

Salmonella typhi Vi conjugate vaccine reduced the incidence of typhoid fever in 2- to 5-year-old children

Lin FY, Ho VA, Khiem HB, et al. The efficacy of a *Salmonella typhi* Vi conjugate vaccine in two- to five-year-old children. *N Engl J Med*. 2001 Apr 26;344:1263-9.

QUESTION

In Vietnamese children who are 2 to 5 years old, does vaccination with *Salmonella typhi* Vi conjugate vaccine reduce the incidence of typhoid fever?

DESIGN

Randomized (allocation concealed*), blinded (participants and outcome assessors),* placebo-controlled trial with 27-month follow-up.

SETTING

16 communes in Dong Thap Province, Vietnam.

PARTICIPANTS

12 008 children who were 2 to 5 years of age (51% boys). Children with illness that required ongoing medical care were excluded. 92% of children received 2 correctly labeled injections and completed the study.

INTERVENTION

5991 children were allocated to *S. typhi* Vi conjugate vaccine (2 doses of 22.5 µg of capsular polysaccharide and 22 µg of *Pseudomonas aeruginosa* exotoxin A in 0.5 ml of phosphate-buffered saline containing

0.01% thimerosal), and 6017 children were allocated to placebo. The children received 2 injections of either placebo or vaccine in the left deltoid muscle 6 weeks (range 28 to 57 d) apart.

MAIN OUTCOME MEASURES

Incidence of blood culture–confirmed typhoid fever at 27 months, change in anti-*S. typhi* Vi IgG antibodies over time, and adverse reactions.

MAIN RESULTS

At 27 months, more children were diagnosed with typhoid fever in the placebo group than in the vaccinated group (Table). Overall, antibody levels increased by a factor of > 575 ($P < 0.001$) in blood samples taken before

the first injection and 4 weeks after the second. The antibody response persisted throughout the 2-year study period. No serious adverse reactions were reported.

CONCLUSION

In Vietnamese children who were 2 to 5 years old, the *Salmonella typhi* Vi conjugate vaccine reduced the incidence of typhoid fever more than did placebo.

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*See Glossary.

Incidence of typhoid fever at 27 months for *Salmonella typhi* Vi conjugate vaccine vs placebo in Vietnamese children†

Protocol	Vaccine	Placebo	RRR (95% CI)	NNT (CI)
All randomly allocated children	0.08%	0.93%	91% (78 to 96)	119 (89 to 163)
Children who received 2 correctly labeled injections	0.07%	0.84%	91% (77 to 97)	130 (95 to 184)

†Abbreviations defined in Glossary; RRR, NNT, and CI calculated from data in article.

COMMENTARY

Typhoid fever continues to be a major health problem in developing countries, as well as a concern to travelers. Although effective typhoid vaccines have been used for almost 100 years, vaccination against typhoid has, to date, played a limited preventive role. 3 vaccines are available, but each has limitations (1).

The results of the well-done trial in Vietnam by Lin and colleagues of a protein-conjugated Vi vaccine are exciting. Conjugate vaccines elicit T-dependent immune responses, are more immunogenic, and are more effective in young children. In this trial, 2 doses of Vi conjugate vaccine were 91% effective (95% CI 78% to 96%) in preventing culture-proven typhoid among children 2 to 5 years of age in a highly endemic region. Among school-aged children and adults, the efficacy of the new vaccine will probably be at least as high as that among the young children.

Several important questions remain unanswered about this vaccine. How long will protection last? Will it, like other conjugate vaccines, be effective in infants, allowing it to be incorporated into existing childhood immunization programs? School-aged children have the greatest burden of typhoid, but morbidity is also high among preschool children.

School-based typhoid vaccination programs are feasible and have been shown to decrease community attack rates (2), but they require a new infrastructure and do not protect younger children. How might this vaccine be best used? Travelers to endemic areas, military personnel, and residents of highly endemic countries are likely candidates. Novel uses for a highly effective vaccine should be considered, including aiding in the control of epidemics that result from highly resistant organisms (3).

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