

## Beauty and the Beast

It rarely happens that the glamour business enters the domain of public health and national security, but it just did. One of the most rapidly growing cosmetic surgical procedures in the United States, especially in high-fashion centers and the entertainment industry, is the injection into the forehead of botulinum toxin, known in the beauty trade as Botox. The use (or abuse) of this procedure, which eliminates frown lines by immobilizing the muscles that yield them, is raising some interesting and unexpected concerns.

First some background, which is necessary because discussions of the procedure in the mainstream media, including an in-depth report in the *New York Times* (7 February 2002, p. 1), have skirted tactfully around the matter of what this powerful drug is and what it does. It's the product of a highly toxic microorganism, *Clostridium botulinum*. What the poison does is to block the release of the neurotransmitter acetylcholine from the endings of motor nerves, so that the muscles they innervate are paralyzed. Conveniently for the plastic surgeons, the toxin is durable enough to last for several months. More conveniently still, the paralysis then wears off, so that the patient has to come back for another shot or learn to live with a face that appears to be aging really fast.

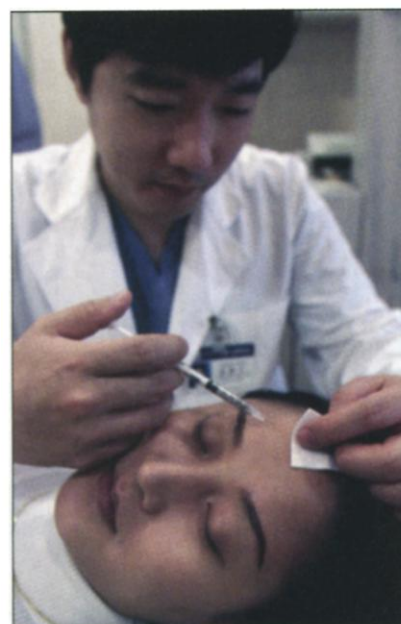
The issues emerging from this practice run the gamut from funny to deadly serious. At the funny end is the plight of the poor Hollywood producers who, according to reports, now just can't find actresses over 40 whose faces look as though their owners have ever worried about anything.

Just in case that doesn't seriously trouble you, here's the next-level worry. The Food and Drug Administration (FDA) has approved botulinum toxin for medical treatment of eye muscle spasms and is now apparently considering approval of its use for this cosmetic purpose. Meanwhile, as often happens, an exploding market opportunity has led to widespread prescription of the toxin for an unapproved use—one that is both highly lucrative and medically entirely unnecessary. This issue is a hardy perennial. When I was at the FDA in the late 1970s, amphetamines were being widely prescribed for weight loss: an unapproved use that, to our sorrow, also widened their diversion for recreational purposes. Because off-label prescription can sometimes be a valuable and innovative medical practice, it cannot be condemned out of hand. But because there is no valid medical benefit from the cosmetic use of botulinum toxin for wrinkle management, the FDA should look skeptically before approving it.

More serious yet is the growing demand for a pathogen and its toxin that constitute both a public health problem and a leading candidate for use in biological warfare. Security analysts (including biowarfare expert D. A. Henderson) rank *C. botulinum* high—right after anthrax—on the list of organisms that terrorists and others might deploy. That is why a 15-year effort has been under way at Fort Detrick, Maryland, to develop a vaccine to protect our troops abroad and, if needed, our civilians at home. The National Institute for Allergy and Infectious Disease (NIAID) is also at work on a vaccine. Some of those who profit from the cosmetic procedure apparently aren't very happy about this; in any event, the Army vaccine, already well tested for safety and efficacy in rodents and nonhuman primates, has not yet been put into a Phase I clinical trial.

Meanwhile, the popularity of the Botox procedure continues to expand, and the manufacturer, Allergan, may be exploring the development of recombinant strains that might, for example, produce longer-lasting paralysis. If the number of Americans receiving treatments continues to grow, perhaps from 1 million to 10 or 20 million, and the market attracts competing firms with biotechnological expertise, will we be happy to have that many of these hot bugs around? Youthful foreheads are nice to have, but in this case they may lay some unexpected external costs on the public health system. Thus, the FDA should do a comprehensive and careful review of the risks and benefits from extending its approval of botulinum toxin to cosmetic use. The Army and NIAID should proceed with haste on the vaccine development mission. And the security community should examine the risks arising from the dual use of this technology. Who would have imagined a world in which terror weapons are employed as beauty aids?

Donald Kennedy



Administering an injection of Botox.