



Is voluntary envenomation from the kambô ritual therapeutic or toxic?

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In recent times a considerable amount of attention has been focused on the potential role of herbal preparations and alternative therapies in causing or contributing to morbidity and mortality [1]. However, despite their current popularity in Western countries little is often understood about the mechanisms of action, or potential interactions between herbal preparations and pharmaceutical drugs, or among herbal preparations themselves, for example when polyherbacy (herbal polypharmacy) has occurred [2]. In addition, these products may be adulterated with heavy metals, standard pharmaceutical agents or parts of endangered plant and animal species [3, 4]. It is recognized that the use of the latter materials has contributed to the decline in numbers of a range of endangered species [5].

A study from Hong Kong reported seven patients (11%) out of 61 who had taken corticosteroid-adulterated proprietary Chinese medicines and had required hospital intensive care; two (3.3%) subsequently died within a month of presentation [6]. Unfortunately the belief that “natural” is safe is completely misplaced as any agent that has therapeutic effects must by its very nature have the potential for therapeutic side effects. As herbal preparations are not part of routine forensic toxicological screening their contribution to lethal mechanism in medicolegal cases often remains unknown [7].

There are also other medicolegal issues that may not always be considered when traditional therapies are adopted in the West. For example, failure to adhere to more usual routes of administration may result in death, as was the case when *Chan Su*, a traditional Chinese herbal product containing secreted toad toxin, was injected rather than ingested. The toad secretions contained lethal levels of bufotinine, a tryptamine derivative alkaloid related to the neurotransmitter serotonin [8]. Lack of understanding of the dangers of overheating also led to a death in a traditional

sweat lodge ceremony in South Australia. The altered states of consciousness induced by potentially lethal hyperthermia were incorrectly interpreted by other participants as being due to astral travelling [9]. Thus, as certain traditional techniques gain popularity their safety has to be examined and their potential medicolegal significance evaluated.

One of these activities is kambô, or sapo, an “emerging ritual” in the West where toxins produced by a giant South American leaf frog are applied to areas of recently burnt skin. Kambô uses resin from *Phyllomedusa bicolor*, one of the largest tree frogs in the Amazon, which is collected over several days by gently scraping secretions from the legs and back with a stick [10, 11]. The kambô ritual is traditionally performed by shamans in order to “purify the body” and increase physical and sexual stamina/strength, and also to ward off *panama* (bad luck). The skin of the leg or foot in women and arms or chest in men is burnt with a stone or stick and the toxin is applied. However, Western uses have been expanded to include the treatment of depression and substance abuse [12]. A search of various internet sites also reveals claims that kambô can be used to treat cancer, meningitis, Alzheimer’s disease, strokes, chronic fatigue syndrome, anxiety, chronic pain, Parkinson’s disease, “vascular problems”, hepatitis, diabetes and arthritis [13].

The secretions, which are referred to by local people as “toad vaccine”, cause a brief but intense period of nausea, abdominal pain, a burning sensation, vomiting, incontinence, dizziness, tachycardia, euphoria and sedation mediated through the actions of peptides such as phyllokinin, adrenoregulin, sauvagine, phyllocerulin, phyllomedusin, dermorphins and deltorphins [12, 14, 15]. These peptides are present in high concentrations in the frog secretions and are absorbed rapidly through the damaged skin resulting in neuroexcitation, vascular smooth muscle relaxation and opiate-like actions [15]. The effects last for approximately 15 min [10]. Unfortunately other effects have included neuropsychiatric manifestations such as confusion, memory loss, lethargy, seizures, psychosis, inappropriate antidiuretic hormone secretion (SIADH) and organ damage to the kidneys, pancreas and liver, the latter with hepatitis [14, 16, 17]. Such side effects

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tend to occur in areas serviced by non-traditional practitioners [10].

Kambô has also been associated with sudden death in both South America and in Western countries [10]. For example, in an Italian case a 42-year-old man died within 30 min of applying a kambô stick; it was hypothesized that hypotension and tachycardia due to the vasoreactive effects of the frog toxin could have exacerbated underlying cardiovascular vulnerabilities from coronary artery atherosclerosis and left ventricular hypertrophy [18]. The recent death of a woman in New South Wales, Australia, allegedly during a kambô ceremony, resulted in interim prohibitions to operate in two states for the practitioners involved while the case is undergoing coronial investigation [19].

It is possible therefore that forensic practitioners may begin to encounter more cases associated with kambô self-envenomation, with effects ranging from psychiatric disturbances to gastrointestinal manifestations and sudden death. A clue to the possibility of a kambô ritual at autopsy may be the presence of characteristic clusters of small rounded symmetrical burns [11].

A problem arising in attempting to assess the safety or danger of this practice is that the numbers of practitioners are unknown and that internet sales are not monitored [20]. Lack of formal training of practitioners may also be an issue that requires addressing as it has been suggested that inexperienced practitioners may incorrectly use the skin secretion of other species of amphibians such as the cane toad *Rhinella marina* [10]. Finally it has also been suggested that the increasing use of kambô rituals may also have a negative impact upon the population numbers of *Phyllomedusa bicolor* in their native habitats in the forests of Bolivia, Peru, Brazil, the Guianas, Colombia and Venezuela [5, 10].

Thus, there are a number of reasons why these cases should now be noted by forensic practitioners who can greatly assist health authorities and the community by monitoring usage and clearly documenting possible side effects/negative outcomes. It is recognized, however, that laboratory screening for organic toxins is often very difficult given the wide range of materials that may be encountered, the number of potential toxins involved, and the limitations of standard toxicological methodology [21].

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