For the first time a patient benefits from a unique gene therapy to treat cystinosis, developed by Cherqui's laboratory at UC San Diego

Some promising news has emerged from UC San Diego. In 2019, 20-year-old Canadian Jordan Janz became the first patient to participate in a Phase I/II clinical trial to test a new approach based on stem cells and gene therapy to treat cystinosis.

Cystinosis is a single-gene disease, caused by a severe disruption in the sequence of an individual gene, resulting in an abnormal accumulation of cystine in all cells of the body. This rare metabolic disorder – one in every 100,000 births worldwide – results in damage to organ tissues, kidneys, liver, muscles and also brain and eyes. The result is many symptoms and adverse consequences, as well as early death.

Gene therapy is a promising treatment for a number of diseases (including hereditary diseases, certain types of cancer and a few viral infections), however the technique remains risky and is still being studied to ensure that it is both safe and effective. Currently, gene therapy is only tested for diseases that have no cure, such as cystinosis.

Janz's treatment was developed for over more than a decade of research by Stephanie Cherqui, Associate Professor, and her team at UC San Diego Medical School (both are shown on the photo). Dr. Cherqui received her Ph.D. in 2002 from

Necker Hospital (Paris, France) ; at the time her research project focused on the molecular characterization of cystinosis, and the generation of a mouse model of the disease. She then specialized in stem cells and gene therapy during her post-doctoral work at the Scripps Research Institute where she was appointed Assistant Professor in 2009. In 2012, Dr. Cherqui joined UC San Diego and became an Associate Professor in 2016. Her laboratory focuses on the use of stem cells and gene therapy for multi-systemic genetic disorders and the fundamental understanding of tissue repair by bone marrow stem cells.
Her research is funded by grants from the National Institute of Health (NIH), the California Institute of Regenerative Medicine (CIRM) and the Cystinosis Research Foundation.

Dr. Cherqui's gene therapy approach involves genetically modifying the patient's own (autologous) stem cells. To achieve this, her team obtained hematopoietic stem cells from Jordan Janz's bone marrow. These stem cells are the precursors of all blood cells, including red blood cells and immune cells. The scientists then introduced a normal version of the cystinosin gene into the stem cells before delivering the donor-recipient patient's own cells, which now produce cystinosin.
As with bone marrow transplants, Janz's genetically engineered stem cells are expected to divide and differentiate into all types of blood cells. These cells should then circulate throughout the body and implant into tissues and organs, where they should produce the normal cystinosin protein. Based on Dr. Cherqui's pre-clinical data, it is expected that the cystinosin will be transferred to the surrounding diseased cells. At this point, Janz cells should finally be able to transport cystine appropriately for elimination, which could alleviate the symptoms.

"These families have so much hope for a better treatment" said Dr. Cherqui. "After all the years of painstaking laboratory research, we now need to move into the clinic. If this works, it will be wonderful. If it doesn't, we will all be disappointed but at least we'll be able to say we tried." Beyond cystinosis, Dr. Cherqui says this type of gene therapy approach could also lead to advances in the treatment of other degenerative, multi-organ diseases, such as Friedreich's Ataxia and Danon's disease, as well as other kidney, genetic and systemic diseases similar to cystinosis.

More information :

UC San Diego News Center : https://ucsdnews.ucsd.edu/feature/a-tornado-at-the-front-door-a-tsunami-at-the-back-door?utm_source=This+Week+Subscriber+List&utm_campaign=8b72e9ce92-THIS_WEEK_2020_01_23&utm_medium=email&utm_term=0_db568fca07-8b72e9ce92-92231621

Cherqui Lab, UC San Diego : https://medschool.ucsd.edu/som/pediatrics/research/labs/cherqui/Pages/default.aspx