

Arthur E. Guedel Memorial Anesthesia Center

And the Nobel Prize Goes to...

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A disappointing commentary on the Nobel Prize is that the field of anesthesiology has been largely overlooked. Apart from important research in the basic sciences, which are fundamental to the care of all patients, only once has a Nobel Prize been awarded that was directly related to clinical anesthesia. However, anesthesia and pain relief provide an immense “benefit to mankind,” the primary criteria by which the awards are made. This oversight is partly a matter of timing: the awards commenced in 1901, and many of anesthesia’s seminal discoveries were made before that time. In addition, the awards are given only to living individuals, and this stipulation precludes recognition of investigators whose discoveries were not recognized in their lifetimes. In truth, if we could give posthumous awards, then the candidates would be abundant.

Though several names could be submitted for this high honor, we suggest a candidate who may be easily overlooked by the Nobel Committee: the Jivaro hunter. Granted this nomination may seem “tongue-in-cheek,” but by trial and error, over thousands of years, the Jivaro perfected the use of curare paste for hunting. To this day, the muscle relaxants derived from their discoveries provide significant benefit to mankind.

As with all nominees, a little history may be helpful. The Jivaro were one of hundreds of indigenous tribes that used curare paste to poison their hunting arrows. Sir Walter Raleigh made one of the first western observations of curare paste in Guyana in 1595. We know of the Jivaro’s use of muscle relaxants because it was extensively documented by Richard Gill, whose writings and collected artifacts are kept in the Guedel Museum. Richard and Ruth Gill’s hacienda was along the Pastanza River in Ecuador, and during the early part of the 20th century, this river was a common trade route for the Jivaro.

Gill was in Ecuador hoping to obtain a medicinal treatment to control the spasm of multiple sclerosis, with which he was afflicted. D-tubocurarine was isolated by King in 1935. However, it was the curare paste that Gill brought back to America in 1938 that led to the development by the pharmaceutical firm E. R. Squibb and Sons of the curare prepared called “Intocostrin.” This curare preparation was introduced into clinical practice by Griffith and Johnson in 1942. That eventually led Daniel Bovet, during his search for a synthetic substitute for curare, to the discovery of gallamine and other muscle relaxants. He was awarded the Nobel Prize in Medicine and Physiology for this—as well as other work—in 1957.

Guedel–Cont’d

Indeed, this is the only Nobel Prize that has been awarded in the field of Anesthesia.

We speculate that the Jivaro may not have applauded Bovet’s reception of this award. While the Gills were accepted, even revered, by the Jivaro, this tribe was neither peaceful nor friendly to outsiders. Indeed, the Jivaro were the only indigenous tribe that neither the Incas nor the Spanish were able to conquer. This status was particularly vexing to both occupying armies because the tributaries of the Pastanza had gold deposits that both civilizations craved.

During these fierce conflicts with foreign invaders, the primary weapon was the wooden spear, not curare. Curare paste (*jambi*) and the blowgun were developed as hunting tools, and the Jivaro banned their use in conflict with humans because death by curare was considered torture. Perhaps with a nod toward humanitarianism, we can learn from their example in this regard as well.

Based on evidence from Gill’s own books and articles that are located in the Guedel Museum and from the notes of anthropologists who lived with the Jivaro in the early to mid 20th century,* one can “imagine” a typical hunting day in the life of an adult male Jivaro.

The day begins early because the adult male will awaken at 2:00 a. m. to begin preparing his equipment. He awakens his wife and asks her to serve him some *chicha* to get him in the right mood. *Chicha* is made from the yucca tuber by boiling it in water. Several women surround a large pot of boiling yucca, taking large spoonfuls into their mouth, chewing it, and then spitting it back into the pot. It is then fermented and ultimately develops into a potent alcoholic drink having a rancid, sour taste. Our Nobel Prize nominee will today consume about 2 gallons of *chicha*.

While his wife serves him *chicha*, the hunter begins to inspect his 7-foot blowgun that he has personally crafted from the chonta palm. This weapon has served him well for many years and is one of his prized possessions. The palm frond is straight and hollow but requires absolute perfection to deliver arrows accurate enough (almost) never to miss small animals (monkeys, toucans) at up to 100 feet. He must therefore split the palm and smooth the inner bore so that it has no bumps or imperfections. He then approximates the two halves, wraps them with plant fibers, and seals the gun with black beeswax. Nothing short of a perfectly straight gun is acceptable.

The hunter will then prepare the arrows for the days hunt. He has made hundreds of arrows by whittling the slender ribs of the ivory nut palm. His *jambi* has been

Guedel–Cont'd

prepared from the bark of the large lianas (or vines) from the species *Chondrodendron tomentosum*, which are found in the rain forest canopy. After preparation by his own hands, the *jambi* is stored in hollow gourds or bamboo tubes for several weeks at a time.

A small notch is placed onto each arrow by carefully caressing it with the sharp teeth of the piranha fish. This detail is required to assure that the arrow will break off as it penetrates the skin, otherwise the animal will find a way to extrude the arrow. The *jambi* is then painted onto the distal tip and hardened onto the arrow by placing it close to a heat source. Careful attention must be directed to solidifying the poison, but not overheating it, which would decompose the alkaloid. If it is not hardened, the *jambi* would be removed on the surface of the skin, and thus rendered ineffective as it pierces the dermis.

A few of the poison-tipped arrows are prepared for immediate use. This is done by wrapping the proximal end of the arrow with kapok, a cotton-like plant product that is held in a small gourd attached to the quiver (see cover of *CSA Bulletin*). This maneuver also requires meticulous attention to detail. A kapok plug is required so that pressure develops behind the arrow during the shot. Obviously, if the plug is absent or too loose, no pressure will develop and the arrow will fall limply from the end of the blowgun. Alternatively, if the plug is too tight, the arrow will become stuck inside the blowgun and require extraction. A plugged arrow in a 7-foot tube can obviously lead to a frustrating delay. The gourd has enough kapok to shoot several hundred arrows. A companion gourd or tube, with a different shape from the kapok gourd, has a lid to carry additional *jambi*, but is only used for hunts lasting several days.

Our hunter's cherished catch is the howler monkey, and he leaves his jungle home about 6:00 a.m. with this prize in mind (coincidentally, about the same time most anesthesiologists leave their homes for work as well). His ancestors have taught him how to imitate the howler, and he makes these sounds as he stealthily enters the dense rain forest. No trails are there to guide him. He positions himself *below*

a group of monkeys because his gun is much more accurate when directed upward. A horizontal shot, although possible, is much more difficult because the trajectory is influenced by gravity.

When he finds a group of howler monkeys he waits quietly below the trees until he selects the preferred animal. A quiet puff of air, and the poisoned arrow drops the paralyzed monkey to the jungle floor without a sound. The other monkeys are totally unaware that one of their company is missing. A rifle or shotgun would scatter the pack within minutes and leave our Jivaro with no option but to either

Guedel–Cont’d

go home or move on to another location. As it turns out, our native has a sustainable hunting practice. The animal is ample enough—he could easily take more, but he claims the reward and is back in his jungle clearing by 2:00 p.m. There he skins the monkey, roasts it, and shares it with family and friends, with generous amounts of *chicha* of course.

Jambi is only a small part of the jungle pharmacopoeia. The remedies available to the Jivaro and other tribes are extensive. All are extracts derived from jungle plants and animals. While the Nobel committee would give the prize primarily for curare, the Jivaro have other unusual drugs that have never been studied. The Shamans use the agent *ayahuasca* to induce a trance-like state that might find applications in anesthesia or health care in general. Another unusual plant product is *timu*, which when poured into a shallow stream, stuns the fish so they can be easily plucked from the surface. Perhaps other natural agents used by the Jivaro will become as commonplace in medicine as muscle relaxants are today.

The *interior* Amazon jungle is still vast, diverse, mysterious and hazardous, but even yet may yield useful agents. Among native Amazon tribes, the Jivaro are particularly knowledgeable of jungle pharmacology. Ethnobotanists and ethnopharmacologists have made some attempts to enter these areas, but these disciplines are still developing and immature. These specialists would benefit from a visit to our museum before entering these areas to learn how the Jivaro gave us our first muscle relaxant via a trusting relationship with Richard and Ruth Gill. The muscle relaxants, which developed from this relationship, have benefitted patients in operating rooms worldwide since 1942, and they presumably will be widely used for many years to come. Thus, based on a dramatic “Benefit to Mankind,” we propose a nomination for the Jivaro Indian tribe for the Nobel Prize in Medicine.

* Fifty years ago the *untsuiri suara* were called Jivaro to distinguish them from their more peaceful and hated rivals, the *acuara suara* and *tsumu suara* whose heads they often severed to produce *tzantsa*, or shrunken heads. Today, however, these three indigenous groups have all learned the importance of trade and peaceful coexistence so they are all collectively referred to as the Shuar Indians.

Credits for Figures

Figure 1: Photograph by the authors.

Figure 2: Courtesy of the Museum of the Amazon (Museo Amazonico), Abya Yala Building, 12 de Octubre, Quito, Ecuador.

Figure 3: Courtesy of the Museum of the Amazon (Museo Amazonico), Abya Yala Building, 12 de Octubre, Quito, Ecuador.

Guedel–Cont'd

- Figure 4: Courtesy of Museo del Banco Central, Calle Largo Street, Cuenca, Ecuador.
- Figure 5: From: Gartelmann KD. Ecuador, *Between the Galapagos Islands and the Amazon River*. Imprenta Mariscal, Quito, Ecuador, 1999.
- Figure 6: Photographs by the authors.