Innovative dry powder formulations of flavonoids for pulmonary administration in cystic fibrosis patients

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Purpose.

To study a new therapeutic approach for cystic fibrosis based on the administration, directly to the lung, of flavonoids, drugs with *in vivo* and *in vitro* antioxidant properties and *in vitro* activity on the defective protein responsible of the disease (CFTR). The inventive aspect is the attempt to deliver and deposit drug particles on the site of action in order to interact with cells involved in the disease directly on the lung epithelium. The objective is to create a high local molecules concentration.

Methods.

Microparticles were prepared by spray drying the neat flavonoid from different water to ethanol feed ratios. The spray-dried flavonoids were characterized for their physicochemical properties including crystallinity, solubility, particle size distribution, morphology, bulk and tapped density, residual humidity, thermal behaviour and fine fraction. The influence of different operative conditions of the spray dryer on the powder properties were studied. Among the various properties evaluated, most importance was ascribed to the percentage of the fine fraction of the powder, measured by single stage glass impinger. The device used for the respirability test was the Turbospin® (kindly donated by PH&T SpA) in which the dose to be aerosolized was premetered in a gelatine capsule.

Results.

By increasing the ethanol content, the feed liquid turned from a suspension into a solution: the spray of flavonoid suspensions carried to powders with high crystallinity degree, low water solubility and high bulk density. On the contrary, the spray of drug solutions led to more amorphous particles, with an higher solubility, lower density and improved aerodynamic behaviour.

Conclusion.

The optimization of the operative parameters led to obtain enhanced aerosol performance of the flavonoid powders containing only the active compound.