

Leukaemia: how can stem cells help?

What do we know?

Leukaemia is a general term that refers to many different types of blood cancers with different causes, different treatments, and different outcomes. Acute leukaemias are characterized by the production of abnormally elevated numbers of blood cells that do not function properly and often suppress the production of normal blood cells.

Present stem cell treatments for severe leukaemias may include the application of a blood stem cell transplant (also known as a haematopoietic stem cell transplant or a bone marrow or cord blood transplant).

Thousands of leukaemia patients worldwide have received successful transplants containing blood stem cells. Although these treatments still carry very serious risks, these risks have greatly decreased over the years as researchers learn more about leukaemia and blood stem cells.



'Blast crisis' in chronic myeloid leukaemia

Image: Stacy Howard, Centers for Disease Control and Prevention

What are researchers investigating?

Researchers now know most of the gene mutations that are most likely to be present in any given type of leukaemia. Studies continue to examine haematopoietic stem cells (HSCs) and what turns them (or their daughter cells) into leukaemia cells.

To reduce current limitations of HSC transplants, researchers are examining new approaches. These include the development of treatments with immune cells, ways to boost patient immunity, and ways to restore blood cell production more rapidly in more patients using either current or alternative sources of cells for the transplants. The latter approaches include strategies to expand HSCs in the laboratory or to derive HSCs from cells called induced pluripotent stem cells (iPSCs) that are immortal cells that are now readily generated in the laboratory.

What are the challenges?

Immediately before a transplant is performed, the blood and immune system of the patient is largely destroyed by chemotherapy. This makes the patient unable to combat infections until the transplanted cells have regenerated the mature cells required to provide this capacity. An ongoing challenge is reducing this vulnerability of patients to infection while transplanted HSCs rebuild the patient's immune system.

A second major challenge is caused by minor genetic differences that may exist between the transplanted HSCs and the donor, even when donor and patient tissue types are highly matched. Such differences can create unanticipated serious incompatibilities that lead to rejections of the transplanted cells or the transplanted cells attacking the patient's tissues. This situation is called graft-versus-host disease, and it can be fatal in extreme cases.

For more information visit:

www.eurostemcell.org/leukaemia