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Typhoid Immunization Recommendations of the Immunization Practices Advisory Committee

These revised recommendations of the Immunization Practices Advisory Committee update previous recommendations (MMWR 1978;27:231-3). They include information on a newly licensed oral live-attenuated typhoid vaccine that was not available when previous recommendations were published.
INTRODUCTION

The incidence of typhoid fever declined steadily in the United States from 1900 to 1960 and has since remained at a low level. From 1975 through 1984, the average number of cases reported annually was 464. During that period, greater than 50% of cases occurred among patients greater than or equal to 20 years of age; 62% of reported cases occurred among persons who had traveled to other countries, compared with 33% of reported cases from 1967 through 1976. TYPHOID AND PARATYPHOID A AND B VACCINES

Two vaccines are generally available for civilian use in the United States: 1) a newly licensed oral live-attenuated vaccine (Vivotif, manufactured from the Ty21a strain of Salmonella typhi by the Swiss Serum and Vaccine Institute) and 2) a parenteral heat-phenol-inactivated vaccine (manufactured by Wyeth) that has been widely used for many years. In controlled field trials conducted among Chilean schoolchildren, three doses of the Ty21a vaccine were shown to reduce laboratory-confirmed infection by 67% for at least 4 years (95% confidence interval = 47%-79%). In a subsequent trial, a statistically significant decrease in the incidence of clinical typhoid fever occurred among persons receiving four doses of vaccine compared with two or three doses. Since no placebo group was included in this trial, vaccine efficacy could not be calculated. The mechanism by which Ty21a vaccine confers protection is unknown; however, the vaccine does elicit a humoral response. Secondary transmission of vaccine organisms does not occur because viable organisms are not shed in the stool of vaccinees.

In two field trials involving a primary series of two doses of heat-phenol-inactivated typhoid vaccine, similar to the currently available parenteral vaccine, vaccine efficacy ranged from 51%-76%. Vaccine efficacy for an acetone-inactivated parenteral vaccine, available only to the armed forces, ranges from 66%-94%.

Parenteral heat-phenol-inactivated vaccine and oral live-attenuated Ty21a vaccine have never been directly compared in a field trial, but the live-attenuated vaccine has similar efficacy to the heat-phenol-inactivated vaccine and results in fewer adverse reactions. Experience is limited with the use of the

Ty21a vaccine for persons from areas without endemic disease who travel to endemic-disease regions, and for children less than 5 years of age. Also, no experience has been reported regarding its use for persons previously vaccinated with parenteral vaccine.

Vaccines against paratyphoid A and B are not licensed for use in the United States. The effectiveness of paratyphoid A vaccine has never been established, and field trials have shown that the small amount of paratyphoid B antigens contained in "TAB" vaccines (vaccines combining typhoid and paratyphoid A and B antigens) is not effective. Combining paratyphoid A and B antigens with typhoid vaccine increases the risk of vaccine reaction. For these reasons, only monovalent preparations of typhoid vaccine containing S. typhi antigens should be used. VACCINE USAGE

Routine typhoid vaccination is no longer recommended in the United States. However, selective vaccination is indicated for the following groups: --Travelers to areas that have a recognized risk of exposure to S. typhi. Risk is greatest for travelers to developing countries (especially Latin America, Asia, and Africa) who have prolonged exposure to potentially contaminated food and drink. Such travelers need to be cautioned that typhoid vaccination is not a substitute for careful selection of food and drink, since typhoid vaccines are not 100% effective, and the protection the vaccine offers can be overwhelmed by large inocula of S. typhi. --Persons with intimate exposure to a documented typhoid fever carrier, such as occurs with continued household contact. --Workers in microbiology laboratories who frequently work with S. typhi.

Routine vaccination of sewage sanitation workers is warranted only in areas with endemic typhoid fever. No evidence has shown that typhoid vaccine is useful in controlling common-source outbreaks. Also, the use of typhoid vaccine is not indicated for persons attending rural summer camps or in areas in which natural disasters, such as floods, have occurred. Primary Vaccination

The following dosages of typhoid vaccines are recommended, based on the experience in field trials: Adults and children greater than or equal to 10 years of age --Oral live-attenuated Ty21a vaccine: one enteric-coated capsule taken on alternate days to a total of four capsules. Each capsule should be taken with cool liquid no warmer than 37 C, approximately 1 hour before a meal. The capsules must be kept refrigerated, and all four doses must be taken to achieve maximum efficacy.

Or --Parenteral inactivated vaccine: 0.5 ml subcutaneously, given on two occasions, separated by greater than or equal to 4 weeks. Children less than 10 years of age --Oral live-attenuated Ty21a vaccine*: one enteric-coated capsule taken on alternate days to a total of four capsules. Each capsule should be taken with cool liquid no warmer than 37 C, approximately 1 hour before a meal. The capsules must be kept refrigerated, and all four doses must be taken to achieve maximum efficacy.

Or --Parenteral inactivated vaccine: 0.25 ml subcutaneously, given on two occasions, separated by greater than or equal to 4 weeks.

If parenteral vaccine is used and there is insufficient time for two doses of vaccine separated by greater than or equal to 4 weeks, common practice has been to give three doses of the parenteral vaccine in the volumes already listed at weekly intervals, although this schedule may be less effective. Booster Doses

Under conditions of continued or repeated exposure to S. typhi, booster doses of vaccine are required to maintain immunity after vaccination with parenteral typhoid vaccines. If parenteral vaccine is used, booster doses should be given every 3 years. Even if greater than 3 years have elapsed since the prior vaccination, a single booster dose of parenteral vaccine is sufficient. When the heat-phenol-inactivated vaccine is used, less reaction follows booster vaccination by the intradermal route than by the subcutaneous route. (The acetone-inactivated vaccine should not be given by the intradermal route

because of the potential for severe local reactions.) No experience has been reported using oral live-attenuated vaccine as a booster; however, using the primary series of four doses of Ty21a as a booster for persons previously vaccinated with parenteral vaccine is a reasonable alternative to administration of a parenteral booster dose. The following routes and dosages of parenteral vaccine for booster vaccination can be expected to produce similar booster antibody responses: Adults and children greater than or equal to 10 years of age

One dose, 0.5 ml subcutaneously or 0.1 ml intradermally. Children 6 months to 10 years of age

One dose, 0.25 ml subcutaneously or 0.1 ml intradermally. The optimal booster schedule for persons who have received Ty21a vaccine has not yet been determined; however, the longest reported follow-up study of vaccine trial subjects showed continued efficacy 5 years after vaccination. The manufacturer of Ty21a recommends revaccination with the entire four-dose series every 5 years. This recommendation may change as more data become available on the duration of protection produced by the Ty21a vaccine. PRECAUTIONS AND CONTRAINDICATIONS

During volunteer studies and field trials with oral live-attenuated Ty21a vaccine in enteric-coated tablets, side effects were rare and consisted of abdominal discomfort, nausea, vomiting, and rash or urticaria. In safety trials, monitored adverse reactions occurred with equal frequency among groups receiving vaccine and placebo.

Parenteral inactivated vaccines produce several systemic and local adverse reactions, including fever (occurring among 14%-29% of vaccinees), headache (9%-30% of vaccinees), and severe local pain and/or swelling (6%-40% of vaccinees); 13%-24% of vaccinees missed work or school because of adverse reactions. More severe reactions have been sporadically reported, including hypotension, chest pain, and shock. Administration of the acetone-inactivated vaccine by jet-injector gun results in a greater incidence of local reactions and is not recommended.

The only contraindication to parenteral typhoid vaccination is a history of severe local or systemic reactions following a previous dose. No experience has been reported with parenteral inactivated vaccine nor oral live-attenuated Ty21a vaccine among pregnant women. Live-attenuated Ty21a should not be used among immunocompromised persons, including those known to be infected with human immunodeficiency virus. Parenteral inactivated vaccine presents a theoretically safer alternative for this group. SELECTED BIBLIOGRAPHY GENERAL

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