Total Screening of Blood Donations for Australia (Hepatitis Associated) Antigen and its Antibody

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Summary

During a period of one year all of 105,724 blood donations were tested for Australia (Au) antigen and its antibody by a standard immuno-electro-osmophoresis method of immunoelectro-osmophoresis of 86 (1 in 1,229) were positive for antigen and 67 (1 in 1,578) positive for antibody. Of these, 52 were false positive for Au-antigen in the screening test (whether incising or equivocal) were checked against eight antisera, of which eight were positive and seven negative for Au-antigen.

Sera positive for antibody in the screening tests were checked against 15 known sera, of which eight were positive and seven negative for Au-antigen.

Some donors had been tested previously, during the period of partial screening. Others donated more than once during the year. For the purpose of analysis the total donations are divided into 31,884 previously tested and 73,840 tested for the first time. The respective incidences of antigen and antibody were studied in men and women, and in men donors from H.M. Prisons.

Results

Table I shows that 86 donors were Au-antigen positive and another 67 antibody positive. Of these 153 positive donors, 49 were being tested for the first time. One antigen-positive and 21 antibody-positive donors had been found negative at a previous donation. The significance of this is discussed below.

Discussion

While the Bulletin of the World Health Organization (1970) advocated total screening of donations, it emphasized that the application of the present relatively insensitive tests may reduce the risk to recipients by less than 25%. Since serum hepatitis may have an incubation period as long as six months, it is too early to assess the full significance of total screening in the
present survey. However, the occurrence of two cases of posttransfusion Au-antigen-positive hepatitis does show that the present screening method will not detect all carriers.

The first patient had received blood from eight donors. During investigation it was noted that a weakly positive reactor for Au antigen on the screening test was one of the eight donors involved. The retesting of the eight donors has given negative reactions for antigen and antibody. It seems likely that the donor, shown in Table I as the only Au-antigen positive among donors previously negative, was responsible for transmitting the disease. Serum from the earlier, apparently negative donation had not been preserved. Fortunately it was possible to obtain a specimen of serum taken at the same time for another purpose 18 months earlier. This earlier specimen and the recent specimen gave a weak positive reaction for Au antigen on the routine screening test. Serial dilutions of the donor's serum showed a marked prozone phenomenon by immunodiffusion, complement fixation as well as by immunoelectro-osmophoresis.

The second case of posttransfusion Au-positive hepatitis illustrates the converse problem of detecting weak antigens in donor sera. The recipient had been given 23 donations. The donor was retested and one gave a weakly positive reaction by immunoelectro-osmophoresis and by complement fixation, though negative by immunodiffusion. Electron microscopy of this serum showed a few characteristic clumps after the addition of anti-Au serum. Again the original specimen of the donor serum was not available. All donor sera are now being preserved for at least six months after testing.

Immunoelectro-osmophoresis is an attractive technique for screening donations, because answers can be obtained so rapidly (Cossart, 1971). False negatives may occur if there is an excess of antigen or of antibody (Kohn and Morgan, 1971). This happened in the above two donations which almost certainly transmitted Au-antigen-positive hepatitis—one donor had a strong antigen and the other a weak antigen. The strong antigen was detectable by complement fixation, immunoelectro-osmophoresis, and immunodiffusion provided a range of dilutions of antigen was used, but the weak antigen was barely detectable by immunoelectro-osmophoresis and complement fixation, and could be confirmed only by immune electron microscopy. In choosing a method for checking donors it is helpful to know the concentration of antigen or antibody likely to be encountered. The selection of antisera for this study has been based on the ability to detect Au antigen in the concentrations so far found in donors. Time will show whether or not the two antigen detecting methods representing the extreme ends of the range of concentration in apparently healthy donors, and how often such concentrations occur.

An immediate concern on finding an Au-positive donor is that the individual may be incubating viral hepatitis. No donor so far has refused to allow a report to be sent to the general practitioner. In only one case, the 18-year-old nurse mentioned above, has an Au-antigen-positive donor developed overt hepatitis. It is interesting to speculate what might have happened if this donor had volunteered one to two weeks earlier. In choosing a method for checking donors it is helpful to know the concentration of antigen or antibody likely to be encountered. The selection of antisera for this study has been based on the ability to detect Au antigen in the concentrations so far found in donors. Time will show whether or not the two antigen detecting methods representing the extreme ends of the range of concentration in apparently healthy donors, and how often such concentrations occur.

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This one donor who developed acute hepatitis is the only Au-antigen-positive donor known to have reverted to antigen negative. Of the others 28 antigen and 28 antibody positives have been retested at intervals varying from 2 to 12 months after the initial positive test, and all have remained positive. Four of the antigen-positive donors had come under suspicion before the discovery of the association between Au antigen and hepatitis, because of being among donors involved in cases of posttransfusion hepatitis. These cases of hepatitis occurred three and four years earlier. The follow-up of the recipients of previous donations of Au-antigen-positive donors has proved time-consuming and frustrating, because of the inadequacy of some hospital records. Although these antigen-positive and antibody-positive donors seem healthy, a detailed study of liver function is being conducted.

INCIDENCE

Population surveys show considerable geographical variation in the incidence of Au antigen in blood donors (Cossart, 1971). The incidence of 1 in 869 (0·115%) shown in Table I for donors tested for the first time is in agreement with the range of about 0·1% for unpaid donors in the U.S.A. and Western Europe. The information about the retesting of previously negative donors shown in Table I suggests that negative donors are unlikely to become positive within the next 6 to 12 months. The one Au-antigen-positive donor in the previously tested group exhibited a prozone, and probably for that reason had been missed at the earlier test. The three antibodies among the previously negative donors were weak, and may well have been missed at the original test. These three donors gave no history of recent illness, and the earlier donations did not cause overt hepatitis in the recipients.

The high incidence of Au antigen of 1 in 153 (0·653%) in men prisoners has no obvious explanation. Viral hepatitis is not a serious clinical problem in the two institutions concerned, and the positive donors are not drug addicts. What is not known is whether or not these men were Au positive at the time of their first imprisonment. The high incidence may be related to social habits and to hygiene.

A higher incidence of Au antigen in men compared with women donors has been described (Banke et al., 1971), though unlike the present series the difference was not statistically significant. Differences in incidence are unlikely to be genetically determined (Cossart, 1971), and it is suggested that the difference in incidences in the sexes may again be related to social habits and hygiene. The higher incidence of antibody in women compared with non-prisoner men shown in Table II is not statistically significant, but a similar observation has been made in Danish donors (Banke et al., 1971). This point should therefore be investigated in larger series.

It would be wrong to cause unnecessary worry among the families of donors found to be positive for either Au antigen or its antibody. Since volunteers have for many years past been asked questions about jaundice, and recent publicity has highlighted the transmission of viral hepatitis by transfusion, it has not been difficult to explain to positive donors that they should refrain from donating blood in the meantime. They have also been easily persuaded to consult their general practitioners. Initially an attempt was made to study other members of the household for Au antigen and its antibody. In one family studied the wife of an Au-antigen-positive donor was found to have the antibody. Soon afterwards it became clear, however, that family studies might cause alarm, and these have been discontinued. From information received from general practitioners hepatitis has not been an overt illness in the households of positive donors. It seems that these donors have not been a danger to household contacts, and if the infection is transmitted the illness is mild or asymptomatic.

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References


