

C. tetani is an anaerobic, gram-positive, spore-forming rod whose spores are highly resilient and can survive readily in the environment throughout the world. Spores resist boiling and many disinfectants. In addition, *C. tetani* spores and bacilli survive in the intestinal systems of many animals, and fecal carriage is common. The spores or bacteria enter the body through abrasions, wounds, or (in the case of neonates) the umbilical stump. Once in a suitable anaerobic environment, the organisms grow, multiply, and release tetanus toxin, an exotoxin that enters the nervous system and causes disease. Very low concentrations of this highly potent toxin can result in tetanus (minimal lethal human dose, 2.5 ng/kg).

In 20–30% of cases of tetanus, no puncture entry wound is found. Superficial abrasions to the limbs are the most common infection sites in adults. Deeper infections (e.g., attributable to open fracture, abortion, or drug injection) are associated with more severe disease and worse outcomes. In neonates, infection of the umbilical stump can result from inadequate umbilical-cord care; in some cultures, for example, the cord is cut with grass or animal dung is applied to the stump. Circumcision or ear-piercing also can result in neonatal tetanus.

■ EPIDEMIOLOGY

Tetanus is a rare disease in the developed world. Two cases of neonatal tetanus have occurred in the United States since 2009. In 2018, 23 cases of tetanus were reported to the U.S. national surveillance system, almost all of which were in adults. Most cases occur in incompletely vaccinated or unvaccinated individuals. Vaccination status is known in 25% of cases reported in the United States between 2009 and 2015; among these cases, only 20% of patients had received three or more doses of tetanus toxoid—containing vaccine.

Persons >60 years of age are at greater risk of tetanus because antibody levels decrease over time. Approximately one-quarter of recent cases in the United States were in persons >65 years old. Diabetes is associated with increased tetanus risk, representing 13% of all cases and 25% of deaths in 2009–2015. People who inject drugs—particularly those injecting heroin subcutaneously (“skin-