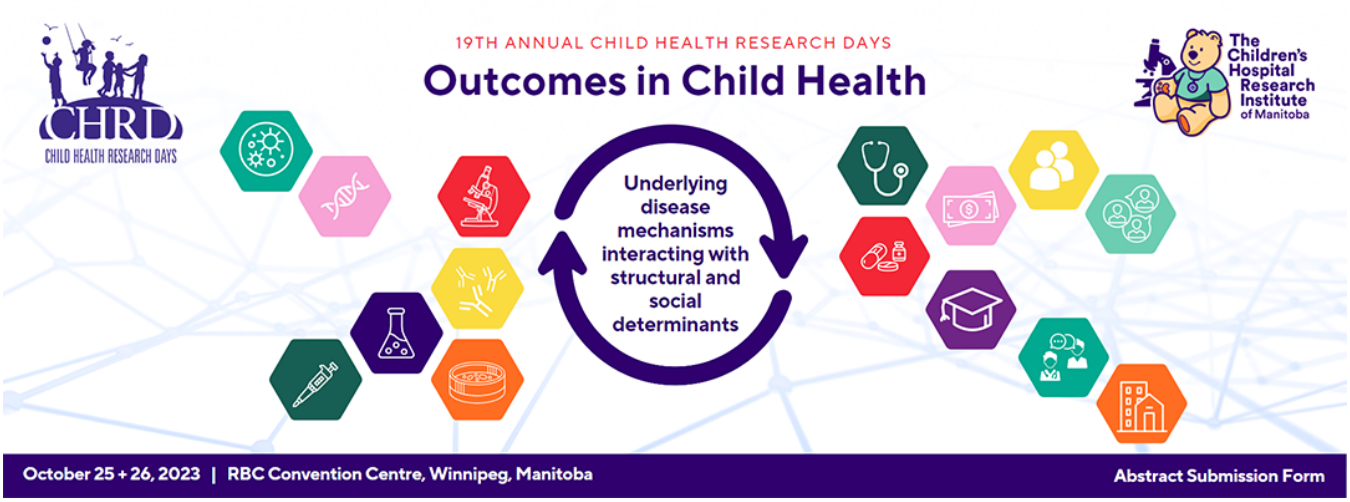

CHRD 2023: Abstract Submission Form

Submitter Name
Jackie Wang

Presenter Name
Jackie Wang

Presenter Status
Undergraduate Students

Research Category
Clinical

Role in the project
Design
Perform Experiments
Analyze Data
Write Abstract

Title
IN VIVO TRANSPLACENTAL TRANSFER OF IGG-MODIFIED NANOPARTICLES FOR PRENATAL DRUG THERAPIES

Background
Nanoparticles (NPs) surfaced-modified with IgG antibodies have the potential to cross the placenta to deliver medication to treat congenital diseases such as congenital diaphragmatic hernia (CDH). We have demonstrated in a transwell model that IgG-modified NPs can cross an intact placental epithelium via the maternal-fetal transfer of passive immunity to facilitate prenatal therapy to a developing fetus. The effectiveness of this method of transplacental NP delivery to rat pups in vivo remains unknown.

Objective
We aimed to explore in a pregnant rat model to assess the biodistribution and safety of IgG-modified NPs for prenatal therapy.

Methods
Pregnant rat dams (E17) were injected via tail vein with chitosan NPs loaded with gadolinium and surface-modified with IgG antibodies targeting the lungs and Alexa Fluor 790 dye. Dams were sacrificed at 4, 8, 12, and 24 hours post injections. The biodistribution of NPs in the maternal organs and pups was assessed fluorometrically with an IVIS Spectrum In Vivo Imaging System prior to being formalin-fixed and paraffin-embedded. Localization of NPs within maternal and fetal organs was visualized with eosin staining.

Results

NPs modified with IgG antibodies targeting the lungs were observed in various maternal and fetal organs fluorometrically. We observed localization of the chitosan NPs in the maternal liver and kidneys but not in the lungs, heart and spleen. We were able to detect the presence of NPs in fetal lungs and placenta as early as 4 hours post-injection by eosin staining

Conclusion
The results indicate that chitosan NPs surfaced-modified with IgG antibodies are capable of transplacental transfer in vivo. The presence of NPs in various fetal organs suggests targeted delivery of medicine with NPs injected into the mother to a developing fetus across the placenta is possible as a prenatal therapy.

Table/Figure File
CHRD_Figure1_JackieWang.pdf

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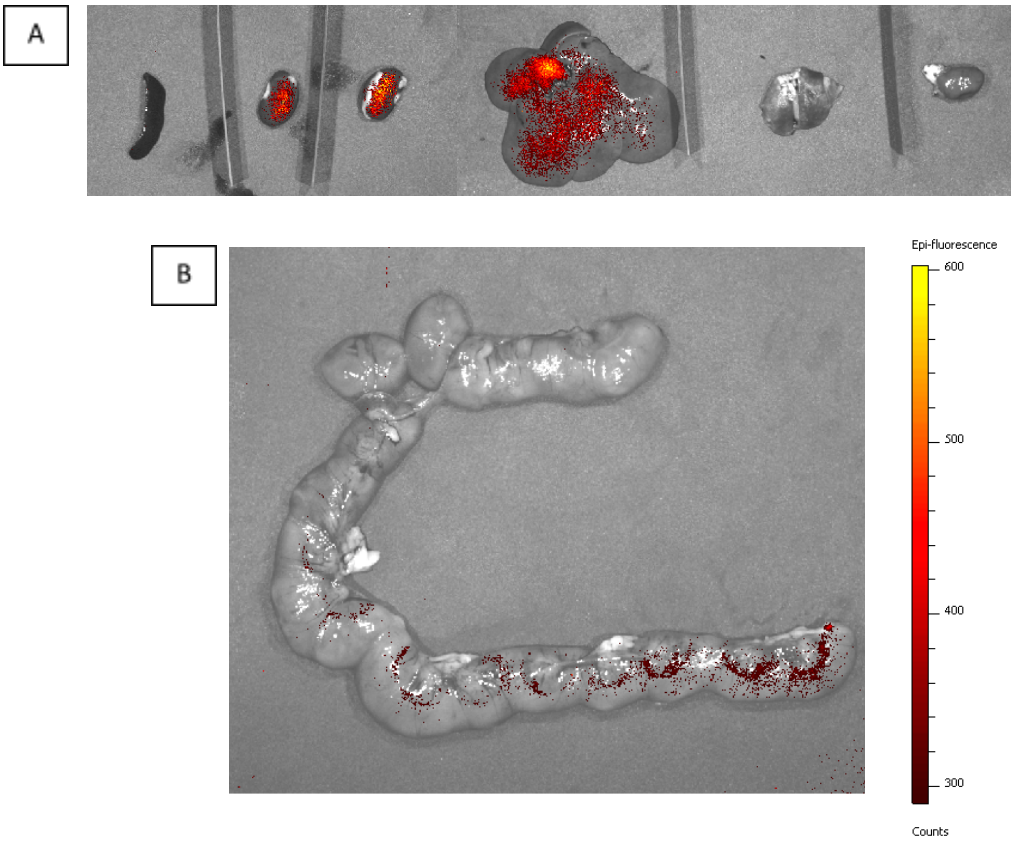

Figure 1. Localization of chitosan nanoparticles 24 hour post-injection into E17 pregnant rat dams. Chitosan nanoparticles loaded with gadolinium, surface modified with IgG antibodies targeting the lungs and Alexa Fluor 790 were administered via tail vein injections. Dams were sacrificed 24 hours post-injection. Biodistribution was determined fluorometrically in an IVIS Spectrum In vivo Imaging System (ex. 745 nm and em. 800 nm). 1A) From left to right are the maternal: spleen, kidneys, liver, lungs, and heart. Nanoparticles were detectable in the kidneys and liver. 1B) Nanoparticles were also detected in the uterine horn and the pups.