number of oil droplets having a size >1.2 μm; wherein channels in the interaction chamber include a plurality of substantially right-angled corners; and wherein the back pressure chamber has at least one fixed geometry channel into which the emulsion passes.

**CLAIMS**

1. A method for the manufacture of an oil-in-water emulsion comprising:

passing ≥50 liters of a first emulsion having a first average oil droplet size through a microfluidization device to form a second emulsion having a second average oil droplet size which is less than the first average oil droplet size; and
filtration of the second emulsion;
wherein the microfluidization device comprises an interaction chamber which comprises a plurality of Z-type channels and a back pressure chamber comprising at least one channel; and
wherein the back pressure chamber is positioned downstream of the interaction chamber.

2. The method of claim 1, wherein the first emulsion is introduced into the interaction chamber at a first pressure and the second emulsion exits the back pressure chamber at a second pressure which is lower than the first pressure; and wherein between 80 and 95 % of the pressure difference between the first and the second pressures is dropped across the interaction chamber and 5 to 20 % of the pressure difference between the first and the second pressures is dropped across the back pressure chamber.

3. The method of any one of the preceding claims, wherein the back pressure chamber comprises a plurality of channels.

4. The method of any one of the preceding claims, wherein the channel or channels of the back pressure chamber are Z-type channels.

5. The method of any of the preceding claims, comprising the step of formation of the first emulsion using a homogenizer.

6. The method of any one of the preceding claims, wherein the first average oil droplet size is 5000 nm or less.

7. The method according to any one of the preceding claims, wherein the number of oil droplets having a size of > 1.2 $\mu$m in the first emulsion is $5 \times 10^{11}$ /ml or less.

8. The method of any one of the preceding claims, wherein the second average oil droplet size is 500 nm or less.

9. The method according to any one of the preceding claims, wherein the number of oil droplets having a size of > 1.2 $\mu$m in the second emulsion is $5 \times 10^{10}$ /ml or less.

10. A method for preparing a vaccine composition, comprising preparing an emulsion according to any one of claims 1 to 9 and combining the emulsion with an antigen.

11. A method for preparing a vaccine kit comprising preparing an emulsion according to any one of claims 1 to 9 and packaging the emulsion into a kit as a kit component together with an antigen component.

12. The method of claim 11, wherein the kit components are in separate vials; for example, wherein the vials are made from borosilicate glass.

13. The method of any of claims 10 to 12, wherein the emulsion is a bulk adjuvant and the method comprises extracting unit doses from the bulk adjuvant for packaging as kit components.

14. The method of any one of claims 10 to 13, wherein the antigen is an influenza virus antigen; for example, wherein the combination of the emulsion and the antigen forms a vaccine composition and wherein the vaccine composition includes about 15$\mu$g, about 10$\mu$g, about 7.5$\mu$g, about 5$\mu$g, about 3.8$\mu$g, about 1.9$\mu$g, about 1.5$\mu$g of hemagglutinin per influenza virus strain.

15. The method of any preceding claim, wherein: the interaction chamber has a plurality of fixed geometry channels into which the emulsion passes and in which the emulsion is accelerated under pressure to reduce the emulsion's oil droplet size and reduce the number of oil droplets having a size >1.2 $\mu$m; wherein channels in the interaction chamber include a plurality of substantially right-angled corners; and wherein the back pressure chamber has at least one fixed geometry channel into which the emulsion passes.