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Hopeful news on blood supply

There is progress to report in slowing the spread of blood-borne infections.

One area which has been highlighted by the AIDS epidemic is the more general problem of infections resulting from contaminated blood and blood products. In addition to HIV, this includes such infections as hepatitis-B virus and non-A, non-B hepatitis virus. Non-A, non-B hepatitis develops in 5-10% of multiply transfused recipients, resulting in 150,000-300,000 cases annually in the United States alone.

While one problem with non-A, non-B hepatitis is the lack of a sensitive serological assay, even such an assay would not eliminate the problem. Both HIV and hepatitis-B, for which we do have such assays can still be transmitted by seronegative donors. In fact nearly 10% of transfusion-related hepatitis-B cases and nearly 25% of the severely jaundiced cases result from hepatitis-B virus transmitted by donors who are negative for the hepatitis surface antigen. As for HIV, at least 13 cases of transfusion-related HIV infection from seronegative donors have been reported.

One group which has been particularly hard hit are hemophiliacs, who receive both pooled clotting factors as well as whole blood transfusions. Nearly 90% of hemophiliacs receiving plasma or clotting factor transfusions have serological evidence of infection with HIV or hepatitis-B and many of these have active disease. In addition 45-80% of hemophiliacs have biochemical evidence of liver damage suggestive of chronic non-A, non-B hepatitis.

There are two ways to approach this problem. One is to develop a non-blood-derived clotting factor and the other is to develop a method of eliminating viruses which may be present in blood whether they are detected or not. Progress is being made in both areas.

An article in the Dec. 24/31, 1988 issue of the British medical journal, *The Lancet*, describes the photochemical decontamination of blood components containing hepatitis B virus and non-A, non-B virus. In these experiments, diluted plasma samples containing non-A, non-B hepatitis virus were treated with a combination of two compounds, known as psoralens, and exposed to long-wave ultraviolet light. Plasma solutions of hepatitis-B virus were similarly treated and the solutions were then transfused into chimpanzees. In the six months after the transfusions, none of the animals showed any evidence of hepatitis. When the animals were subsequently challenged with untreated virus, they developed hepatitis.

These experiments were repeated using antihemophilic factor (factor VIII) contaminated by the two viruses. Treatment with psoralen and UV light abolished the infectivity of the viruses without significantly affecting the clotting activity of the concentrates.

A previously reported study showed that treatment with a compound known as hematoporphyrin derivative (HPD) followed by illumination with a specific wavelength of red light would inactivate certain enveloped viruses such as HIV and hepatitis-B virus. HPD binds to the envelope of the virus and probably acts by disrupting the envelope. The psoralens, on the other hand, bind directly to the DNA or RNA and therefore should affect both enveloped and non-enveloped viruses.

On the synthetic clotting factor front an article in the Jan. 19, 1989 *New England Journal of Medicine* describes the use of a recombinant antihemophilic factor in the treatment of two patients with classic hemophilia. Classic hemophilia results from a defect of a protein called antihemophilic factor, or factor VIII. Use of concentrates of this factor prepared from pooled blood have dramatically improved the treatment of hemophiliacs over the past 20 years. Unfortunately, 60-80% of hemophiliacs exposed to factor VIII concentrates between 1979 and 1984 are seropositive for HIV.

Because pasteurization of concentrates and blood donor screening have not entirely eliminated this problem, there is interest in developing a recombinant form of factor VIII. Researchers at the University of North Carolina at Chapel Hill tested one such preparation on two patients with classic hemophilia and found it to be an effective agent for treating these patients. In addition to being an effective preparation, the recombinant clotting factor was much easier to prepare for administration and did not provoke an immune reaction even in the one patient with a history of previous reactions to the plasma-derived product.

Thus we see that already the research stimulated by the AIDS epidemic is producing benefits beyond the immediate problem of HIV infection. Unless such research is rapidly accelerated and serious steps are taken to control the spread of AIDS, these discoveries will be swamped by the magnitude of this epidemic and go for naught.