Inhalable drug formulations for Idiopathic Pulmonary Fibrosis

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1. Background

- IPF is a severe chronic lung disease
- Drugs for IPF are new and expensive
- First drug slowing the progression pirfenidone became available (in Finland) in 2013
- Second drug nintedanib became available (in Finland) in 2015
2. Aims

- The aim of our study is to develop locally administered drug formulations for the treatment of IPF.
- Local administration → reduced doses → reduced adverse effects and cost.
3. Surface coating by the aerosol reactor

Aerosol Flow Reactor Method
- control over saturation ratio to form particles and coatings

Solute droplets → Particle drying → Introducing L-Leucine vapor → Particles coated by leucine nanocrystals

Possible excipients → L-Leucine

Precursor solution → Well-flowable & dispersible powder
3. Characterization

- Dispersion properties are tested with a simulator which utilizes interplay between vacuum and pressurized gas.
- Biological activity after the processing is demonstrated in cell cultures.
- Dissolution and permeation is studied across Calu-3 monolayer.
- Antifibrotic activity in vivo is studied in silica induced fibrosis in mice.
4. SEM - Tilorone

Pure drug

Formulation
4. SEM - Pirfenidone
4. SEM - Nintedanib
4. Dispersion

Tilorone

Pirfenidone

Nintedanib

Emitted dose±SD (mg)

Fine particle fraction
4. Activity

**Tilorone**

Relative luciferase activity vs Tilorone concentration (µM)

- CAGA
- BRE

**Pirfenidone**

Relative proliferation vs Pirfenidone concentration

- 250 µg/ml
- 500 µg/ml
- 750 µg/ml

**Nintedanib**

Relative ERK phosphorylation vs Nintedanib concentration

- 0.01
- 0.1
- 1
- 10
5. Conclusions

- We have been able to formulate all the drugs
- We have demonstrated that they are biologically active after the processing
- Permeation studies are ongoing
- Antifibrotic activity is yet to be tested
Thanks!

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People