Antibody response to hepatitis B vaccination

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Immunisation against hepatitis B has been offered to hospital staff who are at risk of contracting the disease for several years now. Initially a plasma derived vaccine was used but since 1987 recombinant hepatitis B vaccine has been available in the United Kingdom and has come to be the preferred choice. The rate of seroconversion after three doses of the vaccine is said to be high, although the rate of conversion seems to decrease with increasing age^{1,2} and may be lower when the vaccine is given into the buttock rather than into the deltoid muscle.³ Those who do not convert after three doses of the vaccine may be offered a fourth and some then develop an acceptable antibody titre.^{1,4}

At St Mary's Hospital a hepatitis B immunisation programme started at the beginning of 1985 following the standard regimen—that is, three doses of 20 µg of vaccine separated by intervals of one month and six months. When the programme started, plasma derived vaccine was used but was substituted by the recombinant vaccine when this became available towards the end of 1987; injections have always been given into the deltoid muscle. No screening for antibody levels has been carried out before vaccination since it was known that few individuals in the population are antibody positive (probably less than 1%). Antibody levels are routinely measured three months after the third dose of vaccine and it is some of the results of this postvaccination screen that are briefly reported here.

Subjects and results

A total of 760 employees had a full course of vaccination between February 1987 and May 1989. About a third (30.3%) had two doses of the plasma derived vaccine and one dose of the recombinant vaccine; a much smaller number (7.4%) had one dose of the plasma derived and two doses of recombinant and the remainder had three doses of recombinant vaccine. Antibody levels after vaccination were measured by an enzyme immunoassay method and the results expressed in mIU/ml. Levels greater than 10 mIU/ml were considered to show a positive response, those below this, a negative response. Using this criterion, only 30 of the 769 individuals in

the study (4.0%) showed no antibody response at all or had levels less than 10 mIU/ml. A substantial majority had levels greater than 120 mIU/ml (645, or 84.8%); the response rate did not differ appreciably whichever combination of vaccine was given. The cumulative frequency of the different antibody responses is shown in the figure.

There seemed to be no characteristics that distinguished the responders from the non-responders (table). There were rather more women than men and more were under 30 than over 40; in this they reflect the general characteristics of the staff who have been vaccinated in the health district.

Comment

These results, and those of Cockcroft and her colleagues,⁵ confirm that hepatitis B vaccination is effective in raising antibody levels in health care workers.^{1,2,4} In both the studies reported in this Journal, only about 5% of those vaccinated did not achieve a satisfactory antibody level and Cockcroft and her colleagues show that it is likely that conversion rates of up to 98% can be achieved.

Twenty of those who did not seroconvert after the full course of three injections have been given a fourth dose but only in nine are the results of postvaccination screening available. Four of the nine remain negative but the remaining five have all shown a satisfactory antibody response with levels ranging between 42 and 117 mIU/ml.

Given the relatively high cost in both time and labour that vaccination programmes entail, and given

Hepatitis B antibody titres after vaccination.

Age and sex of non-responders after hepatitis B vaccination

	Age group (y)				
	20-	30-	40-	50-	≥60
Men	6	4	2	0	1
Women	11	1	4	1	0

that the seroconversion rate is so high, routine antibody screening after vaccination must be called into question except perhaps for those at the highest risk, such as those working in renal units or in drug addiction units. Abandoning screening would be more convenient for those who had been vaccinated and would also free occupational health staff for other, more useful activities. Finally, one may question the whole philosophy of hepatitis B vaccination for while it has been shown to be effective in raising antibodies, there is a danger that those who receive the vaccine will suppose that there is nothing more they need do to prevent themselves from contracting hepatitis B. It is important to emphasise that vaccination is no substitute for safe working practices and if these are implemented and complied with then the risks of becoming infected will be minimal and the degree of protection offered probably at least as great as that given by vaccination. Safe working practices

are also important to ensure that risks from other blood borne infections are also kept at acceptable levels.

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1 Deinhardt F. Aspects of vaccination against hepatitis B: passive-active immunisation schedules and vaccination responses in different age groups. *Scand J Infect Dis* 1982;38:17-23S.

2 Fagan EA, Tolley P, Smith HM, et al. Hepatitis B vaccine: immunogenicity and follow-up including two year booster doses in high-risk health care personnel in a London teaching hospital. *J Med Virol* 1987;21:49-56.

3 Center for Disease Control. Suboptimal response to hepatitis B vaccine given by injection into the buttock. *MMWR* 1985;34:105-8.

4 Campbell AD, Hambling MH, Pinnington PA, Lees E. Efficacy of hepatitis B vaccine. *J Soc Occup Med* 1988;38:46-7.

5 Cockcroft A, Soper P, Insall C, et al. Antibody responses following hepatitis B immunisation in a group of health care workers. *Br J Ind Med* 1990;47:199-202.

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