LETTER FROM PARIS

White corpuscle transfusion

A white-cell separator has broad implications for many diseases

by Noah Hardy

White corpuscles, charged with defending the body against diseases, are the backbone of the immune system.

They occur in three distinct forms. Lymphocytes initiate an immune response to foreign invaders by producing antibodies. Granulocytes and monocytes engulf and digest microbes.

In humans a chink in the white cell armor is associated with leukemia and other cancers, aplasia, a disease of blood-forming bone marrow cells characterized by a marked shortage of white cells, and septicemia, a generalized infection that occurs because white cells are in short supply or because their activity has been suppressed deliberately, as in transplant recipients who would otherwise reject their foreign organs.

Transfusions of large numbers of white cells would be of obvious value to such individuals. Heretofore it has been virtually impossible. Oxygen-carrying red blood cells are easily transfused to persons who have lost a lot of blood. Platelets, responsible for clotting, can, by a method refined about a decade ago, be readily given to patients who are hemorrhaging. But white cells, which normally do not appear in large numbers in circulating blood, have been difficult to separate in quantity from other components in the blood of healthy donors.

These cells may be harvested now by a newly perfected continuous flow cell separator, a $60,000 IBM machine that, in five hours, can isolate 10 billion lymphocytes or granulocytes from volunteers with neither danger nor damage. Blood from one vein is passed through the device which automatically centrifuges it, selects the desired fraction and returns the rest to the donor through another vein. First used at the Institut de Cancerologie et d'Immunogenetique at Villejuif near Paris, headed by Dr. Georges Mathe, a pioneer in bone marrow transplantation, the IBM separator is now on order at several medical schools in the United States, including those at the University of Wisconsin and Duke University. The French scientists have proposed, and their government is expected to adopt, a measure that would reimburse white cell donors for their lost working time.

Septicemia in aplasic patients has been treated successfully with massive transfusions of granulocytes obtained by use of the cell separator, and remissions of certain types of leukemia have been brought about by lymphocyte transfusions. Research has shown that lymphocytes are capable of reacting against malignant cells. In addition to injecting lymphocytes from normal donors, Dr. Mathe and his co-workers are experimenting with another anti-leukemia technique. A patient's own lymphocytes are separated from his blood, treated in the laboratory to prime their ability to fight cancerous cells and reintroduced to the patient's bloodstream. In effect, the researchers are harvesting white cells and teaching them to reject tumors.

They do this by exposing the white cells to their cancerous enemies in test tubes. This makes the cells more anxious to attack tumors when they are reintroduced into the patient.

Another possibility lies in immunizing the donor against specific tumor antigens (structures on a cell that mark it as foreign) before taking his blood. The safety of a procedure of this type, which would involve exposing a healthy individual to such antigens, is the key problem, though recent experiments at the Villejuif laboratory suggest it may be possible. Investigations of the use of lymphocyte transfusions to transfer immunity from one individual to another are also in order, according to scientists participating in a symposium on transfusions of white corpuscles, held recently at the Centre National de la Recherche Scientifique in Paris. Individuals suffering from immune deficiency diseases, in which they produce very few, if any, white cells on their own, could defend themselves, therefore, against certain viral and fungal infections to which they are particularly susceptible.

White blood cells, harvested abundantly from human donors, could also be useful in preparation of antilymphocyte serum, a drug widely employed by transplant surgeons in an attempt to weaken, rather than enhance, their patients' natural immune response.

To date, though experiments in transfusing white cells have been encouraging, one problem has appeared. As the frequency of transfusions to a patient rises, efficacy diminishes. Tissue typing tests and a policy of matching donor and recipient as closely as possible, as is done with kidney and other organ transplants, could limit this difficulty, though it is hard to type white cells in a severely deficient patient and, as with other tissue transplants, it may be difficult to find sufficient numbers of compatible donors.