I love stem cells

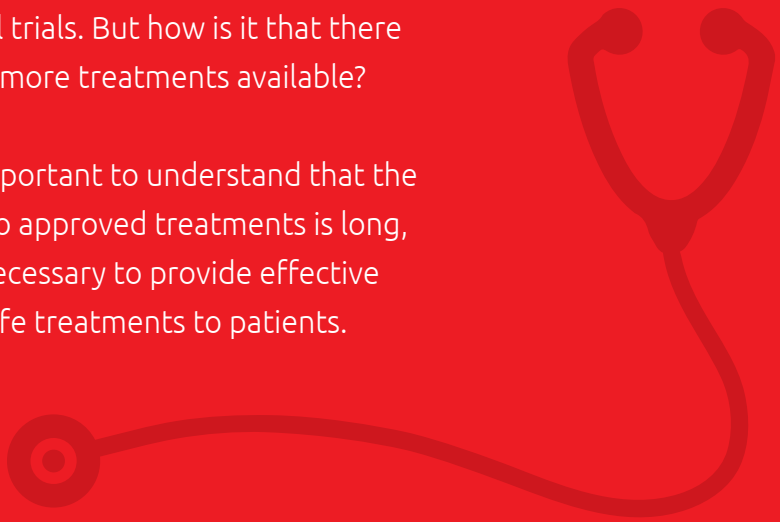
FROM RESEARCH TO CELL THERAPY

ALL YOU NEED TO KNOW

CellCAN
Regenerative Medicine and
Cell Therapy Network

While the media talks a great deal about the enormous potential of **cell therapy**, or stem cell-based treatments. This information is frequently based on promising research findings or ongoing clinical trials. But how is it that there aren't more treatments available?

It is important to understand that the path to approved treatments is long, but necessary to provide effective and safe treatments to patients.



THE DIFFERENT **STAGES** OF **TREATMENT DEVELOPMENT**

Before scientific discoveries become an approved and available treatment for patients, they must go through a development process. This process is intended to ensure the safety and effectiveness of treatments. The entire treatment development process can take up to 15 years or more.

Preclinical research

Laboratory and Animal Research

Show Proof-of-Principle that product is safe and effective

Quality control

- Assess cell function
- Make sure cells are free of contamination
- No animal products
- Scale-up to produce sufficient quantities

Clinical research

Phase I-III

Test safety and/or effectiveness

Market Approval / Phase IV

PRECLINICAL RESEARCH

Preclinical research is the first step of the treatment development process. This step aims to demonstrate that the treatment has the potential to be safe and effective before further testing is conducted.

At this point, scientists conduct experiments in animals that have diseases or injuries similar to the ones they are studying in humans. They are seeking to better understand the disease, assess the problems it causes, and find a way to solve these problems.

Research results are examined through an independent review process called peer review to ensure that the research has been carried out properly. The results are then published so that other scientists can repeat the experiments and validate their results.

When the preclinical research results demonstrate sufficient efficacy and safety, the research moves towards the next development stage of clinical trials performed in humans.

REQUIRED ETHICAL AND REGULATORY APPROVALS FOR CLINICAL TRIALS

Clinical research can only begin once the clinical trial application has received ethics approval (from the Ethics Committee of the centre where the research will be carried out) and regulatory approval in the country where the clinical trials will be conducted (for example, Health Canada in Canada or the Food and Drug Administration in the United States).

The Ethics Committee, which ensures that participants in clinical trials are treated ethically, is composed of experts in science, clinical research and the law, as well as representatives of the public and patient groups. The Ethics Committee considers in particular the following:

- The research protocol, or what the researchers intend to do
- The information given to patients and the way it is presented
- How consent is obtained from patients
- How participants will be monitored
- Whether the research benefits outweigh the risks
- The ability of participants to withdraw from the study for any reason whatsoever

Regulatory approval aims to ensure that the proposed clinical trials are safe for patients and that the treatment under study is effective. Regulatory agency reviewers consider such factors as:

- The research protocol
- The quality of preclinical data
- How the participants will be monitored
- If ethics approval has been or will be obtained
- Where the research will take place
- Risks for participants
- Potential benefits of the research

Once these approvals are obtained, the development of treatments may progress to the clinical phase so that researchers can gather the data required to get the treatment approved.

CLINICAL RESEARCH

Clinical trials performed in humans have 3 or 4 phases and are intended to demonstrate the safety and efficacy of the proposed treatments in order to get licensing (approval) for clinical applications.

In clinical research, the first aim is to demonstrate the safety of the treatment on a limited number of participants (Phase 1) before proving effectiveness in a larger sample of patients with the disease (Phases 2 and 3).

It is generally expected that the scientists or centre performing the clinical trial will cover the costs of patient participation. Be very careful if a clinical trial requires payment from participants.

PHASE 1

The goal of Phase-1 clinical trials is to determine whether the intervention or proposed treatment is safe and not whether patients benefit from it. This phase usually involves a limited number of participants (10 to 60), although this number can vary depending on the study.

If this is the first clinical trial in humans for the proposed treatment, scientists must above all demonstrate to regulators (in their clinical trial application) that the preclinical research data shows:

- The treatment is safe and effective
- The stem cells behave as expected
- The stem cells can be produced in sufficient quantities while being of superior quality

PHASE 2

Phase-2 clinical trials involve more participants and involve a preliminary assessment of the effectiveness of a treatment for a medical condition (also called an "indication"). During this phase, researchers also continue to monitor the presence of adverse side effects (safety).

PHASE 3

Phase-3 clinical trials are larger still. The goal in this stage is to gather more data about the safety and efficacy of treatment, particularly compared to other treatments available on the market. Generally, after Phase-3 clinical trials, the results are submitted to regulatory authorities in an application for licensing (approval) in order to receive market authorization. This authorization will make the treatment available to doctors for the approved indications.

PHASE 4

Phase-4 clinical trials are tests performed after the treatment is approved (available on the market). This post-approval testing is done to continue monitoring the safety and effectiveness of the approved product and to study certain populations (e.g., children) that were not included in previous phases.

EXCEPTIONS FOR **MEDICAL INNOVATION** STUDIES

Some types of studies fall outside the normal regulatory framework. These studies, called medical innovation studies, are exceptions and are performed by a doctor on a small number of very sick patients when there are scientific reasons to do so based on preclinical research that has demonstrated the treatment's safety and efficacy. They are also done when the doctor thinks it could be beneficial to these patients.

Medical innovation is not part of the research and development process; it is rather a treatment approach available to doctors in special circumstances. Since this research is only done on a very small number of patients, clinical trials would need to be conducted by scientists or organizations before the treatment is approved and placed on the market.

The purpose of clinical trials is to acquire knowledge to support applications for regulatory approval before the therapy is made available to patients. Although patients who participate may benefit from it, clinical trials do not exist to provide therapy.

Clinical trials are research and not therapy

In some types of clinical trials (placebo-controlled trials), patients don't know if they are receiving the actual treatment as they are randomly assigned to either a group receiving the experimental treatment or a group receiving a placebo (which is a treatment that only simulates the actual treatment being studied). They do this to see whether psychological aspects play a possible role in the effectiveness of a treatment.

This brochure was adapted from the document *"What you need to know about stem cell therapies"* produced by the Stem Cell Network, Albany Medical College, and the Health Law Institute - University of Alberta. CellCAN thanks its partners for giving us permission to use this document.

WHAT IS THE STATE OF **DEVELOPMENT** OF **STEM CELL-BASED THERAPIES**?

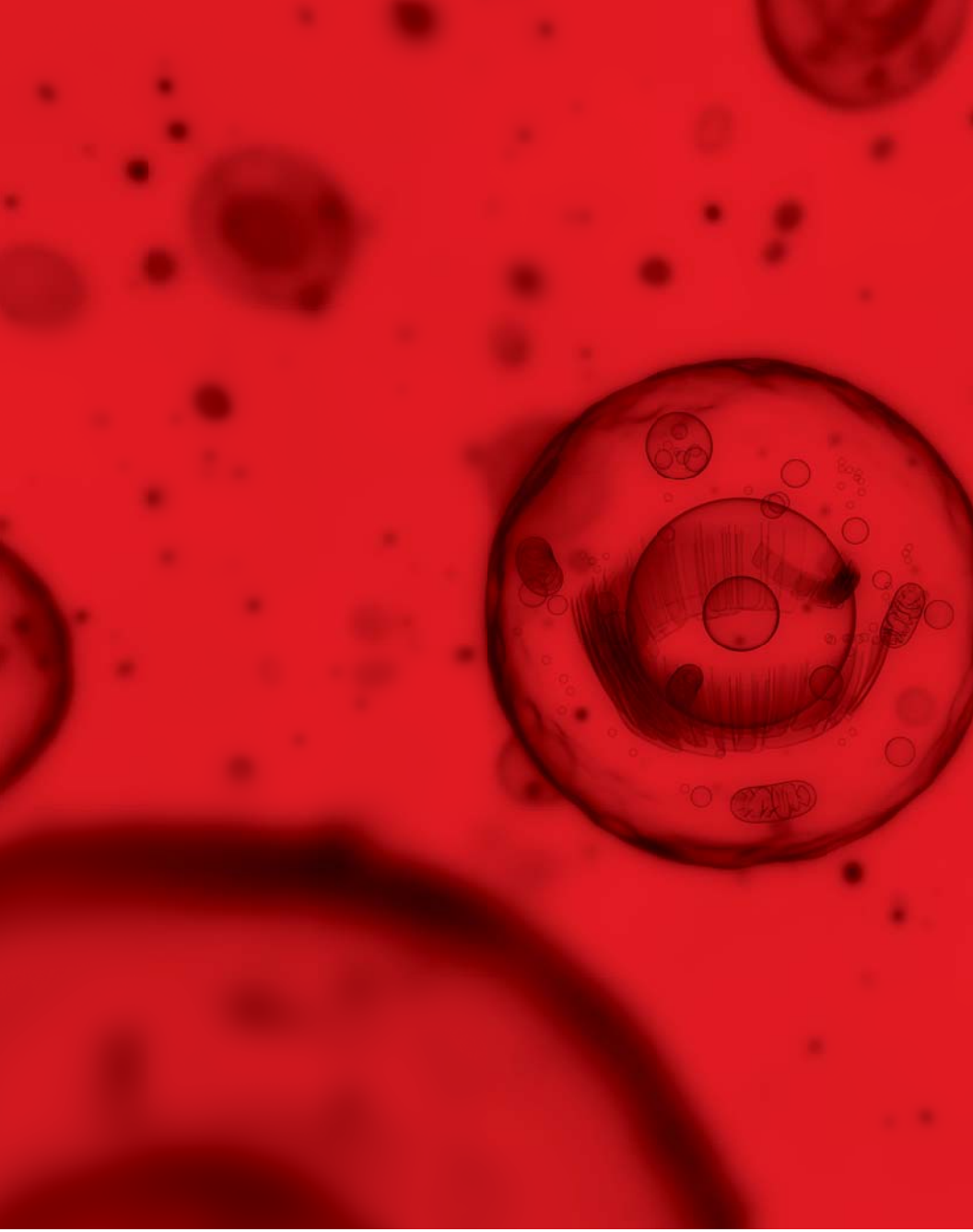
Stem cells have the potential to treat many diseases. There are more and more therapies being tested and approved. Therapies using blood (hematopoietic) stem cells can treat some blood cancers and other blood and immune system diseases. Commonly called "bone marrow transplants" or "blood cell transplants," these treatments are well known and have been used successfully for a long time.

Most research on stem cells is at the development stage in the laboratory or in the early stages of clinical trials (Phase 1 and Phase 2).

- Ongoing clinical trials typically use adult stem cells and mainly blood (hematopoietic) stem cells and sometimes stem cells from umbilical cord blood. These cells are used to treat cancer or graft-versus-host disease, a complication after a bone marrow or stem cell transplant.
- Some clinical trials are studying the use of "mesenchymal" stem cells to treat graft-versus-host disease and also to study heart attacks, liver problems, multiple sclerosis and other disorders.
- Clinical trials are also underway for neurological diseases, cardiovascular diseases, eye diseases and diabetes.
- Human embryonic stem cells are used in rare Phase-1 clinical trials for the study of spinal cord injuries and vision problems.
- The Japanese government has recently approved an application for a first pilot study (small-scale study) using cells created from induced pluripotent stem cells (adult stem cells with added genes that can turn into any type of human cell) to study age-related macular degeneration (a condition causing vision loss).

ADDITIONAL **RESOURCES**

You can also find a registry of all clinical trials conducted around the world here: **clinicaltrials.gov**
If you have any questions, you can reach us at **info@cellcan.com**



CellCAN
Regenerative Medicine and Cell Therapy Network

5415, boul. de l'Assomption, suite 235
Montréal, QC H1T 2M4

info@cellcan.com

WWW.CELLCAN.COM

WWW.ILOVESTEMCELLS.CA

@CellCAN_Network