Currently, many drugs fail relatively late in the drug development process because the tests used in the earlier stages of drug development simply do not reflect what happens in real life when the drug is administered in patients. This is partly because these early tests rely heavily on animal cells, and when human cells are used, they have often been extensively modified to survive in culture and so no longer behave naturally. Those working in drug research and development therefore urgently need a well-characterized and renewable supply of cells that more accurately mimic what happens in the human body. The main aim of the StemBANCC project is to generate and characterise high quality human induced pluripotent stem (iPS) cell lines from 500 subjects that can be used by researchers to study a range of diseases, including diabetes and dementia, and test for drug efficacy and safety. The cell lines will help to improve and speed up the drug development process, and ensure that patients benefit from more effective and safer drugs.

The power of pluripotency

Most adult cells cannot divide and have a fixed identity. Stem cells such as those found in embryos, are able to self-renew and are pluripotent, i.e. able to give rise to any cell type in the human body. However, in recent years researchers have developed a way of reprogramming ordinary adult cells to create so-called induced pluripotent stem (iPS) cells. Like embryonic stem cells, iPS cells are able to generate any kind of cell; as such, they offer researchers a potentially limitless supply of different kinds of human cell that can be used in research and drug development. The research resulting in the creation of the first iPS cells was a major scientific breakthrough that won scientists John Gurdon and Shinya Yamanaka the 2012 Nobel Prize in Physiology or Medicine.

A unique resource

StemBANCC's goal is to generate 1 500 iPS cell lines from 500 people, characterise them in terms of their genetic, protein, and metabolic profiles, and make them available to researchers. All cell lines also undergo a rigorous quality check.

The raw materials for the project are largely skin and blood samples taken from patients with certain diseases, people who display adverse reactions to drugs, and healthy individuals. The collection of these samples is carried out with the individuals' informed consent and in line with strict ethical standards.

There is a strong focus on peripheral nervous system disorders (especially pain); central nervous system disorders (e.g. dementias); neurodysfunctional diseases (e.g. migraine, autism, schizophrenia, and bipolar disorder); and diabetes. The project also investigates the use of human iPS cells for toxicology testing; here the team uses the iPS cells to generate liver, heart, nerve and kidney cells.

Ultimately STEMBANCC will be a source of well-characterised, patient-derived iPS cells that will help researchers study diseases, develop new treatments, and test the efficacy and safety of new drugs.