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Method for modulating the pharmacokinetics of inhaled biopharmaceuticals

KEYWORDS

- Respiratory diseases
- Therapeutic proteins
- Pulmonary drug delivery
- Sustained drug release

Technology Market:

Medical / Therapeutic proteins for respiratory diseases

Inhalation aerosols offer a targeted therapy for respiratory diseases. However, the therapeutic efficacy of inhaled biopharmaceuticals is limited by the rapid clearance of the macromolecules in the lungs. Fast elimination of biopharmaceuticals results in high unit doses and high administration frequency, which jeopardizes compliance and outcome of the therapy. Inhaled biopharmaceuticals would therefore benefit from a method that sustains protein availability within the pulmonary tissue.

The UCL invention

UCL researchers have demonstrated that the covalent coupling of a large polyethylene glycol (PEG) chain to proteins greatly increases their residence time within the lungs following delivery to the respiratory tract (Fig. 1). As a result, the therapeutic efficacy of the proteins is enhanced in respiratory diseases (Fig. 2).

Advantages

- ✓ Increased availability of inhaled therapeutic proteins within the lungs and thereby, enhanced efficacy of inhaled biopharmaceuticals in respiratory diseases
- ✓ Reduced inhaled doses of therapeutic proteins due to the increased local potency
- ✓ Reduced administration frequency of inhaled therapeutic proteins due to the prolonged local residence time
- ✓ High drug loading technology (≥ 50% by weight of protein in the PEG-protein conjugate)
- ✓ Technology compatible with any inhaler device (nebulizers, DPIs and soft-mist inhalers)
- ✓ Potential increase in physical stability of the proteins during nebulization and atomization

This work is the subject of a patent application: WO2015107176.

Relevant references

- Koussoroplis *et al.*, J. Control. Rel. 187: 91-100, 2014.

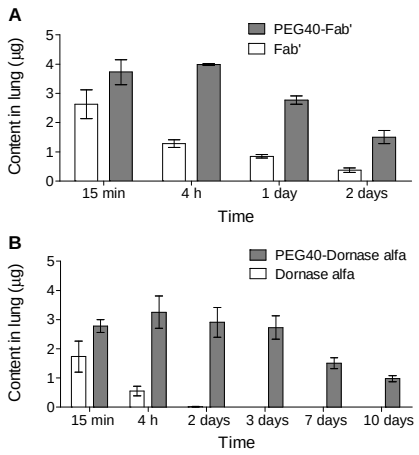

Fig. 1: Content of proteins conjugated to a 40 kDa PEG chain and unconjugated proteins in the lung following delivery to the respiratory tract in mice. A, a Fab' antibody fragment; B, dornase alfa. Mean values (± SEM) of 3 to 7 mice per time point.

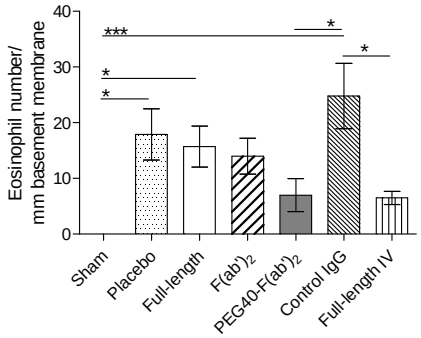

Fig. 2: Assessment of airway inflammation in a murine model of house dust mite-induced lung inflammation following delivery of anti-IL-17A antibody constructs to the respiratory tract. For comparison, the full-length anti-IL-17A was also delivered IV at a 10-times higher dose. Mean values (± SEM) of 8 mice..

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INTERESTED TO DEVELOP AND / OR COMMERCIALIZE THIS TECHNOLOGY

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