Biological isolation garment

A spinoff of the astronaut's biological isolation garment will allow hospital patients who are highly vulnerable to infection to leave their sterile habitats for several hours, carrying their germ-free environment with them. The garment was designed originally to be worn by astronauts returning to earth until their arrival in a quarantine facility aboard the recovery ship. It was meant to protect the environment against unknown microorganisms from the moon—an unnecessary precaution when men visit the planets. A prototype isolation garment has been tested in hospitals and by the National Cancer Institute with favorable results. It is a coverage-type suit with attached inner and outer garments, all made out of a penetration-resistant fabric. A separate hood with a transparent face mask is attached to the suit. The entire garment is easily sterilized for re-use.

Air is supplied through a flexible hose connected to the helmet, providing a continuous supply of purified air. Positive pressure is maintained inside the suit to prevent unfiltered air from entering the suit. The garment is a useful extension of patient isolation rooms, becoming an extension of the protected environment. The garments thus designed can be used in any of 200 hospitals where isolation rooms are installed to treat leukemia, radiation injuries, burns, and immune-deficiency diseases. Environmental infection can be reduced by using these garments, and instance, it is responsible for nearly 70% of all deaths in acute leukemia.

While no commercial versions of the garment are yet available, several manufacturers have shown interest in licensing the NASA patent.

Storing blood cells

White blood cells and bone marrow can now be stored for future use by leukemia patients. The results of a study at the Jet Propulsion Laboratory's medical group in electronics and cryogenics—two fields where very low temperatures are needed—led to the development of a new method of storing white cells. The study was conducted with the cooperation of the California Institute of Technology, and the results were published in the journal Nature.

Conclusion

The Skylab chamber and its leak proof seals were adapted for medical use with seals that not only don't leak but are adaptable to a considerable difference in size. Further design refinements are necessary and are expected to be completed this year.
Immune-deficient child leaves hospital sterile room for up to four hours carrying germ-free environment with her in a modification of the astronaut's isolation garment. The garment was developed originally to be worn between spacecraft landings and quarantine as a precaution against carrying unknown microorganisms from the moon. The spinoff is intended for children with aplastic anemia, leukemia, or other disorders requiring a sterile environment.

White blood cell- and bone-marrow bank can be established using freezing unit that emerged from NASA electronics and cryogenics research. Freezing system monitors temperature of the cells themselves and the system maintains a consistent freezing rate. Ability to freeze, store, and thaw white cells and bone marrow without damage is important in leukemia treatment.
Engineers at JPL proposed a solution to the blood-cell freezing problem first identified by the Research Triangle Institute Biomedical Application Team during discussions with the National Cancer Institute. JPL's solution utilized a special electronic circuit developed for precise temperature control of scientific instrumentation now on its way to Mars on board the Viking spacecraft. JPL then turned the idea over to the Goddard engineers for implementation, since the Goddard Center was geographically more convenient to the National Cancer Institute.

The freezing unit monitors the temperature of the cells themselves. A thermocouple placed against a polyethylene container relays temperature signals to an electronics system, which in turn controls small heaters located outside of the container. The heaters allow liquid nitrogen to circulate at a constant temperature and maintain a consistent freezing rate.

Freezing white blood cells is important in leukemia work. There are more than 80 types of white cells, making patient-donor matching difficult. Storage life of unfrozen white blood cells is only a few hours.

The Goddard freezer, which was delivered last year to the cancer institute, can freeze up to 220 ml of white blood cells in one hour. Animal bone marrow also is being frozen by the unit for transplant research. Results so far are encouraging.

**Better physician's 'black bags'**

There's a limit to what a physician can carry in his "black bag." But NASA-Johnson is extending that limit dramatically by transferring technology accrued through monitoring of astronauts' vital signs.

The development is evolving now in preparation for providing diagnosis and treatment of space-shuttle crew and passengers. Of course it can be adapted to aircraft, shipboard, and physician emergency calls too.

The portable medical-status system contains an electronic vital signs monitor, a cassette machine for recording electrocardiograms and electroencephalograms, equipment for minor surgery, as well as conventional diagnostic instruments such as the stethoscope, and drugs.

The big job was to make it all portable. Liquid-