U of T and SickKids first to grow lung cells using stem cell technology

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Dr. Janet Rossant, a professor in the Departments of Molecular Genetics and Obstetrics and Gynaecology. Photo courtesy of SickKids

Researchers at the University of Toronto and the Hospital for Sick Children (SickKids) are paving the way towards individualized medicine for patients with cystic fibrosis.

It is the first study to successfully use stem cells to produce mature lung cells that could potentially be used to study cystic fibrosis and test drugs.

"This study shows the major impact stem cell research can have on the field of individualized medicine," says Dr. Janet Rossant, a professor in the Departments of Molecular Genetics and Obstetrics and Gynaecology, principal investigator of the study and chief of research at SickKids. "It is a promising move toward targeted therapy for patients with cystic

fibrosis."

Researchers were able to induce human embryonic stem cells to become mature lung cells, which contained the CFTR gene. The gene, discovered at SickKids in 1989, is responsible for cystic fibrosis when mutated.

To create the lung cells, researchers used an induced pluripotent stem cells (adult cells genetically induced to function like embryonic stem cells) derived from the skin of patients with cystic fibrosis. They prompted these stem cells to become lung cells, which contain mutations specific to the patients involved.

Once researchers found that they could create lung cells derived from individual patients they then used a compound that resembles an investigational drug that is currently being tested for cystic fibrosis to see if it would rescue the CFTR gene mutation.

If the lung cells of a particular patient can be generated then tests could also be done to evaluate the effectiveness of specific drugs on individual patient's cells, says Rossant.

If the drug is effective in vitro, then the next step would be to see if it works on the patient.

Prior to this year, the only therapies available for patients with cystic fibrosis have targeted the symptoms (like infection and digestive disorders) rather than the CFTR gene mutation.

"More recently there has been a paradigm shift and now drugs are being developed to target the mutant CFTR specifically," says Christine Bear, a co-investigator of the study, co-director of the SickKids Cystic Fibrosis Centre and senior scientist in Molecular Structure and Function at SickKids.

"However, every patient is unique, so one drug isn't necessarily going to work on all patients with the same disease," says Bear. "Take cancer as an example, each individual responds differently to each treatment. For some, a certain drug works, and for others it doesn't. This tells us that we need to be prepared to find the best option for that individual patient."

In this particular study, the compound used did not work in all of the derived cell lines. This finding further emphasizes the need for individualized medicine, says Bear.

Researchers say the next step is to perfect the method of generating epithelial lung cells, so that the process is more efficient and can be used to investigate other genetic diseases.

More information: The study is published in the August 26 advance online edition of *Nature Biotechnology*.

Provided by University of Toronto

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