

This new red cells  
that supply oxygen,  
white



**ASSIGN  
BUSTER**

This article was written by Dr. Gregory Hale, professor of Pediatrics at the University of Kentucky College of Medicine, in response to questions posed by Scientific American Magazine regarding the treatment of certain diseases with cord blood stem cells. There is some additional information provided by Viacord, a medical service company that provides private family cord blood banking, processing, and research. Dr. Hale discussed the advantages of cord blood stem cell transplants, the results of several transplants, as well as the research that on-going in the field of stem cell transplantation. The blood that remains in the human umbilical cord blood following birth contains a rich source of hematopoietic progenitor cells known as stem cells. These stem cells are the master cells of the blood. They divide to make new red cells that supply oxygen, white blood cells that fight disease and infection, and platelets that facilitate healing.

Doctors now have three sources of stem cells available to them: bone marrow, mobilized bone marrow or peripheral blood, and umbilical cord blood. Bone marrow has traditionally been used as a source of stem cells, but research is proving that cord blood may be an excellent alternative source. Cord blood can be utilized for the treatment of many diseases, including leukemia, sickle cell anemia, and Hodgkins disease. The first successful cord blood transplant took place in 1988 when a newborns cord blood was used in a life saving stem cell transplant for her older brother who had Fanconi anemia. Since then, there has been much research into the advantages of cord blood stem cells. Cord blood is much more readily available and poses no donor risk. The blood is simply collected from the placenta and umbilical cord after the baby is born and stored. The potential

of expanding the ethnic diversity of the donor pool is greatly increased, since minorities are considerably under-represented in bone marrow transplant pools.

Cord blood stem cells may also pose less risk of graft-versus-host disorder, or GVHD, than stem cells from bone marrow. GVHD occurs when the donors immune cells make antibodies against the hosts tissues, resulting in serious complications. In the last ten years, several studies of cord blood transplants have taken place and their results have been published in science and medical journals. In 1996, the New England Journal of Medicine reported the results of 25 consecutive cord blood transplantations from August 1993 to November 1995 by Dr.

Joanne Kurtzberg at Duke University. After bone marrow searches were unsuccessful for 17 patients, cord blood was collected from unrelated donors at the New York Blood Center. Nineteen patients had malignant diseases and four had nonmalignant conditions. The patients average age was seven years and the average weight was 19.4 kilograms. Twenty cord blood units were slightly HLA-mismatched and one was HLA-identical. The HLA, or Human Leukocyte Antigen, induces the formation of antibodies because it is recognized by the immune system as a threat. Engraftment was successful in 23 of 25 patients, and only two patients had severe graft-versus-host disease.

In contrast, bone marrow transplants in children have a 30 percent incidence of graft-versus-host-disease. Seven of the patients with malignant disease and 6 with nonmalignant conditions were alive one year after

transplantation. The report concluded that HLA-mismatched cord blood is an alternative source of stem cells for transplantation in children. In another study by Dr. John Wagner at the University of Minnesota Hospital, 13 patients with malignant leukemia diseases and five with nonmalignant conditions received cord blood transplants between July 1994 and December 1995. The average age of these patients was 2.7 years and the average weight was 15.

4 kilograms. Seven patients received HLA-matched blood and 11 received varying degrees of HLA-mismatched grafts. Six months after transplantation, 65 percent of the patients were alive and only two developed severe graft-versus-host disease. The authors stated that the benefits of cord blood transplantation included the low rate of graft-versus-host disease, rapid availability of blood, lessened donor risk, and a low risk of transmissible infections such as cytomegalovirus and Epstein Barr virus. Even with these and other successful transplantations, there are still questions to be answered.

For example, what is the minimal cell dose? Can an adult recipient be effectively transplanted?