Letters to the Editors

Sirs,

I would like to draw attention to several inaccurate statements made by William Anderson in his recent letter to the Editors (Tetrodotoxin and the Zombi Phenomenon, *Journal of Ethnopharmacology* 23 (1988) 121—126). Let me first place his comments in perspective by offering a brief review of my interdisciplinery research on the Haitian zombie phenomenon.

I was first sent to Haiti in 1982 by the late Dr. Nathan S. Kline, then Director of the Rockland State Research Institute. In 1980 Kline and a group of associates had discovered what they believed to be the first verified instance of zombification; an individual who had been diagnosed dead, buried and later found alive. Kline asked me to investigate reports from the ethnographic and popular literature of a folk toxin said to be capable of lowering the metabolic state of a victim to such a level that he or she could be erroneously pronounced dead.

While pursuing the ethnobiological investigation in Haiti, I observed that the bokor (sorcerer, or negative priest) consistently included several marine fish as ingredients in a dry powder known as the pouă zombí. At certain times of the year these fish may contain lethal levels of tetrodotoxin (TTX), a neurotoxin capable of inducing apparent death. In the fall of 1983, when I approached with my findings a leading TTX authority Professor C.Y. Kao of the State University of New York Downstate Medical Center in Brooklyn, he enthusiastically cited a 1978 Japanese case in which a poisoned individual recovered 24 h after suffering all the symptoms associated with brain death. He noted that such a case, though rare, was not unprecedented, an observation fully supported by a review of the biomedical literature.

In December, 1984 I provided Kao with two samples of the reputed zombi powder for analysis by Takeshi Yasumoto of Tohoku University, Sendai, Japan. One, which was two and a half years old, yielded no evidence of TTX. The other sample which had been collected six months previously contained 1.1 μg of TTX per gram of powder, an amount too small to result in significant pharmacological activity. Based on the results of this one assay of two samples, Kao concluded that my hypothesis was false and suggested it be abandoned. My understanding of the emic reality of the Haitian zombie, as well as the complexity of folk preparations led me to suggest that his conclusion was premature. I raised the following issues for consideration.

First, this powder is not made by a pharmaceutical laboratory. In all my publications I have mentioned the variability of toxin levels within natural populations of the fish, as well as the diversity of formulas concocted by the
bokor. Researchers have found that even during the season of greatest toxicity only about 50% of tested specimens from a single site are toxic. Given this variability, the fact that one of the samples contained any TTX is significant, and it proves, contrary to what Anderson asserts, that TTX is an ingredient.

Second, analysis of the powder requires putting it in solution. If those doing the analysis do not put it into a buffered solution, the analytical procedure itself may inadvertently destroy most of the powder's TTX. Laurent Rivier of the Université de Lausanne reports having found between 5 and 20 μg of TTX per gram of powder from a portion of the same sample that was sent to Yasumoto, a concentration that Kao has said is "getting into the ballpark of feasibility" (Booth, 1988).

Third, much of the current experimental research concerning the in vivo effects of TTX involves microgram-milligram amounts of the drugs, administered intravenously (i.v.) or interperitoneally (i.p.). Given alone, very little, if any TTX crosses the blood-brain barrier. However, if TTX is administered directly into cerebrospinal fluid, nanogram amounts have more dramatic effects than do microgram amounts administered i.v. or i.p. (Clark and Coldwell, 1973; Clark and Lipton, 1974). It may be the case that some of the powder's other ingredients enable increased transport across the blood-brain barrier and that this enables a three orders of magnitude reduction in the effective dose of TTX.

Fourth — and this consideration weighs in heavily — it is only when the bokor succeeds that his machinations become apparent — only when he causes others to believe the victim is dead and then revived. One success in dozens of attempts would be sufficient to support the cultural belief in the zombie phenomenon.

No one has suggested that there is an assembly line producing zombies. On the contrary, given the complexities inherent in the process, zombification is likely to be an extremely rare event. Given the latitude afforded the bokor by having only his successes apparent, and the fact that very few successes are required to gain a powerful reputation, the pharmacological efficacy of any particular batch of powder is not so critical that the proportions of ingredients in two samples can be used to pass judgement on the plausibility of the entire endeavor. The issue that must be addressed is the observation that the Haitian bokor seek out and use in their preparations several species of fish known to contain lethal levels of TTX.

Finally the most serious allegation mentioned by Anderson in his letter is that I deliberately failed to report that "careful analysis of the collected powders showed no evidence of significant TTX" (Anderson 1988:125). This is incorrect on two accounts. First, three distinct analytical techniques have provided unequivocal evidence that TTX is present in the only sample that has been thoroughly examined by three different laboratories. In the case of Rivier's analysis the concentration discovered is most certainly "significant".

Second, at no time have I deliberately concealed the results of any labo-
ratory analysis. On the contrary as soon as the results of Yasumoto's first assay became available I informed my major professor, Richard Evans Schultes of the Botanical Museum of Harvard University as well as Laurent Rivier who was already involved in experimental work with samples of the powder. Both advised me to continue to pursue my hypothesis. I did not refer to Yasumoto's results in my unpublished dissertation because Schultes advised against it, recognizing as he did that the results of a single assay could not prove or disprove my hypothesis. Noting that in the evaluation of the zombi preparations the possibility of a false-negative conclusion was extremely high, Schultes suggested that I incorporate the laboratory data at a later date in the published version of my thesis, by which time the results of Rivier's experiments might be available. Rivier's subsequent discovery of a concentration of TTX as much as twenty times that first reported by Yasumoto suggests that Schultes' assessment was correct. In my published thesis Passage of Darkness (Davis, 1988), which Anderson does not cite, both the results of Yasumoto's analysis and the later work of Lazdunski and Rivier are noted and discussed in Chapter 6.

Anderson's false assertion that significant levels of TTX have not been found in the zombi powders should allow the reader to place his other egregious statements in perspective. He claims falsely that I attempted to commission the creation of a zombi. To the contrary I specifically wrote in The Serpent and the Rainbow that such an act represented "an ethical Rubicon I was not willing to cross" (Davis, 1985:266). He notes inaccurately that the preparation entails "roasting (the fish) to the point of incineration" (Anderson, 1988:123), when in fact the fish are sun dried and only placed on a grill momentarily. Anderson questions the "astonishingly short time" that it took to identify the ingredients of the zombi preparation without acknowledging my expressed conviction that for the bokor the poison is not a dark secret but rather a mundane support of an essentially magical esoteric rite.

Perhaps mostly surprisingly, Anderson implies that my desire to understand the magical foundations of the zombi phenomenon represented an abdication of scientific objectivity. What it in fact represents is an awareness that the examination of any folk practice involves two levels of analysis, one of which lifts the observer to the position of judge and obliges him not simply to understand how the informants see their world, but also to generate scientifically useful explanations to account for social and cultural phenomenon. The second and equally important level of analysis involves the elucidation of the categories and rules maintained and endorsed by the informants themselves. In the case of the Haitian zombi, an understanding of the emic perspective of the Vodoun acolytes was an essential element of the research.

Despite our obvious differences, Anderson and I would now appear to agree on three important points: (i) TTX can cause a person to appear to be dead even though that person subsequently revives; (ii) TTX is an ingredient in one of the samples of the zombie powder; (iii) occasional Japanese victims
of fugu (TTX) poisoning appear to be dead but are not. The causal hypothesis is obvious, and based on this I have researched the historic, ethnographic, biological and medical literature in an attempt to make sense out of sensation. The alternative hypothesis is that the presence of TTX in the zombie powder and the effect of zombification are coincidental. My hypothesis may be wrong, or in need of substantial revision, but none of the objections raised by Anderson change its status relative to its alternative. Accordingly, without claiming to know the truth, I will continue to pursue what seems the more viable explanation of an exceedingly complex cultural phenomenon.

References


Wade Davis

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