Discussing the need for an adolescent hepatitis B vaccine booster in infant vaccinees

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QUESTION

My son heads off to university soon. Will the hepatitis B shots he received as a baby still give him good protection? He already had a Hepatitis A shot just before a school trip to Central America last spring. Should he get a booster dose of hepatitis B vaccine now? Would the combined hepatitis A and B shot be suitable?

ANSWER

Your son will require a second dose of hepatitis A vaccine for prolonged protection. The need for an adolescent hepatitis B (HB) booster in this situation is uncertain. Protection wanes faster after infant compared with adolescent HB vaccination, with evidence of loss of protection in some young adults. However, international experts do not yet advise routine booster doses for individuals immunized as infants. Additional follow-up studies are needed to clarify the situation for Canadians.

ADOLESCENT HB VACCINATION

Canadian provinces were pioneers in establishing school-based HB vaccination programs, with British Columbia leading the way in 1992 (1). Ample evidence confirms that recombinant HB vaccine induces a robust, long-lasting immune response in preadolescents. A remarkable prospective study conducted in Quebec City (2) monitored anti-HB surface antigen titres for 15 years after routine vaccination of eight- to 10-year-olds. The seropositivity rate (titre ≥10 IU/L) was 98.9% at series completion and 76.7% 15 years later. Virtually all of those who were seronegative after 15 years responded strongly to a booster dose, indicating persistence of immune memory. The capacity to recall an antibody response following exposure to HB virus is considered to be sufficient to protect against symptomatic disease because the long incubation period of this infection allows time for a recalled immune response to neutralize infection at an early stage. This is consistent with the observation of a 90% decline in the rate of acute HB infection among Canadians 10 to 19 years of age between 1990 and 2008 (3). Based on similar observations from around the world, no booster vaccination is currently recommended following primary HB vaccination (4). Whether protection will last life-long will require prolonged follow-up studies.

INFANT HB VACCINATION

All provinces have programs to immunize infants born to HB-infected mothers. Three provinces (British Columbia, New Brunswick and Prince Edward Island) and all three territories also implemented routine infant HB vaccination in the late 1990s. When children vaccinated as infants reached the age of the concurrent adolescent HB vaccination programs, those provinces phased out the latter programs, taking a leap of faith that infant vaccination will protect individuals well into adulthood. Follow-up studies (5) from other countries consistently show that anti-HB surface antigen titres decline progressively after infant vaccination, becoming undetectable (<10 IU/L) in the majority after 15 years. Unlike adolescent vaccinees in the Quebec study (2), infant vaccinees do not consistently respond to a booster stimulus after 15 years (5), implying loss of immune memory and renewed susceptibility to infection. In a meta-analysis of global studies performed ≥15 years after infant vaccination (5), ≥15% of participants were nonresponsive to a booster stimulus and required additional doses of HB vaccine to restore protection (titres ≥10 IU/L). Breakthrough infections have been infrequently documented in follow-up studies but increase in frequency with duration of follow-up (6). In Canada, susceptibility to infection may not result in increased case numbers for a time because those immunized as infants mix socially with multiple older cohorts better immunized as adolescents or adults, minimizing the impact of high-risk behaviours such as sex and drug use.

Studies are urgently needed in Canada to determine the rate at which protection is being lost in individuals vaccinated as infants and, if needed, the optimal age at which to reinforce HB immunity to extend it through adulthood, with its increased risks of HB exposure associated with sexual activity, foreign travel and high-risk behaviours. However, it is evident that long-term protection is inferior after infant immunization compared with adolescent immunization. Another reason to consider a booster dose during adolescence for individuals vaccinated in infancy is to attempt to put them on an equal footing with adolescent vaccinees as both groups face the risks of adolescence and adulthood. This would be equitable because no other immunization program tolerates such large differences among vaccinees of different ages.

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