Philosophic Objection to Vaccination as a Risk for Tetanus Among Children Younger Than 15 Years

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ABSTRACT. *Objectives.* **Although safe and effective vaccines are available to protect against tetanus in the United States and vaccination rates are high, cases of tetanus among children continue to occur. The objectives of this article are to describe reported cases of tetanus in children in the United States and to identify the reasons for lack of protection against tetanus.**

Methods. **We reviewed all cases of tetanus in children <15 years of age that were reported to the National Notifiable Diseases Surveillance System from 1992 through 2000. Cases were defined by physician diagnosis. We verified the information in the case reports with state and local health departments.**

Results. **From 1992 through 2000, 15 cases of tetanus in children <15 years of age were reported from 11 states. Twelve cases were in boys. Two cases were in neonates <10 days of age; the other 13 cases were in children who ranged in age from 3 to 14 years. The median length of hospitalization was 28 days; 8 children required mechanical ventilation. There were no deaths. Twelve (80%) children were unprotected because of lack of vaccination, including 1 neonate whose mother was not vaccinated. Among all unvaccinated cases, objection to vaccination, either religious or philosophic, was the reported reason for choosing not to vaccinate.**

Conclusion. **The majority of recent cases of tetanus among children in the United States were in unvaccinated children whose parents objected to vaccination. Parents who choose not to vaccinate their children should be advised of the seriousness of the disease and be informed that tetanus is not preventable by means other than vaccination.** *Pediatrics* **2002;109(1). URL: http://www.pediatrics.org/cgi/content/full/109/1/e2;** ***tetanus, vaccination, vaccine exemption, immunization law.***

ABBREVIATIONS. CDC, Centers for Disease Control and Prevention; TIG, tetanus immune globulin.

Since the mid-1990s, marked progress has been made to increase overall vaccination rates in the United States.[1] Despite this success, pockets of low vaccination coverage persist, especially among groups of religious or philosophic objectors to vaccination. Historically, these groups have experienced periodic outbreaks of vaccine-preventable diseases, eg, measles, pertussis, and polio.[2–5]

In recent years, concerns about the safety of vaccines have been highlighted by the news media and may have influenced additional parents to refuse vaccination for their children.[6] Recent studies suggest that a major factor contributing to this decision is the sense that the vaccines are more dangerous than the diseases against which they protect. Other factors include the beliefs that the diseases are rare because of herd immunity and that parents can protect their children from contracting the disease and from experiencing disease-related complications.[7]

Tetanus is unique among vaccine-preventable diseases in that it is not contagious and the causative agent, *Clostridium tetani*, is ubiquitous in the environment. Herd immunity plays no part in protecting individuals or the community. Tetanus toxoid-containing vaccines have demonstrated high effectiveness.[8] Thus, most cases of tetanus are in people who are unvaccinated, are partially vaccinated, or have waning immunity.[9]

Cases of tetanus in the United States have been reported to the National Notifiable Diseases Surveillance System, Centers for Disease Control and Prevention (CDC), for >30 years.[9] These reports include information about tetanus vaccination but not the reason for lack of vaccination. This report describes cases of tetanus among children <15 years of age in the United States from 1992 through 2000 and examines reasons for the lack of vaccination against tetanus.

METHODS

Cases of tetanus are reported on a weekly basis by state and local health departments to the National Notifiable Diseases Surveillance System.[9] A case of tetanus is defined as an illness with acute onset of hypertonia and/or painful muscular contractions (usually the muscles of the jaw or neck) and generalized muscle spasm without other apparent cause.[10] Tetanus is a clinical diagnosis; there is no specific confirmatory laboratory test.

We reviewed information available for all cases of tetanus among children <15 years of age reported to the National Notifiable Diseases Surveillance System from 1992 through 2000. In 1992, an expanded case report form was implemented for the surveillance system. This form requested information on age, vaccination history (maternal vaccination history if a neonatal case), description and setting of the wound, medical care for the wound before the onset of tetanus, clinical course, treatment including time to receipt of tetanus immune globulin (TIG; listed as a categorical variable), and outcome.

Until 2001, information about the reason for not vaccinating was not specifically requested on the reporting form but frequently was documented in the "comments" section. We contacted state epidemiologists to verify information on the case

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report forms and to complete information about the reason for lack of vaccination among unvaccinated cases.

We defined "vaccine objectors" as parents who refused vaccine(s) for their children for any reason, including individuals who had taken legal exemption from vaccination requirements and individuals who unofficially refused vaccine for philosophic or religious reasons. The term "exemptor" has been used in other reports exclusively for individuals who have a legal exemption from vaccination.[5,11]

RESULTS

From 1992 through 2000, 386 cases of tetanus were reported in the United States (2000 data provisional, CDC unpublished data). Fifteen cases (3.9%) were among children <15 years of age. Fourteen of the cases were white, non-Hispanic in children, and 1 case was in a Hispanic child. Cases were reported from 11 states; all cases were indigenous to the United States.

Among the 15 cases of tetanus in children, 2 cases in neonates were reported previously[12,13] (Table 1). The median age of the 13 non-neonatal cases was 9 years (range: 3–14 years). Twelve of 15 cases were in boys. Two children had received ≥5 doses of tetanus toxoid-containing vaccine 2 and 4 years before onset of tetanus, respectively. The mother of 1 neonate (Table 1, case 1) reported receiving a single dose of tetanus vaccine in Mexico, before moving to the United States, 18 years before the infant was born. Objection to vaccination, either religious or philosophic, was given as the reason for not vaccinating all of the remaining 11 children and the mother of 1 neonate (Table 1, case 2).

Both neonates had umbilical infection, 1 after application of "healing" clay to the umbilical stump.[13] Among the 13 non-neonatal cases, the source of injury was a puncture wound in 11 cases (73%) and blunt trauma in 2 cases. Eight of the puncture wounds were sustained on the foot when the child was outdoors. TIG was administered to 13 of 15 children. The median interval between the onset of symptoms and administration of TIG was 1 to 4 days (range: 7 hours to >15 days).

Tetanus was associated with severe disease and complications, particularly among unvaccinated children. Eight children (53%) required mechanical ventilation. The median length of hospitalization was 24 days (range: 1–60 days). One of the 2 children for whom TIG was refused for religious reasons had complications of a perforated colon and prolonged hospitalization (Table 1, case 12). Children who were fully vaccinated experienced milder tetanus illness than the unvaccinated children (median: 2-day compared with 25-day hospitalization, respectively). There were no deaths.

DISCUSSION

C tetani is a normal inhabitant of soil and of animal and human intestines. Disease results when anaero-

TABLE 1. Characteristics of Cases of Tetanus

Case	Age	Gender	State	Year	Tetanus Toxoid History	Description of Injury	Puncture	Time to TIG‡	Length of Hospitalization	Ventilator	Reason Unvaccinated/Time Since Last Dose
1	7 d	M	TN	1995	1 TT*	Umbilical wound	No	7–23 h	60 d	30 d	Partially vaccinated—18 y
2	9 d	F	MT	1998	0*	Umbilical wound/contaminated clay	No	7–23 h	19 d	12 d	Philosophic—mother unvaccinated
3	3 y	M	MO	1995	0	Bug bite on leg	Yes	15+ d	24 d	9 d	Religious—Assembly of Yahweh
4	4 y	M	IN	1999	0	Stepped on wire in barn	Yes	5–9 d	26 d	22 d	Religious—Amish
5	5 y	M	FL	1999	0	Stepped on thorn	Yes	1–4 d	10 d	No	Religious
6	8 y	M	MI	1992	0	Stepped on stick	Yes	—	36 d	Yes (>18 d)	Philosophic
7	8 y	M	CA	1998	0	Puncture and abrasion on hand and foot	Yes	1–4 d	12 d	No	Philosophic—personal belief exemption
8	8 y	F	OH	1998	0	Kicked tree stump in yard	No	—	6–8 wk	Yes	Religious—Amish
9	9 y	M	PA	1995	0	Splinter in bare foot	Yes	5–9 d	38 d	No	Religious—Amish
10	12 y	M	MO	1992	0	Stepped on nail in barn	Yes	Refused TIG	—	No	Religious—Amish
11	12 y	F	TX	1994	5 DTP†	Stepped on rake	Yes	5–9 d	1 d 6 wk home care	No	Vaccinated—4 y
12	12 y	M	WV	1997	0	Stepped on nail in barn	Yes	Refused TIG	60 d	Yes	Religious—belief in holistic medicine
13	12 y	M	PA	2000	0	Concrete block fell on elbow	No	1–4 d	16 d	No	Religious—Amish
14	13 y	M	MI	1992	0	Cut finger at home	Yes	10–14 d	—	Yes	Religious—Amish
15	14 y	M	PA	1997	6 DTP†	Small dog bite on lower calf	Yes	7–23 h	3 d	No	Vaccinated—2 y

DTP indicates diphtheria and tetanus toxoid, and pertussis-containing vaccine; TT, tetanus toxoid-containing vaccine.
* Maternal vaccination.
† Confirmed by vaccination record.
‡ Categories for the interval between the onset of symptoms and receipt of TIG included <7 h, 7–23 h, 1–4 d, 5–9 d, 10–14 d, and >15 d.

bic conditions in a contaminated wound allow germination of *C tetani* spores. The initial injury can be seemingly mild or inapparent.[14] The spectrum and severity of illness exhibited by patients in this case series were consistent with the spectrum and severity of cases reported in the literature. The length of the illness in tetanus ranges from 3 weeks to 2 months; typically, muscle spasms subside after 2 weeks and may resolve within 1 month.[15] Treatment often requires that the patient be sedated and mechanically ventilated for long periods. Although none of the children in this series died, the reported case fatality ratio may range from 10% to 90%. Higher rates of survival correlate with longer incubation periods and with access to high-quality medical care, including mechanical ventilation.[14]

The distinctive finding among our cases was that all children who were unvaccinated had not received vaccine because of religious or philosophic objection to vaccination. The mother of 1 neonate, a Mexican immigrant who had received only 1 dose of tetanus toxoid-containing vaccine, was the only exception. Her 2 previous pregnancies in the United States had provided opportunities to complete or update her vaccination against tetanus.[12]

Immunization laws for tetanus toxoid-containing vaccine for school entry are mandated by all states. Three types of exemptions from vaccination are recognized: medical, religious, and philosophic. In 1999, all 50 states allowed medical exemptions, 48 states allowed religious exemptions, and 15 states allowed philosophic exemptions.[1] Limited information is available nationally on the number of parents who exempt from vaccinations as required for school entry or on the number of parents who home-school their children and are not covered by school immunization laws.[16]

In our series, the small proportion of tetanus cases that were in children who were fully vaccinated reflects the high effectiveness of tetanus vaccines. Tetanus in fully vaccinated children is rare but well-documented.[17] Vaccination can modify the severity of the disease[18]; the vaccinated children in this series experienced milder tetanus illness than the unvaccinated children. At least 3 doses of tetanus toxoid-containing vaccine are required for adequate, long-lasting protection against tetanus.[19] Five doses of a tetanus toxoid-containing vaccine consisting of a primary series and 2 booster doses starting in infancy and booster doses at 10-year intervals are recommended by the CDC's Advisory Committee on Immunization Practices to produce and to maintain a high level of protection against tetanus.[20]

Our cases likely constitute an underestimate of the actual number of tetanus cases in children during the study period. Although tetanus is a reportable disease in all states, not all cases are recognized or reported.[21] National surveillance for tetanus, which is a passive reporting system, depends on voluntary reporting from clinicians through state and local health departments. If all tetanus cases had been reported, then the proportion of cases in vaccine objectors might be different.

Tetanus in individuals who are not protected can result from mild injury and can cause life-threatening disease even with the availability of intensive medical care. Vaccination against tetanus is highly effective for the individual but provides no protection for the community. Cases of tetanus in children may be sentinel events for recognizing pockets of underimmunization and groups that are at risk for contracting other vaccine-preventable diseases. Parents who choose not to vaccinate their children should be advised of the seriousness of the disease and informed that tetanus is not preventable by means other than vaccination.

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