

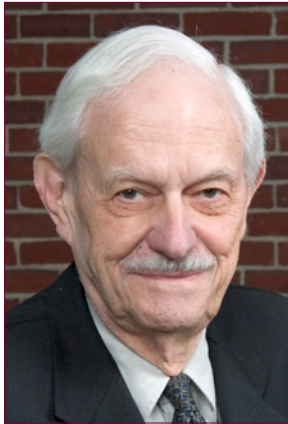
[Editor's Note: The following commentary, written by the late Stanley M. Aronson, MD, first appeared in the August 2008 issue of the Journal.]

These are the Times that Try Men's Soles

STANLEY M. ARONSON, MD

ON MEMORIAL DAY OF this year, the New York City Department of Health warned Manhattan citizens to refrain from removing their shoes and socks when walking through Central Park. This edict was not prompted by any imminent threat of hookworm disease [typically transmitted via bare feet] or of an alien virus, heretofore unknown, that thrives in new-mown grass and endangers the lives of those foolhardy enough to expose their toes. No, the warning was issued because of the extremely remote threat of stepping on a rusty nail contaminated with tetanus germs. No actual cases were cited.

There always seems to be someone to take the simple, pastoral joys out of life, to deny humanity certain inalienable pleasures. For a constricted civilization confined to their shoes, ties, beliefs and other paraphernalia, there arises a visceral, indeed atavistic, pleasure in walking barefoot upon a verdant lawn. Imagine if walking barefoot were declared illegal except for one day in mid-June, each year. Oh, how citizens would flock to the parks on that joyous day and revel in experiencing the tingling of grass upon their naked feet, with no intervening socks or shoes. It is perhaps akin to Emerson's observation: "If the stars should appear but one



night in a thousand years, how would man believe and adore."

This is not to deny the malign role of the tetanus germs in human history. Admittedly, tetanus infection survives only in a narrow niche of human experience. Unlike the germs that cause great epidemics, it

is transmitted neither by air nor contaminated water; nor does it travel from person to person via venereal contact or by contaminated needles or blood specimens; nor even by the intermediacy of an insect such as the anaphelene mosquito. It is a disease which is infectious but not communicable.

The germs of tetanus [*Clostridium tetani*] are extremely hardy, capable of surviving even in the absence of oxygen. They thrive in the manure of domesticated livestock and therefore in the pastures that provide fodder for cattle. The tetanus germ is able to subsist for years as inactive spores intermixed in the top soil of pastureland. But when, for example, fragments of muddied clothing [bearing tetanus spores] are thrust into the body following battle wounds, the tetanus spores become activated, multiply and produce an exotoxin [called tetanospasmin], a nerve poison which is then carried by nerve fibers and the

bloodstream to the remainder of the body, thus affecting the connections between motor nerves. This chemical disturbance of the junction between nerve endings causes intense and painful muscle spasms called tetany. The jaw muscles contract, for example, producing a phenomenon called lockjaw. Difficulties in swallowing and even breathing arise, followed by lability in both blood pressure and body temperature. The muscle spasms are unyielding and may

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result in severe arching of the trunk. If untreated, death generally ensues within days. Tetanus infection is such a common complication of battlefield wounds that members of the military in most armies are routinely immunized against tetanus infection. In World War II, among 4.5 million Americans who were wounded in battle, only four cases of tetanus were recorded, a tribute to the military immunization program.

Deep wounds sustained by civilians are routinely treated with surgical debridement and tetanus immunization. Thus, tetanus infections in nations such as the United States are now rare.

During the last decade there have been about 43 cases of tetanus recorded per year in the United States. The great

majority have been documented in California, Texas and Florida. The protective effects of childhood vaccination against tetanus, [a requirement for entrance into the public school system of all 50 states], tend to diminish over the years, thus making the elderly or foreign-born immigrants substantially more susceptible to tetanus infection. Two other groups are particularly vulnerable: those with diabetes and those chemically dependent who employ illicit drugs such as heroin intravenously. In the case of addicts, the germs are introduced by syringe needles which are contaminated with soil.

Yet tetanus infection persists elsewhere, particularly as a major cause of death amongst newborns, especially in southern Asia and Africa. Two traditional factors contribute materially to

the presence of tetanus infection in the newborn. First, in many cultures, the severing of the newborn's umbilical cord is done ritually by using the father's scythe, thus symbolically reaffirming the paternity of the offspring. Yet another source of contamination is the use of mud packed against the umbilical stump of the newborn to diminish the bleeding, a common maneuver in regions without health centers. In both instances – the farming implement and the farmyard mud – the likelihood of contamination from tetanus spores is high. The World Health Organization estimates that 400,000 to 600,000 infants die each year from tetanus infection.

A myth prevails in the United States that penetrating wounds caused by rusty nails result in tetanus. It is not the rust but the soil-contamination with tetanus

germs that remains the cause. Tetanus infection, for practical purposes, has now become a burden virtually confined to third world nations, and particularly their rural newborn. The New England states have not seen a case of tetanus for over a decade, even amongst its barefoot-in-the-park population. ❖

Author

Stanley M. Aronson, MD, (1922–2015) was a neuropathologist, Editor-in-Chief of the *Rhode Island Medical Journal*, (1979–1989), and founding Dean of Brown Medical School, (1972–1981).