Chapter 20
Web Text Box 2

Success and a Setback with SCID

Children with severe combined immunodeficiency disease (SCID) show an almost complete failure to fight infection and die soon after birth if not kept in sterile conditions. SCID is more widely known as "bubble boy disease" because confinement to a germ-free plastic bubble was the way in which patients were kept alive for a number of years. One rare form of SCID, caused by a failure to make an enzyme called adenosine deaminase, can be treated by regular injections of recombinant protein (“production of mammalian proteins in bacteria” on book page 113). In 1990 the first trial of a genetic therapy began at the National Institutes of Health in Washington. White blood cells from patients were transfected with a plasmid encoding adenosine deaminase, which inserted into random positions in the genome and began to be transcribed. Although the therapy does seem to have helped the patients, they still need to be periodically injected with recombinant adenosine deaminase.

The most common form of the disease, X-SCID, affects only boys and occurs in about 1 in every 150,000 births. X-SCID is caused by a defective receptor for interleukin 2 (book pages 161, 264, 321, 325). In 1999, a team at INSERM in Paris initiated a trial in which white blood cells from X-SCID patients were transfected with a viral vector containing the normal interleukin 2 receptor gene. The cells were then returned to the patient. These trials were hailed as the first major gene therapy success. Of the original cohort of eleven children, seven were essentially cured, living normal lives at home with a functional immune system. However, trials were stopped when it was discovered that four of the children developed leukemia from the insertion of the gene-carrying retrovirus near an oncogene. Attention is now directed at developing new strategies that allow the gene to be corrected but without the risk of triggering cancer.