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Immunoglobulin E responses to diphtheria and tetanus toxoids after booster with aluminium-adsorbed and fluid DT-vaccines

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Immunoglobulin E responses to diphtheria and tetanus toxoids were investigated in pre- and postbooster samples of 104 children given, at 10 years of age, a DT booster with either an adsorbed (n = 51) or a non-adsorbed, fluid vaccine (n = 53). Vaccination with adsorbed DT is part of a national immunisation programme and represents the first regular booster given to these children, primarily immunised with three doses of adsorbed DT at age 3–6 months. The vaccines, with a content of 30 Lf of diphtheria toxoid and 7.5 Lf of tetanus toxoid per millilitre, were given for booster in a dose of 0.25 ml as a deep subcutaneous injection. In the prebooster samples, 3 and 14% had measurable IgE to diphtheria and tetanus, respectively. These rates rose to 94 and 92% in the postbooster samples, respectively. The median (range) of IgE to tetanus among recipients of the adsorbed vaccine was 0.59 PRU ml^{-1} (< 0.1–17.5), as compared to 0.27 (< 0.1–8.22) in the recipients of the fluid vaccine (p = 0.027). The median IgE response to diphtheria toxoid in the whole group was 1.8 (< 0.1–17.5), with no significant difference between the two vaccines (p = 0.76). There was no correlation between the IgE and IgG responses (r < 0.07, p > 0.5) but the two IgE responses as well as the ratios of IgG/IgE showed strong correlations (r > 0.7, p < 0.001). The study thus revealed unexpectedly high rates of IgE responses to diphtheria and tetanus toxoids in a regular DT booster vaccination programme, which were associated to high rates of local side effects. The clinical significance of the findings remains to be elucidated but aluminium as adjuvant may need re-evaluation.

Keywords: Immunoglobulin E; booster vaccination; aluminium adjuvant; diphtheria tetanus (DT) vaccine; adverse effects

Adverse reactions to vaccinations are common but they have been tolerated for the benefit of immunity against serious disease. The causes of the mainly local reactions to tetanus–diphtheria (DT) vaccination are not fully understood and the true rates in national immunisation programmes are seldom known since they are not routinely monitored. In Sweden, a systematic recording of local reactions was started to verify an apparent increase in the incidence after the school DT booster programme in 10-year-old school children[1]. The study showed high rates of local reactions in the children who had received adsorbed DT vaccine for primary vaccination in infancy and these rates were significantly higher than those seen in children who had been vaccinated according to a previous programme with non-adsorbed, fluid DTP for primary series (*Table 1*).

A likely cause for the increased incidence would be the presence of aluminium adjuvant in the vaccine given for primary series. Supporting this possibility, we have noted a higher rate of local side-effects in children boostered with an adsorbed acellular pertussis vaccine in the group who had received the same vaccine for primary immunisation than in the group who had received fluid whole-cell DTP for primary series[2,3]. We also found that the children with the highest rates of local side-effects had a significantly higher rate of immunoglobulin E (IgE) response to pertussis toxin than children without local reactions[3]. Others have reported higher IgE responses to tetanus toxoid after booster with adsorbed tetanus vaccine than with fluid vaccine[4–6].

The effect of aluminium adjuvant is to potentiate the specific protective antibody responses, usually in the IgG antibody class. On the other hand, aluminium is also a potent inducer of IgE responses. Adjuvants are

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