
Summary and recommendations

Health Council of the Netherlands. Hematopoietic stem cells. The Hague: Health Council of the Netherlands, 2003; publication no. 2003/17

Blood contains various types of cells that develop from hematopoietic stem cells. Diseases can give rise to a deficiency of blood cells, which can sometimes be remedied using stem cells from donors.

Potential sources of these stem cells are bone marrow, blood collected from donors stimulated with substances that “mobilise” the stem cells (mobilised blood), and umbilical cord blood. Recent research findings suggest that hematopoietic and other stem cells may have the potential to develop not only into blood cells but also into other cell types, such as liver or muscle cells. In the long term, these possibilities may pave the way for new clinical applications and thereby alleviate the shortage of organ donors. A great deal of research is still needed, however, before these possibilities can be realised.

In present-day practice, hematopoietic stem cells are primarily used in the treatment of malignant blood diseases such as the leukemias and lymphomas. They also find application in patients with solid tumors such as breast cancer, hematopoietic disorders such as thalassemia and a number of metabolic diseases. A distinction is drawn between autologous transplantations, where the cells are collected from the patients themselves, and allogeneic transplantations, in which case the cells are harvested from a donor.

In applications of this kind, mobilised blood is increasingly taking over the role formerly played by bone marrow, the classic source of stem cells. The collection of bone marrow is more stressful for the donors than the harvesting of mobilised blood, whereas the latter can yield equally good clinical results. The safety of the procedure deserves careful attention, also in case of mobilised blood donors. Increased use is also being

made of umbilical cord blood, though the relatively small number of stem cells collected per donation is a limiting factor. It is therefore important that researchers should explore the possibility of obtaining larger quantities in the laboratory by means of cell division. The development of methods to expand the number of stem cells, regardless the source, may alleviate the shortage of donors. By that shortage, a suitable (tissue-matched) donor is not available for a rather large number of patients, especially migrants.

Another way of alleviating the donor shortage could be to store larger quantities of cord blood for general use via a cord blood bank. Storage for possible autologous use is impractical, however, since the likelihood of such use actually taking place is remote (less than 1:10,000).

Alongside the shift from bone marrow to mobilised blood and, to a lesser extent, umbilical cord blood, there have also been developments with regard to the selection of donors and in treatment techniques. The selection of donors can be improved with the aid of new laboratory tests (molecular typing), which allow large numbers of donors to be matched to suitable transplantees. Furthermore, increasing use is being made of therapeutic methods that partially spare the bone marrow. As a result, the mortality and morbidity associated with stem cell transplantations have declined.

The number of transplantations performed world-wide has fallen in recent years. Less use is made of autologous cells than a few years ago, mainly due to disappointing results in patients with solid tumors. However based on recent results in a certain group of breast cancer patients, an increase is to be expected over the coming years.

The use of allogeneic cells remains virtually unchanged. This fall in the number of stem-cell transplants is expected to be partially offset by an increase in allogeneic stem-cell transplants, prompted by a broader interpretation of the indication for intervention. Partly as a result of the donor shortage, however, there is unlikely to be any substantial increase in the overall total in the near future. No such rise can be anticipated either in the number of transplants in children. Consequently, the current number of centres at which stem-cell transplants are performed is considered to be adequate for the time being.

Legislation of the donation of stem cells is spread over different laws. However, the mandatory rights and the protection of donors are warranted sufficiently. Also the safety and quality of the stem cells to be used are guaranteed legally in a sufficient manner. The same applies to the quality of the institutions concerned and the expertise of the professionals involved.

Warrants are less well regulated in case of autologous donations. In practice, this situation does not seem to yield problems. Attention should be paid to the quality of the information given to people who consider to store cord blood for autologous use in the future.

The immune system plays an important role in allogeneic stem-cell transplants. Since allogeneic cells are foreign to the body, they can provoke severe immune responses (graft-versus-host disease). Conversely, the allogeneic cells can trigger a significant therapeutic response in tumors (graft-versus-tumor effect). Immunological expertise is therefore indispensable when performing allogeneic stem-cell transplants. Research into the immunological aspects of stem-cell transplants is thus also desirable, as is research into the above-mentioned proliferation of stem cells by means of cell division.

The Committee makes the following recommendations:

- Research into the cell division of hematopoietic stem cells is to be promoted with a view to overcoming the shortage of stem cells for transplantation purposes.
- Research into the immunological aspects of stem cell transplantation is to be encouraged, in view of the importance of graft-versus-host disease and graft-versus-tumor effect.
- Donation of umbilical cord blood for general therapeutic use is to be promoted and storage for autologous use is to be discouraged (in consideration of the shortages and given that autologous use is very unlikely).
- The number centres for allogeneic stem cell transplantation is not to be extended in view of trends in the numbers of those transplantations.