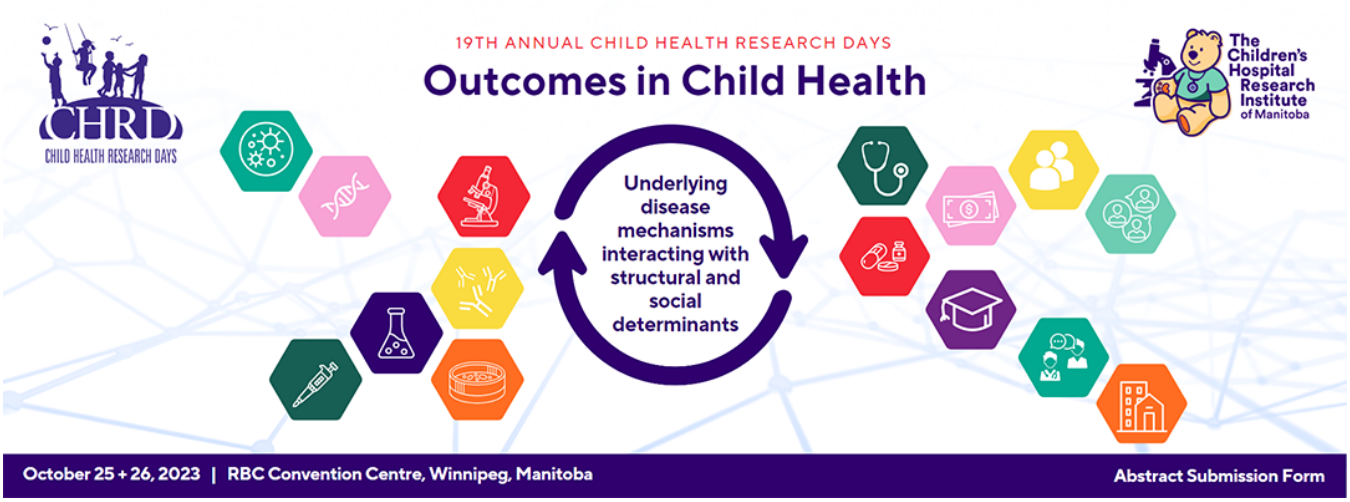


# CHRD 2023: Abstract Submission Form

**Submitter Name**
Yuichiro Miyake

**Presenter Name**
Yuichiro Miyake

**Presenter Status**
Post-Doctoral Fellows

**Research Category**
Basic Science

**Role in the project**
Design
Perform Experiments
Analyze Data
Write Abstract

**Title**
Using microinjection for drug delivery with nanoparticles in lung explants to study prenatal treatment of congenital diaphragmatic hernia.

**Background**
Congenital diaphragmatic hernia (CDH) is associated with abnormal lung development resulting in lung hypoplasia and pulmonary hypertension, and fetoscopic endoluminal tracheal occlusion (FETO) improves the survival rate in fetuses with severe CDH. To further improve outcomes, microinjection into the trachea for drug delivery has potential as a clinical therapy. Here, we present an ex vivo microinjection technique with rat lung explants to study prenatal therapy with nanoparticles (NPs).

**Objective**
We used microsurgery to isolate lungs from rats on embryonic day 18. We injected chitosan nanoparticles loaded with fluorescein (FITC) into the trachea of the lung explants.

**Methods**
We compared the difference in biodistribution of two types of nanoparticles, functionalized IgG-conjugated nanoparticles (IgG-nanoparticles) and bare nanoparticles after 24 hours culture with immunofluorescence (IF). We used IF to mark lung epithelial cells with E-cadherin and to investigate an apoptosis (Active-caspase 3) and inflammatory marker (Interleukin, IL-6) and compared its abundance between the two experimental groups and control lung explants.

**Results**

Lung explant samples came from two different litters for each group. We detected the presence of nanoparticles in the lung explants, and the relative number of nanoparticles to cells was 2.49 fold higher in IgG-nanoparticles than bare nanoparticles ($p<0.001$). Active caspase-3 protein abundance was similar in the control, bare nanoparticles (1.08 fold), and IgG-nanoparticles (1.47 fold) groups ($p=0.34$). Similarly, IL-6 protein abundance was not different in the control, bare nanoparticles (1.13 fold), and IgG-nanoparticles (1.07 fold) groups ($p=0.48$).

**Conclusion**
Our novel microinjection model to deliver nanoparticles effectively into the trachea with rat lung explants holds promising potential as a tool to study prenatal treatment for CDH, and provides insights into a new prenatal therapy. This model offers a controlled platform to investigate the potential of prenatal therapy with nanoparticles.

**Table/Figure File**
Y.Miyake CHRD Fiugre.pdf

# Authors


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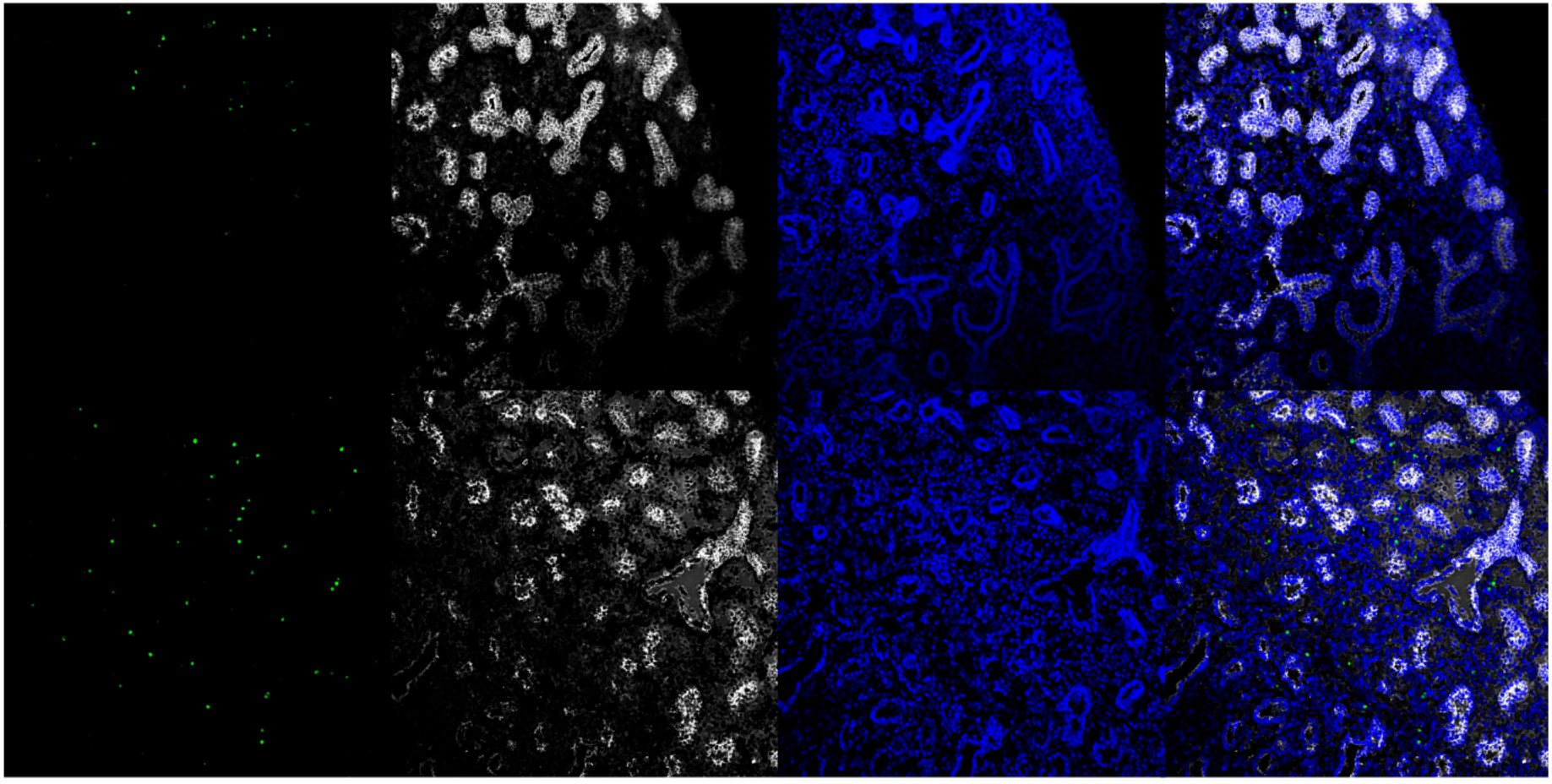
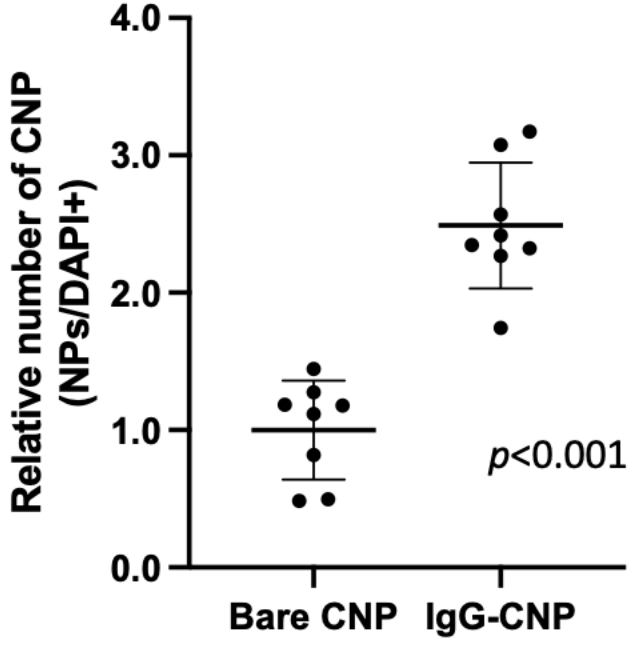

Nano particle (FITC)
E-Cadherin
DAPI
Merged
Bare CNP
IgG- CNP


Relative number of CNP (NPs/DAPI+)
4.0
3.0
2.0
1.0
0.0
p<0.001
Bare CNP
IgG-CNP