Dry powder inhalers are used for the treatment of pulmonary diseases. They are based on a mix of drug and excipient (drug carrier) that is inhaled by patients. The excipient (20-100µm) transports the drug (1-5µm) to the pulmonary alveoli. The drug delivery efficiency is dominated by the interaction force between the excipient and the drug. In order to modulate the interaction force and to optimize the deposition of the drug, we have to control the morphology, size, and rugosity of both components.

**Strategy**

For more information, contact Aline Dellicour (a.dellicour@ulg.ac.be) or Morgane Valentin (morgane.valentin@ulg.ac.be)

**Efficiency of the formulation**

Thank you to Edith Roex for her great contribution to particle design by double emulsion W/O/W.

Next Generation Impactor

Dosage by HPLC

In vitro test

Active ingredient: 400µg

Excipient: 25mg

Stabilizer

Rugosity

Spray drying

Centrifugation and lyophilisation

Antisolvent precipitation with ultrasonication

Antisolvent precipitation

Ultrasonic Probe

Double emulsion W/O/W

Water with pore-forming agent

Organic solution with API and polymer

Solution

Suspension

Grinding

Ground suspension

Addition of water

Centrifugation and drying

API organic solution

Antisolvent with stabilizer

Organic solution

Antisolvent with stabilizer

API, organic solution

Antisolvent with stabilizer

API

Excipient

Active Principal Ingredient

Adhesion force

Inhalation

1-5µm

20-100µm

Dry powder inhaler

No control of:
- Size
- Morphology
- Rugosity

Raw excipient

No control of:
- Size
- Morphology
- Rugosity

Raw API

Excipient

API

Stages of the impactor

T+E

PS

1

2

3

4

5

6

7

8

Delivered dose (µg)

Delivered dose (mg)

6 µm

10 µm

20 µm

org.

Antisolvent precipitation

Addition of water

Centrifugation and drying

Organic solution with API and polymer

Antisolvent with polymer

Antisolvent with stabilizer

Ultrasonic Probe

Addition of water

Centrifugation and drying

Antisolvent precipitation

Antisolvent precipitation with ultrasonication

Antisolvent with stabilizer

Centrifugation and drying

Spray drying

Stages of the impactor

T+E

PS

1

2

3

4

5

6

7

8

Delivered dose (µg)

Delivered dose (mg)

6 µm

10 µm

20 µm

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