

A conversation with Dr. Neal Halsey on January 13, 2015

Participants

- Dr. Neal Halsey – Professor of International Health and Director of the Institute for Vaccine Safety, Johns Hopkins Bloomberg School of Public Health
- Jake Marcus – Research Analyst, GiveWell

Note: These notes were compiled by GiveWell and give an overview of the points made by Dr. Halsey.

Summary

GiveWell spoke with Dr. Halsey as part of its investigation into maternal and neonatal tetanus prevention. Conversation topics included the relationship between doses of tetanus toxoid-containing vaccines and immunity in mothers and children, problems with subpotent vaccines, and the challenges of collecting data on immunization rates.

Tetanus vaccination and immunity

There is human variability in the antibody response to any vaccine so it is impossible to make absolute rules about the relationship between tetanus toxoid-containing vaccine (TCV) doses and immunity in mothers and children. However, there are some widely accepted guidelines:

- 3 doses of a TCV by 12 months of age will produce long-term immunity (10-20 years) in nearly everyone; some women will have enough of an antibody response to protect their offspring
- 3 doses of a TCV by 12 months of age and a booster dose given at some point in childhood or during pregnancy will provide immunity for mothers and their infants through the childbearing years.
- 2 doses of a TCV will produce protective levels of antibodies in almost all individuals for up to 2 years
 - 2 doses before age 12 months and a single booster during pregnancy or before will protect some mothers and their infants
- 2 doses in a previously unimmunized pregnant woman will produce enough antibodies to protect herself and her infant during that pregnancy, but it is recommended that the mother get a third dose at some point to ensure immunity throughout the childbearing years

Guidelines and recommendations

The three recommended doses in infancy are usually delivered in conjunction with the vaccines for diphtheria and pertussis (DTP3). While it is recommended to receive the three doses in infancy, there is a strong immunological memory associated with this vaccine. Women who receive two or three doses during infancy and a single dose at age 20 will still show a strong antibody response.

Because it is difficult to keep records of vaccinations and people can often forget what immunizations they have received, it's better to give a single TCV booster in pregnancy, even if women may have already received three to four doses in the past.

There is some uncertainty about the immune response to a single childhood dose of a TCV and a booster later in life. Some data show that people will have an immune response to a second dose up to 10 years after the initial exposure.

Subpotent vaccines

In the early 1990s, the WHO and a group of individuals, including John Bennett from the Carter Center, identified subpotent TCVs. These vaccines were not producing enough antibody response to ensure immunity. There were cases of neonatal tetanus in women who had received two doses. Since then, the WHO has strengthened its certification process to cover all vaccines used in its program. It is still possible, however, that there are manufacturers producing poor quality TCVs.

Coverage rate uncertainties

Surveys in adults that attempt to measure TCV coverage rates rely on individuals' abilities to recall past immunizations. Because of this, these surveys do not measure infancy DTP3 immunizations. Surveys will generally ask women of childbearing age how many doses of a TCV, including booster doses, they received as an adult. Because women might have received between one and three doses of a TCV in infancy and any number of boosters during childhood or adulthood, there is a lot of uncertainty.

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