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# Magnetically-guided particle delivery to airway surfaces for cystic fibrosis gene therapy: Synchrotron-based visualisation and optimisation for improved in vivo lentiviral gene transfer

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Gene vectors to treat cystic fibrosis lung disease should be targeted to the conducting airways, as peripheral lung transduction does not offer therapeutic benefit. Viral transduction efficiency is directly related to the vector residence time. However, delivered fluids such as gene vectors naturally spread to the alveoli during inspiration. Extending gene vector residence time within the conducting airways is important, but hard to achieve.

Gene vector conjugated magnetic particles that can be guided to the conducting airway surfaces could improve targeting. Due to the challenges of in vivo visualisation, the behaviour of small magnetic particles on the airway surface in the presence of an applied magnetic field is poorly understood. The aim of this study was to use synchrotron imaging to visualise the in vivo motion of a range of magnetic particles in live rat trachea to examine the dynamics and patterns of individual and bulk particle behaviour in vivo.

Synchrotron X-ray imaging revealed the behaviour of magnetic particles in stationary and moving magnetic fields, both in vitro and in vivo. Particles could not be dragged along the live airway surface with the magnet, but during delivery deposition was focussed within the field of view where the magnetic field was the strongest.

These results show that magnetic particles and magnetic fields may be a valuable approach for improving gene vector targeting to the conducting airways in vivo.

## Level of Expertise

Experienced Researcher

## Presenter Gender

Man

## Pronouns

He/Him

## Which facility did you use for your research

None of the above

## Students Only - Are you interested in AINSE student funding

## Do you wish to take part in the Student Poster Slam

No

## Condition of submission

Yes

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