Spray Drying Adjuvanted Tuberculosis Vaccine Encapsulates Nano-emulsions Within a Dry Powder Inhalable Product

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Introduction

A promising adjuvanted tuberculosis vaccine candidate is currently stable as a refrigerated liquid. Developing a dry powder version would greatly reduce cost of storage and transport. Inhalable delivery targets the lung directly and reduces risks associated with intramuscular injection.

Aim

Spray drying of the adjuvant system into a dry powder within the inhalable range that maintains physicochemical properties.

Methods

The adjuvant, as an oil-in-water emulsion, was spray dried into a polydisperse powder using different formulations: with a disaccharide excipient, and with the disaccharide excipient plus various shell formers. Characterization of the spray dried powder included morphology examination by ultramicroscopy, physiochemical properties, and lung deposition modelling.

Results

Imaging of the spray dried powder, as shown in Figure 1; show that the nano-emulsions were successfully embedded within the spherical microparticles. Physicochemical analysis was conducted to determine the level of nano-emulsion retention and integrity in the spray-dried powders and compared to the pre-spray dried liquid feedstock.

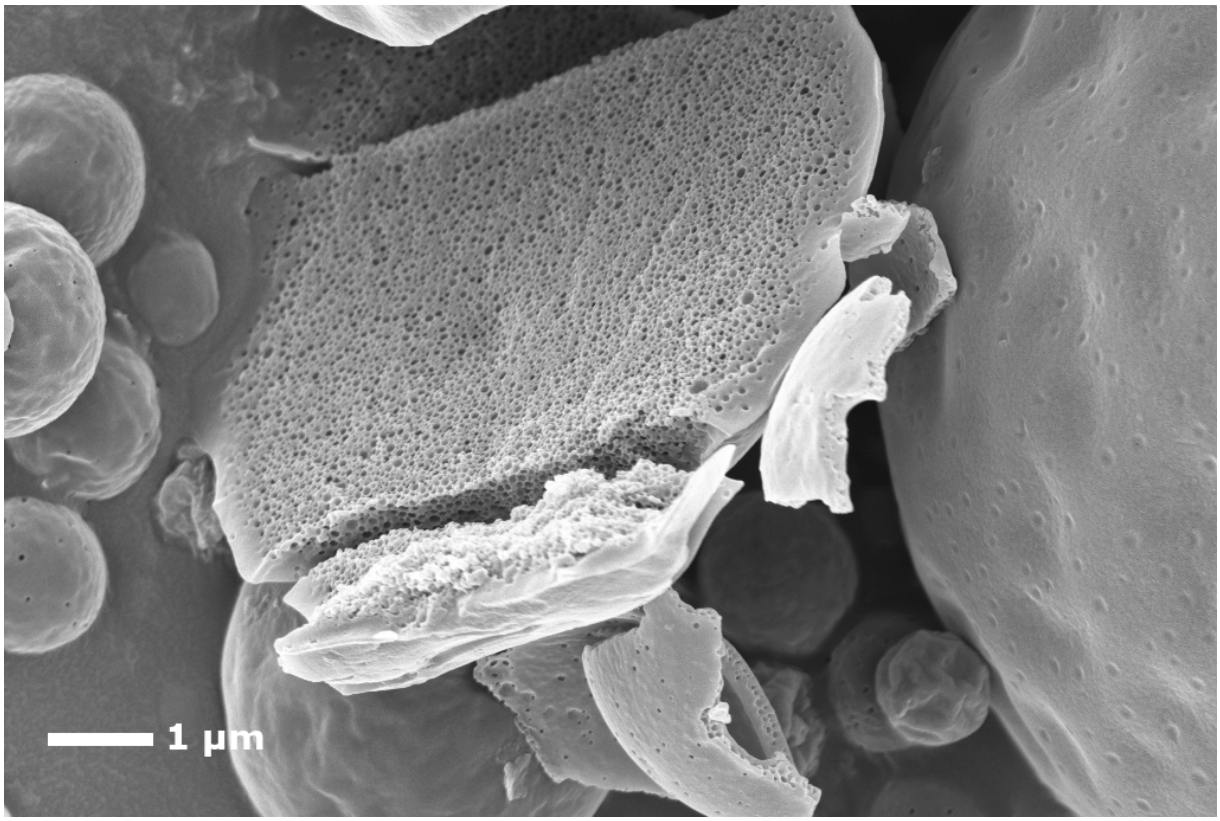

Figure 1 Scanning electron microscopy image of the inner morphology of spray dried microparticles, inner voids are left behind by the vaccine nano-emulsions

Conclusion

Oil-in-water vaccines can be spray dried into a powder with acceptable lung deposition. The use of shell formers improve the dispersibility of the particles and improved total lung dose. The results show that an inhalable dry powder tuberculosis vaccine may be feasible.