Preventing Lung Disease in Babies by Developing Synthetic Surfactant Proteins A and D

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1 Lung Disease in Babies

Premature babies are at risk of developing chronic lung disease with serious complications including brain damage and lung infections. These babies lack the natural lung defence proteins, surfactant proteins A and D (SP-A and SP-D).

- No effective treatments are available to prevent this disease.
- This costs the NHS £1 billion per year.

To develop synthetic versions of SP-A and SP-D into treatments to prevent chronic lung disease in babies.

2 Surfactant Proteins A and D

SP-A and SP-D are natural lung defence proteins which prevent infection of viruses and bacteria and modulate the immune system.

- Neutralise Infection
- Kill Bacteria and Viruses
- Modulate Immune System
- Clear Dying Cells

3 Making SP-A and SP-D with Spider Silk

1 - Fuse DNA
- Spider Silk DNA
- Natural SP-A or SP-D DNA
- Fused DNA

2 - Produce protein using Bacteria
- Efficient
- High yields
- Bacteria
- Synthetic SP-A or SP-D
- SP-A with spider tag

3 - Efficient purification
- Innovative
- Straightforward
- Now therapeutically viable
- Electrophoresis gel
- SP-A with spider tag
- Purified SP-A

4 Synthetic SP-A Prevents Viral Infection

Epithelial cells were infected with respiratory syncytial virus. Synthetic SP-A:

- Reduced infection by 96.4 %
- Was more effective than natural SP-A: 96.4% vs 38.5 % reduction

Virus
- Virus + Natural SP-A
- Virus + Synthetic SP-A

Infected cells (dark grey) detected by antibody

Showing means (n=3) (+/- standard error of the mean). Statistically significant using t-test.

5 From Lab to Babies and Beyond

Discovered therapeutic potential
2015 £50k grant

Innovate UK

2016 £500k grant

Phase I clinical trial

2018 £3m grant

Manufacture development

2020

Italy Pharmaceutical partnership

Treatment for premature babies

Treatments for asthma and COPD

6 Conclusions

We have generated synthetic SP-A and SP-D with real therapeutic potential. This exciting advancement has resulted in us now developing treatments to prevent chronic lung disease in premature babies.

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