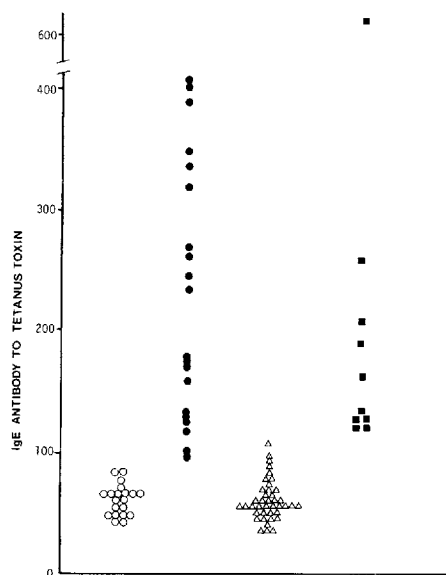


Elevation of Levels of IgE Antibody to Tetanus Toxin in Individuals Vaccinated with Diphtheria-Pertussis-Tetanus Vaccine



Legend. IgE antibody responses to tetanus toxin (units/ml) in the serum of 20 infants (age, one to two years (O) before and (●) after vaccination with diphtheria-pertussis-tetanus (DPT) vaccine, (Δ) 40 adults (age, 30–39 years) presumed to be unvaccinated, and (■) 10 adults (age, 19–20 years) 30 months after a booster dose of alum-precipitated tetanus toxoid. Antibody levels were determined by an enzyme-linked immunosorbent assay. Microplates were coated with 100 μl of 40 limit flocculation units of tetanus toxoid, which was pipetted into each well of a microplate. After overnight refrigeration (4 C), the wells were washed and filled with buffer (5% bovine serum in phosphate-buffered saline), sealed with Parafilm (American Can Co., Neenah, Wis.), and refrigerated until used. Duplicate 100-μl aliquots of serial dilutions of test serum or reference serum (obtained from a donor who developed allergic signs when exposed to the powder of lyophilized tetanus toxoid) were pipetted into the wells, which were refrigerated overnight and then washed three times with buffer. One hundred microliters of the working dilution of antibody to IgE conjugated with β-D-galactosidase (Medical and Biological Laboratories, Nagoya, Japan) was pipetted into each well for detection of IgE antibody. After overnight incubation at 4 C, the wells were washed three times and 200 μl of a substrate solution (0.1 mg of 4-methylumbelliferyl β-D-galactoside/ml) was poured into the wells and incubated for 60 min at 37 C; a 150-μl aliquot of the solution was then transferred into 1.5 ml of stopping solution and fluorescence was measured by a fluorospectrophotometer (set at 360 nm for excitation and 450 nm for emission). The emission densities of each dilution were plotted on a logarithmic graph to create a standard curve. The reference serum gave sig-

Summary

Alum is a well-known adjuvant for inducing IgE antibody responses in mice and is widely used in the immunization of humans with vaccines such as tetanus and diphtheria toxoids. *Bordetella pertussis* in DPT vaccine is also an IgE antibody-inducing adjuvant. There have been several reports of anaphylactic reactions [1, 2] and even death [3] due to tetanus toxoid.

In the present study, levels of IgE antibody to tetanus toxin in the unvaccinated adults were <100 units/ml (average, ~70 units/ml), levels that were comparable with those of the unvaccinated infants. Levels of IgE antibody were significantly elevated in sera obtained from the infants after vaccination with DPT vaccine. Similar levels were detectable in the sera of the young adults (students from a nursing school). The levels of IgG antibody to tetanus toxin was also elevated in the young adults, although these levels were not elevated to the same extent as the levels of IgE antibody (data not shown).

These findings indicate that, after immunization with DPT vaccine, levels of IgE antibody to tetanus toxin are elevated independently of levels of IgG antibody. In three infants, DPT vaccine caused local erythema, swelling, and tenderness and produced 700, 3,060, and 4,000 units of IgE antibody to tetanus toxin/ml. The relationship between IgE antibody and adverse reactions to tetanus toxoid needs further study.

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nificant emission up to a 1:10,000 dilution; therefore, we defined the reference serum as containing 10,000 units of IgE antibody to tetanus toxin. IgG antibody to tetanus toxin was also determined in the same manner, using microplates with wells coated with 4 limit flocculation units of tetanus toxoid.