Spray Drying of Cubosomes for Oral Vaccine Delivery

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**Purpose**

To prepare cubosomes carrying the model antigen ovalbumin and the adjuvant Quil A using spray drying as method, as well as to in vitro characterize these particles.

**Method**

- The spray dried powder was heated to 90°C for 24h. This:
  - Reduced electrostatic charges in the powder
  - Allowed easy reconstitution to a colloidally stable suspension
  - Induced weight loss of 8%
- The powder was rich in cubosomes after reconstitution (Fig. 2)

**Results**

- Particle Morphology
  - The spray dried powder was heated to 90°C for 24h. This:
    - Reduced electrostatic charges in the powder
    - Allowed easy reconstitution to a colloidally stable suspension
    - Induced weight loss of 8%
  - The powder was rich in cubosomes after reconstitution (Fig. 2)

**Particle Characterization**

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Size (nm)</th>
<th>PDI</th>
<th>Zeta potential (mV)</th>
<th>MMAD (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cubosomes with OVA</td>
<td>256±10</td>
<td>0.42</td>
<td>-31.7±1.4</td>
<td>4.1±0.4</td>
</tr>
<tr>
<td>Cubosomes with OVA and Quil A</td>
<td>233±13</td>
<td>0.24</td>
<td>-38.3±1.7</td>
<td>4.1±0.02</td>
</tr>
</tbody>
</table>

**Loading into microcontainers**

- Microcontainers were fully and homogenously filled with cubosome powder by an embossing method. The microcontainers offer the possibility to protect the formulation during passage through the stomach and provide release of the cubosomes in the intestine.

**Conclusion**

The developed cubosomes show properties suitable to be used for oral vaccine delivery in microcontainers.