

One Man's Poison ... [is another's unfurrowed brow]



The ancient Sumerians, ancestors to the Babylonians, Hebrews and Assyrians, had shown resourcefulness in taking discarded scraps of meat, seasoning them with salt and herbs, chopping them up and then molding them into cylindrical shapes by stuffing the mash into cleansed animal intestine. Homer, in his *Odyssey*, talks of blood sausages; and there are sufficient references to this form of preserved meat to verify that the preparation of sausages was also widely practiced in ethnic cultures far removed from the Middle East and Mediterranean. The English word, sausage, is derived directly from the French word, *saucisse*, which in turn has descended from the Latin, *salsus*, meaning to salt and thus to preserve. Yet another Latin word for sausage is *botulus*.

The ancient Roman cuisine, particularly in the southern Italian region of Lucania, was richly enhanced by varieties of sausage. These meat-containing delicacies became closely associated with the promiscuous Roman fertility festival of Lupercalia; so much so that the early Church determined that eating sausage was a sin. By the Tenth Century, the Byzantine Empire outlawed its production and consumption.

In the Middle Ages sausages continued to enliven the peasant diet despite ecclesiastic disapproval. Each European nation developed its own formula of meats, animal blood and herbs such that geographic enclaves were closely identified with their own distinctive wines, cheeses and sausages. Germany took great pride in its immense variety of sausage, collectively called *wurst*, often naming them after one or another German city [eg, *Frankfurter*.]

The German penchant for sausage led inevitably to published instances of food poisoning associated with poorly prepared sausage. It is not that cases of sausage poisoning were confined to the German states. Rather, the German medical profession was then sufficiently advanced to underwrite numerous medical periodicals reporting new or unusual illnesses. In 1822 the German physician Justinus Kerner described cases of food poisoning, ascribing them to the consumption of indifferently prepared sausages. By 1870 these isolated cases of sausage poisoning were called botulism, named after the Latin word for sausage, to distinguish such cases from other varieties of food poisoning. The underlying biochemical cause of botulism, however, remained a mystery.

The incubation interval in individuals suffering from acute botulism—the time between ingestion of poisoned food and the arrival of symptoms—tends to be brief, generally less than a few hours. The roster of acute symptoms includes abdominal pain, nausea and vomiting, followed by a dry mouth and blurred vision. If the intoxication is more severe, these inaugural symptoms are followed by difficulty in speaking and swallowing and weakness of limb muscles. In even more severe cases, there is respiratory compromise due to the involvement of the muscles needed to breathe.

In 1895 the Belgian bacteriologist Emile van Ermengem isolated specific bacteria from sausages which had caused botulism, microorganisms now classified as *Clostridium botulinum*.

By 1944, the toxin elaborated by these bacteria was finally isolated and purified. Gram for gram, it became the world's most lethal poison. Scientists have since demonstrated that the toxin attacks the nerve endings, preventing nerve impulses from reaching, and thus activating, muscle fibers. In summary, the sole known effect of the botulinus toxin is to inactivate nerve endings and cause muscle flaccidity and paralysis. The effects are temporary, wearing off in weeks or months, but botulism will be fatal if the muscles needed to aid in breathing are widely impaired. Having isolated the neurotoxin, the development of an effective antitoxin vaccine was quickly achieved.

Cases of botulism caused by sausage contamination have become increasingly rare. Most cases of botulism now are secondary to improperly sterilized home canning of foods.

There had been a time, once, when the name Bo-Tox might have suggested a rising star from the movies or the world of jazz [such as Bo Diddley, Bo Diddie or Bo Derek]. But the discoveries of Jean and Alastair Carruthers, a husband and wife team of physicians, during the 1990s, brought specific meaning to the term as a shortening of the words, botulinus toxin. They noted that the injection of an extremely dilute solution of this toxin often flattened the folds of the human forehead, sometimes called the glabellar wrinkles, by paralyzing the subcutaneous muscles. The therapeutic erasure of these wrinkles, often associated with advanced aging, caused a rejuvenation of the cosmetically treated face lasting up to six months. By 1999 over 4.7 million botox treatments had been undertaken.

And thus, from a banal form of food poisoning in German sausage, to a recognition that certain *Clostridium* bacteria elaborate a highly poisonous neurotoxin, and finally the extracting of this botulinus toxin, taming it by extreme dilution and thus converting it into a widely used, safe cosmetic aid in erasing wrinkles and other unseemly skin folds. Other beneficial uses of bo-tox include counteracting the severe muscle spasms that often accompany limb fracture, the treatment of neck muscle spasms, strabismus [cross-eyedness], a newer therapy for tension or migraine headache and yet other medical conditions. Truly, beginning with the world's most powerful poison, a wondrous transformation, a Cinderella story.

— STANLEY M. ARONSON, MD

Disclosure of Financial Interests

Stanley M. Aronson, MD, has no financial interests to disclose.

CORRESPONDENCE

e-mail: SMAMD@cox.net