Zombie fish eaters?

Luigi Garlaschelli

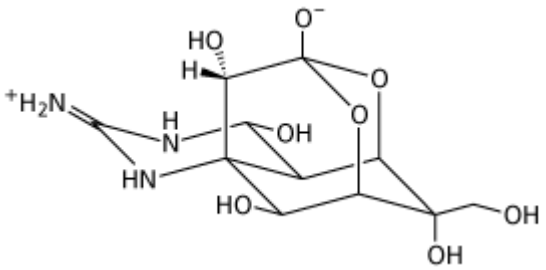
Chemistry in Britain, nov. 2002

Could traces of puffer fish toxin explain the supposed existence of Haiti's zombies? Luigi Garlaschelli unearths the evidence - for and against

Zombie fish eaters? Could traces of puffer fish toxin explain the supposed existence of Haiti's zombies? Luigi Garlaschelli unearths the evidence - for and against According to widespread Haitian beliefs, voodoo sorcerers (bokors) would administer a 'magic powder' to their victim. The victim would lapse into a state of such low metabolic activity that he (or she) might appear clinically dead. The poor soul would then be buried alive, only to be rescued hours later by the sorcerer who dug him up, fed him an hallucinogenic concoction, and sold him as a slave, often to sugar plantations. If by some lucky chance (the bokor's death, divine intervention etc) the zombie could free himself, he can still be spotted by his glassy eyes, limited speech capability, nasal voice and slow and 'goofy' movements. The existence of zombies is often taken for granted by Haitian people, and 'zombification' is still considered a crime in Haitian law: Article 264 forbids the administration of drugs that can induce apparent death. If the victim is buried thereafter, the crime is equated to homicide. But do zombies really exist, or is all this just superstition and legend? And if they do exist, are they misunderstood cases, or is there any pharmacological rationale for the activity of the bokor's magic drugs? What is the active molecule in the 'zombie powder'? In 1982 a young Harvard ethnobotanist, Wade Davis, met Nathan Kline at the Rockland State Research Institute of New York. Kline, a pioneer in the use of tranquillisers, wanted Davis to go to Haiti and try to secure a sample of that mysterious powder, which - despite his 30 years of work in Haiti - he had never procured. Kline was particularly excited because he believed that he had found, for the first time, a real zombie: a man named Clairvius Narcisse, who claimed to have been made a zombie 18 years before, and to have returned to his village by freeing himself from slavery. Tetrodoxin Tetrodoxin Davis visited the island several times and bought eight samples of the supposed zombie powder from bokor witch doctors with whom he had become familiar, also taking part in their grisly ceremonies. On analysing these samples, Davis found that they contained a number of ingredients, including fresh remains of human cadavers, noxious toads, nettles, as well as parts of a puffer fish (Sphoeroides testudineus) found in Haitian waters. It was this fish that puzzled Davis, since puffer fish and the similar porcupine fish (Diodon hystrix) are known to contain tetrodotoxin, a potent toxin that can block the sodium channels between nerve endings and can cause paralysis and death. Tetrodotoxin poisonings are not unfamiliar in Japan (646 cases were reported from 1973 to 1983, but some estimates suggest there may be up to 200 cases per year), because puffer fish is the basis for fugu, an unusual seafood starter. This dish must be prepared by licensed cooks, who remove all the organs where the toxin is stored in the animal - skin, gonads, liver and gut. This toxin is not made by the puffer fish itself, but rather by epiphytic or symbiotic bacteria (like Shewanella alga) growing on algae that the fish eats. Most intriguingly, among the described symptoms of fugu poisoning is progressive limb paralysis while maintaining consciousness. In Japan, however, there are no reported cases of zombies. After Davis's first trip to Haiti in 1982, he gave a sample of zombie powder to Leon Roizin, a pathologist who had been studying the effect of drugs on the central nervous system for 40 years. The results sparked a long controversy. Davis cited them briefly, without giving any data, in a paper in 1983, claiming that administering the powder to rats and rhesus monkeys had induced paralysis in the animals, while maintaining their central nervous system and heart activity. In a personal communication, Davis stated: '3.5g of crude poison might put a 73kg human into a comatose, cataleptic state'. However, Roizin refused to comment further on this experiment, which he had done informally as a favour to his friend Kline. The test was never repeated, never published, and Roizin also refused to have any

further contact with Davis. Later he commented that he was not sure whether some other kind of drug may have been addedto the samples. In 1984, Davis had a similar test repeated by John Hartung, an anthropologist turned medical researcher at Downstate Medical Center in Brooklyn. The powder was fed to rats, and it was rubbed on the animals' skin, and injected intraperitoneally (into the abdomen). He observed no effect. This second test was not mentioned, not even as a personal communication, in Davis's PhD dissertation in 1986 - an anthropology and ethnobotanic thesis, for which no pharmacologists or toxicologists sat on the adjudicating committee. In it, Davis mentioned again his first 1983 paper, in the following terms: 'Laboratory tests have shown both the presence of tetrodotoxin in the samples, and have indicated that the powders when applied topically to rats and monkeys are biologically active'. Interestingly, the cited paper does not contain analytical evidence for the presence of the toxin, which was found in trace amounts in only one sample. Tracking the subsequent analyses of the various samples is tricky. Data appeared in a letter to the journal Toxicon in 1986 by C. Y. Kao, also from Downstate Medical Center in Brooklyn, and Takeshi Yasumoto of the Tohoku University in Sendai, Japan, an authority on HPLC analysis of the toxin in cases of fugu poisoning. Kao found no biological activity in the samples that he received in 1984 from Davis, while Yasumoto found less than 1.1µg of tetrodotoxin per gram of sample, and less in others. They concluded that 'the widely circulated claim in the lay press to the effect that tetrodotoxin is the causal agent in the initial zombification process is without factual foundation'. In his subsequent book The serpent and the rainbow, Davis again cited Roizin, and Laurent Rivier at the University of Lausanne. Rivier, however, informed Davis (in letters dated 1983 and 1985) that he had found only traces of tetrodotoxin. In 1986 Rivier sent part of the samples to Michael Lazdunski, head of a third laboratory, the Biochemistry Centre at the University of Nice. Doses this time turned out to be between 64ng and 20µg per gram of sample. Davis explained such different results by noting that the samples were inhomogeneous and strongly basic - such that the drug would have decomposed during the extraction step performed by Kao, leaving behind only insignificant traces of toxin. He stated that the composition of the powder could vary, that the zombification process is never sure and that the powder is not supposed to be put into water. Kao's comments have always been sharper; he was quoted as saying 'I feel I have been taken for a ride', criticising Rivier and Davis for their instrumental methods and the lack of standards. It seems clear that Davis, possibly in good faith even if thoughtlessly, tried to back up his stimulating thesis by weak evidence. Once depicted by the media as an ante litteram Indiana Jones, Davis also wrote two books, of which The serpent and the rainbow served as the basis for a horror movie with the same title. A few ethnobothanists and anthropologists, like Richard E. Schultes and Irven deVore at Harvard University, rate Davis's global work as interesting, and excuse some barely legal acts, such as the exhumation of a corpse, that Davis witnessed.

Texodoxin



So are the zombies still a mystery? Possibly the explanation is not simply a chemical and pharmacological one, but is more complex and has its roots in a number of superstitions, folklore, magic cults and misinterpretation. In Haiti, until a few years ago, death was recognised even without medical certification, and burial occurred within a short time due to the hot climate. Thus, cases of apparent death with subsequent 'resuscitation' might well have happened. Besides this,

bodies are seldom buried, but generally placed above ground in concrete family tombs, which can be easily broken open. Some magic ceremonies of the voodoo - like those witnessed by Davis - actually make use of parts of corpses, such as skulls etc, that are rather easily available. And again, during the Duvalier dictatorship regime,

the most frightening facets of the voodoo cults were exploited as a tool for social control, and to cover up abductions, secret homicides and tortures. Haitian people regard supposed zombies with sorrow and not, as we would expect, with fright. Fear is restricted to the possibility of being zombified oneself. In spite of the high population density in Haiti, no one has ever seen an enslaved zombie on a secret bokor's territory. They are only identified on their return home, in those rare cases when they apparently escape from captivity. The authors of a paper in The Lancet in 1997 report three supposed zombies, returned to their families after years of absence. Clinical (DNA fingerprinting and psychiatric) tests have been performed on these persons, and their personal stories reconstructed by interviewing their supposed relatives and so on. The authors' conclusion was that: 'It is unlikely that there is a single explanation for all zombies. Mistaken identification of a wandering, mentally ill, stranger by bereaved relatives is the most likely explanation…People with a chronic schizophrenic illness, brain damage or learning disabilities are not uncommonly met with wandering in Haiti, and they would be particularly likely to be identified as lacking volition and memory which are characteristics of a zombie'. In this multi-faceted picture, it seems certain that bokor sorcerers do prepare repugnant concoctions and that they do perform awful rites. Even though the 'chemical theory' of zombification cannot be completely excluded, the efficacy of 'zombie powder' does not appear to be corroborated by sufficient evidence. It is far more likely that tetrodotoxin would poison a Japanese gourmet, instead of a poor Haitian peasant.

This article has been adapted with permission from La Chimica e l'Industria (September 2001, number 7, p71)