A goal of eliminating neonatal tetanus (NNT) by 1995 was declared by the World Health Assembly in 1989 and further endorsed at the World Summit for Children in 1990. Tetanus is responsible for 14 percent of all neonatal deaths globally and is a leading cause of neonatal mortality in the poorest parts of the world.

What Has Been Accomplished and Learned in the Past Ten Years?
Each case of neonatal tetanus represents multiple failures of health services to provide routine immunization, antenatal care, and clean delivery and cord care services. NNT is completely preventable by immunizing females before or during pregnancy or by ensuring clean delivery, clean cutting of the umbilical cord, and proper care of the cord in the days following birth. A series of highly effective, safe, and inexpensive tetanus toxoid immunizations can be given during a wide window of opportunity, lasting from infancy through adulthood.

The bacteria that cause tetanus are found everywhere in the environment, and everyone is susceptible to the disease. NNT occurs most commonly when tetanus spores contaminate the umbilical cord as it is being cut or dressed after delivery. In the developing world the disease rapidly progresses to difficult breathing, exhaustion, starvation, and, in most cases, death. Maternal tetanus is the result of contamination from tetanus spores, usually linked to unsafe abortion practices or unhygienic deliveries.

The World Health Organization (WHO) estimates that on average, only five percent of NNT cases are actually reported to health services. Because the disease does not occur in epidemics, it often goes unnoticed. An infant with NNT usually dies at home without being seen by a health worker. In most developing countries, neither the birth nor early death is registered in any vital events reporting system. For these reasons, neonatal tetanus is called the “silent killer.”

Elimination of NNT by 1995 was redefined as less than one case per 1000 live births in every district in every country. Major progress toward that goal has been achieved. In 1995 alone, an estimated 700,000 potential deaths due to NNT were prevented. By 1999, 104 out of 161 developing countries had achieved elimination.

However, an estimated 289,000 cases of NNT continue to occur annually, with the case fatality rate averaging 70 percent. WHO estimates that 215,000 infants died from tetanus in 1998. In addition, some 30,000 women die each year from maternal tetanus. Reported immunization coverage of women of childbearing age with two or more doses of tetanus toxoid (TT) has remained stagnant in developing countries (at slightly less than 50 percent) since the mid-1990s, although evidence from several countries indicates that the proportion of protected women is higher than reported immunization coverage.

The goal of maternal and neonatal tetanus (MNT) elimination by 2005 was recently declared by UNICEF, WHO, and UNFPA. Substantial resources have been raised, resulting in renewed momentum to eliminate MNT in the 57 countries that have not yet done so. Approximately 100 million women are considered at highest risk and in need of immunization.
What Are the Challenges?

In addition to difficulties in reaching the poorest and least educated populations who lack regular access to health services, tetanus control poses special challenges. Accurate measurement and interpretation of immunization coverage is difficult because women of childbearing age need multiple doses over a thirty-year span—with varying intervals between doses—and unprotected women enter childbearing age each year.

Detection of NNT is made difficult by reluctance in some cultures to acknowledge cases of the disease, poor health facility coverage, and undeveloped disease surveillance in underserved areas. In addition, areas of high risk are difficult to identify precisely in the least developed countries. In countries with the weakest infrastructure and highest mortality, NNT may not cluster in focal areas, but may be more widespread, appearing in "silent" areas where disease surveillance has limited reach. As a non-communicable disease, NNT does not exhibit the familiar epidemiological patterns of other vaccine-preventable infectious diseases, such as measles, poliomyelitis, and smallpox.

Yet it is not necessary to locate every case to know that tetanus is a problem. Wherever neonatal mortality is high, tetanus is usually a major contributor. The factors contributing to its high incidence are widespread and well recognized in the least developed countries:

- poor access to or use of general health services, including child immunization,
- low access to or use of antenatal care services, including maternal immunization,
- high incidence of home deliveries, often unassisted or assisted by unskilled attendants,
- a predominantly rural population engaged in agriculture,
- proximity to farm animals,
- low literacy levels and income.

Since antenatal care services are not well developed in many areas where tetanus remains a problem, population-based strategies to control the disease have been developed. The World Health Organization pioneered a strategy of continuous immunization with a total of five doses of tetanus toxoid for women of childbearing age, including pregnant women.

This strategy does not protect individual newborns as rapidly as does immunizing women who are already pregnant, but eventually it protects the susceptible population. However, because women must be screened and immunized or referred during any health facility visit, it has been difficult to implement this strategy without strong commitment by health services, additional resources, and durable, patient-held immunization records.

Many of the immunization strategies aimed at different target groups can be used to control tetanus. There is no single global blueprint for all situations. Different strategies need to be used and combined, over time, to control the disease at affordable cost. The immunization strategies and the most appropriate target groups must be defined in each country, based on local data and operational and financial circumstances.

Another challenge is the need for sustained effort. As an environmental hazard, tetanus can never be eradicated. Its elimination as a public health problem will need to be maintained year after year through continuous political commitment and application of resources.

What Must Be Done?

Just 27 countries account for 90 percent of the global burden of MNT cases: Afghanistan, Angola, Bangladesh, Burkina Faso, Cambodia, Cameroon, Chad, China, Côte d’Ivoire, the Democratic Republic of Congo, Ethiopia, Ghana, Guinea Bissau, India, Indonesia, Liberia, Mali, Mauritania, Mozambique, Nepal, Niger, Nigeria, Pakistan, Senegal, Somalia, Sudan, and Yemen.

As part of broader national immunization plans, many of these countries are articulating the strategies, activities, and resources needed to achieve and maintain MNT elimination. Nearly 60 percent of the $100 million in external support needed for national efforts to achieve the MNT elimination goal by 2005 has been raised.

For countries to achieve MNT elimination, WHO, UNICEF, and UNFPA advocate the “high-risk approach.” This strategy involves identifying districts at highest risk within countries and focusing interventions in those areas. The primary elements of the program include supplemental tetanus immunization of at least 80 percent of all women of child-bearing age with three properly spaced doses of tetanus toxoid to quickly clear the backlog of
unprotected women, thereby providing immunity lasting more than five years. The strategy then calls for maintaining elimination in formerly high-risk districts by routinely vaccinating pregnant women, increasing routine DTP coverage for children, and increasing women’s access to and use of clean delivery services.

To maintain the decline of tetanus, some countries may need to repeat supplementary tetanus immunization periodically in inaccessible, underserved areas as new cohorts of under-immunized women enter their childbearing years and as immunity wanes among previously vaccinated women. Disease surveillance in “silent” areas will need to be improved and a constant effort made to detect new high-risk areas. The frequency of follow-up supplemental immunization to maintain high levels of protective immunity in a population may need to be determined through periodic serologic studies until routine disease surveillance can be improved. In addition to strengthening surveillance, there is a need to improve current systems that routinely monitor coverage with tetanus toxoid and clean delivery.

Longer-term strategies are also required to protect adolescent females entering the period of risk. Their need for timely protection cannot be met solely by infrequent follow-up campaigns. To maintain the momentum and political interest associated with the supplemental immunization of childbearing-age women in high-risk areas and to take advantage of gains being made in infant immunization, school-based immunization can be introduced in areas where a high proportion of girls (e.g., more than half) are enrolled in the early grades of primary school. School-based tetanus immunization, whether as priming or booster doses, increases the duration and level of protection of girls before they enter childbearing age and sharply reduces the number of doses required later for complete protection. This is an important operational consideration because these females will be more difficult to reach routinely after they become adults. All girls and boys in the early grades can be immunized during a single annual visit to each primary school.

During the past decade, female enrollment rates in primary school increased dramatically in many developing countries. Tetanus toxoid immunization is especially cost effective when added to an integrated, comprehensive package of school health services. Where appropriate, such school-based approaches can sustain the gains achieved during supplementary “high-risk” immunization activities by channeling political interest into longer-term follow-up action.

Other new approaches and technological developments are needed. Simple and robust population-based serological methods, which use filter paper to detect anti-tetanus antibody levels among women of childbearing age, are under development. In areas with poor disease surveillance, field assays that use minimally invasive methods of sample collection (e.g., finger-prick or saliva) in combination with appropriate sampling methods will assist in confirming areas suspected of being at high risk, targeting scarce resources to areas of highest susceptibility, and monitoring progress. The introduction, testing, adaptation, and marketing of inexpensive clean birth kits in partnership with the private sector shows promise for reducing harmful practices during home deliveries. A slow-release micro-encapsulated tetanus toxoid vaccine is currently being tested in clinical trials. Another need is for the design and introduction of long-lasting immunization records that women and girls can keep at home.

Auto-disable, single-dose injection devices have emerged as an important tool for increasing tetanus immunization coverage while strengthening safe injection practices among underserved populations. One easy-to-use injection device is pre-filled with a single dose of tetanus toxoid and cannot be reused. These injection devices may enable programs to try innovative approaches to expanding immunization coverage, such as administration by trained birth attendants or other lay providers and use in areas of limited health facility infrastructure and staff shortages. They may also provide cold chain flexibility during storage and transport, and may overcome acceptability concerns, such as fear of unsafe injections.

Recommended strategies to eliminate maternal and neonatal tetanus have already proven effective, feasible, safe, and affordable in many of the least developed countries. Financial and human resources and strong political support will be required to achieve and maintain elimination. With that support, elimination of maternal and neonatal tetanus as a public health problem in every country is indeed possible by 2005.

—Robert Steinglass
References


