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INDIGENOUS SNAKE BITE REMEDIES OF THE LUO OF WESTERN KENYA

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ABSTRACT.—Medicinal plants have been overtaken in the treatment of snake bites by serum therapy and are rarely considered efficacious remedies in biomedicine. Nevertheless, rural inhabitants rely on plant medical material and the attention of highly regarded local traditional healers when threatened by snakebite poisoning. This paper examines curative and preventive snakebite treatments, beliefs and practices collected from 100 Luo respondents. The informants reported the use of a number of herbal and non-herbal remedies including mystical therapies and 24 herbaceous plants whose aerial parts are preferred. Treatments involve cut, suck, and bind methods followed by application of plant leaf and root poultices held in place with strips of cloth or bark.

Key words: medicinal plants, venomous snakes, Luo, Kenya, East Africa.

RESUMEN.—Las plantas medicinales se han empleado para el tratamiento de las picaduras de serpiente en sueroterapia, aunque la biomedicina no suele considerarlas remedios eficaces. Sin embargo en las zonas rurales se confía en las plantas y la atención de los apreciados curanderos tradicionales para tratar las picaduras de serpiente. Este trabajo analiza los tratamientos curativos y preventivos para las picaduras de serpiente, así como las creencias y prácticas recopiladas de 100 personas encuestadas de la etnia Luo. Los informantes comentaron el uso de numerosos remedios vegetales y no vegetales, incluidas terapias espirituales y 24 plantas herbáceas de las que suele preferirse su parte aérea. Los tratamientos consisten en dar un corte en la zona afectada, succionar, vendar y posteriormente aplicar emplastos de hojas y raíces que se sujetan a la zona afectada con tiras de ropa o cortezas de plantas.

RÉSUMÉ.—Les plantes médicinales, rarement considérées comme efficaces par la biomédecine pour le traitement des morsures de serpent, ont été surpassées dans ce traitement par la thérapie de sérum. Cependant, les habitants des régions rurales dépendent des plantes médicinales et des guérisseurs traditionnels spécialisés quand ils sont mordus par les serpents. Cet article rend compte des traitements curatifs et préventifs, des croyances et des pratiques recueillies auprès de 100 informateurs Luo pour combattre les morsures de serpent. Ces informateurs ont signalé l'usage de plusieurs remèdes à base de plantes et d'autres sans plantes, y compris les thérapies mystiques et 24 plantes herbacées pour lesquelles la partie aérienne est utilisée. Les traitements comprennent les méthodes de coupure, de succion et de garrottage. Puis, on applique des cataplasmes faits de feuilles et de racines que l'on maintient à l'aide de bandes de tissus ou d'écorces.

INTRODUCTION

People fear snakes of the families Elapidae (cobras and mambas) and Viperidae (vipers and adders) because of their highly irritable nature, elaborate poison apparatus, and toxic venom, which causes respiratory difficulties, persistent bleeding, and even death. Snakebites inflict great suffering on victims. Globally, the number of accidents involving snakes reaches one million, resulting in 600,000 envenomations and more than 20,000 deaths annually (Chippaux 1998).

With two groups of venom-spitting cobras and a great diversity of vipers, Africa is a global diversity center and focal point of cobra distribution and the Old World vipers (Ditmars 1946; Fitz Simmons 1970). The Republic of Kenya has a fair share of these snakes—97 species—of which four are endemic, distributed in almost every part of the country. Most areas of the Nyanza province of Kenya provide niches conducive to reptile life. A sinister reputation surrounds seven local venomous snake species: *Naja nigricollis* (***raikombe mar pii***), *Naja haje* (***raikombe maratiglo***), *Naja melanoleuca* (***raikombe mar bungu***), *Dispholidus typus* (***thuond winyo***), *Dendroaspis polylepis* (***rachier***), *Bitis arietans* (***fuu***), and *Bitis gabonica* (***fuu manigi tungene***). All these snakes produce copious saliva with venom that helps them to stun or kill, swallow, and digest prey (Ducker 1975). When cornered or agitated, these snakes also use venom as a defense. These actions evoke feelings of fear, revulsion, and awe in people and cause human mortality.

Up to 80% of snakebite victims in Kenya first consult traditional practitioners before visiting a medical center (Snow et al. 1994). Direct testimony from victims attests to the perceived powers of traditional treatments. The success of traditional healers is vaguely understood to be partly due to the occult and sometimes mystical nature of their practice. In an attempt to examine their practices, which remain incompletely known, this paper pays attention to herbal and some nonherbal therapies used by traditional healers in managing snakebites among humans and livestock in the study area.

THE STUDY AREA

The study was carried out in Nyanza Province in Western Kenya. The province lies astride the equator, lat. 0°35′ S, long. 34°45′ E, bounded to the west by Lake Victoria and to the south by the Republic of Tanzania. It falls within the Lake Victoria regional mosaic plant belt of Africa, dominated by a graded vegetal landscape of relict tropical rainforest, bush grassland (*Themeda-Hyparrhenia*) and wooded grassland vegetation of the *Combreto-Dodoneae-Balanites-Acacia* matrix.

The Luo people are an agropastoral-cum-labor-migrant group of the Western Nilotic cluster of societies (Cohen and Atieno-Odhiambo 1989); their language, Dholuo, has a Nilo-Saharan eastern Sudanic affiliation. Many authors note their extensive local knowledge of medicinal value of plants that grow in their environment (Johns et al. 1990; Kokwaro and Johns 1998; Owuor 1999). Accounts of Luo culture and life are given by Ogot (1967), Whisson (1964), Kawango (1995), and Ocholla-Ayayo (1976). Luo disease etiology and therapies are embedded in indigenous religious beliefs, Christianity, and their ***chik*** (customary laws) or ***kweche*** (taboo). Among the rural Luo, illness is commonly ascribed to ***juogi*** (spirits)

or ***nawi*** (material used by evil persons to cause harm). Urban Luos have diverse hybrid views on illness. Nonetheless, intolerable misfortune, even among Christian Luos, is commonly ascribed to ***jachien*** (the evil or unhappy ancestral spirit). The holistic health outlook of the Luo requires the drawing of elements from both the physical and spiritual world in disease management. Nyasaye, the supreme god, is the source of all healing power, which he gives to agents such as medicine men in form of ***bilo***, or special magic power. This power enables some practitioners to communicate directly with the spirit world of departed ancestors.

HERBAL ANTIVENOM RESEARCH

The perceived efficacy of traditional herbal snakebite remedies and related therapies evokes much interest among researchers. Most of the indigenous remedies reported in literature are root-derived. Various plants named ''snakeroot'' with long twisted ''snaking'' roots are preferred. Taylor (1970) notes that in North America and Asia, this name applies to at least five different plants supposed to be snakebite remedies: *Aristolochia reticulata* (Texas snakeroot), *Ophiorrhiza mungos* (snakeroot), *Liatris spicata* (button snakeroot), *Eryngium aquaticum* (white snakeroot), and *Asarum canadense* (Canadian snakeroot, wild ginger).

However, this study shows the prevalence of foliar plant parts (***it yath*** or ***oboke***) in Luo usage; 73% leaf preparations, 19% root preparations and 8% bark. In addition 58% of the documented snakebite pharmacopoeia are non-woody species. These figures are based on the total sum of interviewee responses for frequency of parts and plant growth form (shrub, herb, and tree) usage.

The fundamental supposition in medicinal plant research is that natural products from plants can complement serum therapy or alleviate the side-effects of modern snakebite therapy. The idea is spreading rapidly and widely with research successes, such as the pronounced activity of aqueous extracts and 12-methoxy-4-methylvoachalotine from *Tabernaemontana catharinensis* against South American rattlesnake venom (Batina et al. 2000); coagulative (prothrombin) activation of *Mucuna pruriens* seed extract (Guerranti et al. 2001); anti-inflammatory activity of *Bidens pilosa* flavonoids in laboratory animal studies (Geissberger and Sequin 1991; Jager et al. 1996); significant inhibition of lethality, myotoxicity, and venom enzyme activities of *Naja kaouthia* venom by aqueous *Mimosa pudica* root extracts (Mahanta and Mukherjee 2001); *in vitro* and *in vivo* antagonism of venom-induced haemorrhage, coagulant, defibrinogenating, and inflammatory activity of *Vipera russellii* and *N. kaouthia* venom by root extracts of *Vitex negundo* and *Emblica officinalis* (Alam and Gomes 2003); detoxification (*in vitro*) of *Echis carinatus* and *Naja nigricollis* venom by *Guiera senegalensis* leaf extract (Abubakar et al. 2000); isolation of Russell's viper venom-specific anti-inflammatory, antipyretic, and anti-oxidant active compounds from *Hemidesmus indicus* (Alam and Gomes 1998a, 1998b); neutralization of *Bothrops jararaca* and *Crotalus durissus terrificus* venom toxicity by ar-turmerone fraction of *Curcuma longa* extracts (Ferreira et al. 1992); uncharacterized anti-inflammatory and analgesic compounds of *Strychnos henningsii* (Tits et al. 1991). Venom of the West African serpent *Echis carinatus* has been the subject of interesting investigation—ehretianone, a quinonoid xanthene, isolated by Selvanayagam et al. (1996) from *Ehretia buxifolia* root bark, displayed

activity. Onuaguluchi (1989) further demonstrates *Diodia scandens* activity against *E. carinatus* venom.

It is important to note that these plants represent a fraction of the world's herbal envenomation pharmacopoeia and against this background the case for medicinal plant research is strengthened. Vasanthi and colleagues (2003) demonstrate that opportunities are not limited to terrestrial plants; brown seaweed *Padina boergesenii* and red seaweed *Hypnea valentiae* extracts were found to detoxify (*in vitro*) *N. nigricollis* venom. Remarkable mortality reduction was noted in rodents administered with extract-reconstituted venom injections compared to those challenged with venom only.

METHODOLOGY

One hundred respondents consisting of lay persons and specialist traditional practitioners were interviewed over an eight-month period. Questionnaires with both close and open-ended questions as in Martin (1995) were used to collect survey data. Specialist traditional healers interviewed ranged from 32–63 years of age. They owe their healing skills to training by knowledgeable kin, spirit inspiration, or ***nyiewo yath*** (buying medical skill from a non-relative specialist). Their reputation is based on their lineage and/or career record in treating difficult cases. Healers were asked to state plant names and their cultural meanings, medicine preparation methods, and symptoms of deleterious snakebites. The interviews were conducted in the local Dholuo language. Data collection entailed return visits and transect walks in which samples of the herbal medicines were observed and collected. Voucher specimens of medicinal plants, in triplicates, were collected, prepared and identified in the field using Agnew and Agnew (1994), Beentje (1994), Knox (1996), and Turill and Milne-Redhead (1952). They were later verified before deposition at the University of Nairobi herbarium. Laboratory validation of antidotal activity of these plants was not done.

RESULTS

The Luo have various beliefs about snakes. Though snakes are particularly linked with witchcraft, big snakes are associated with the underworld of dead people and are considered their messengers. The appearance of such snakes in settled areas prompts community speculation and magico-religious expectations. People still believe in ***nyang'indi*** (a huge fertility and harvest serpent); totemic veneration of huge boids (pythons) called ***omieri*** and venomous snakes remain ritualistic objects. The Luo snake name ***thuol*** or ***tond-bungu*** is mentioned reluctantly in speech or viewed adversely as it expresses the potential danger and fear of snakebites. Some individuals are believed to be specially endowed with the power to manipulate snakes for evil purposes. It is a common belief that snakebites result from malevolent magic by some practitioners who keep snakes as pets and send them to bite victims. Onyango-Ogutu and Roscoe (1974) note that skeletal vertebra of sacred snakes were worn by diviners around their necks and in their practices they sometimes ''extract snakes from sick individuals.'' The Luo people believe that divine forces can be present in totem animals, thus snakes

straying into homesteads should be unharmed until they leave the house (Ocholla-Ayayo 1976; Onyango-Ogutu and Roscoe 1974). Among our informants, especially the younger ones, these beliefs varied. However, core values related to Luo religious and medical philosophy that combine therapy with faith were consistent. In our study we found that adult informants had elaborate knowledge of snakebite treatments. Our findings further indicate that these therapies are administered by specialists after primary treatment in the field.

Snake attacks are reportedly sure, quick, sometimes unnoticed, and result in scratches and fang entry wounds. All interviewees described observations matching clinical ophitoxaemia—the wide spectrum of local and systemic manifestations that result from snake venom poisoning. Informants reported that the effects of snakebites including swelling or skin discoloration, shock, weakness, convulsions, shortness of breath, nausea, severe pain, paralysis, unconsciousness, and even death. The local people seek help through traditional herbal medicines.

LUO HERBAL SNAKEBITE MEDICINES

Twenty-four plants employed as snakebite medicine by the Luo people, including two exotic species (*Senna siamea* and *Tithonia diversifolia*), were collected and are listed alphabetically along with their local names and voucher specimen numbers in Table 1. Local plant names recorded in this study show slight variations from those presented by Kokwaro and Johns (1998) in the *Luo Biological Dictionary.* The plant names fit assumed ethnosystematic categories in Martin (1995); with primary (unitary), secondary (binomial), and complex (polynomial) names recorded. Stace (1996) posits that the dearth of local plant names is due to the value-based emphasis of folk taxonomies—a possible explanation why the fern, *Pellaea viridis,* with marginal importance as food, medicine, or animal forage lacked a local name response.

INDIGENOUS LUO SNAKEBITE THERAPIES

In this study it was found out that envenomation hazards are linked with traditional foraging and cultivation activities, similar to the findings of Chippaux (2000). Virtually all households engage in outdoor activities, especially subsistence agriculture. Nonetheless, as reported by 26 informants, the vulnerable members of the population are farmers, firewood collectors, hunters, and herders between the ages of 12 and 50 years. We could not ascertain snakebite frequency because of insufficient records, but the general view in the study area was that frequency of snakebite incidents is medium to high.

Traditional treatment for snakebites begins in the field immediately after the victim is bitten. Fresh medicinal plant preparations are prepared and administered within a half hour. Bands are tied above and below the bitten area to slow the spread of venom. Incisions are then made across the main wound area using a razor blade or a lancing pin. The bitten area is then sucked with the mouth until blood flows freely. This practice is believed to drain the poisoned blood. Thereafter, some healers cauterize the wound with heated broken clay pot pieces or put potassium permanganate crystals on it before placing or rubbing plant

TABLE 1.—Plants used as snakebite medicine by Luo.

Plant	Family	Luo name	Preparation/specimen no.
Ammocharis tinneana (Kotschy & Peyr.) Milne-Redh.	Amaryllidaceae	***apap thwon pap*** 'the brave one of the field'; ***rabwond otenga*** 'eagle's tuber'	Root sap used in the preparation of a snakebite alexiteric. BOO 250 (NAI)
Annona senegalensis Pers. ssp. *senegalensis*	Annonaceae	***obolo***, ***obolobolo***. The names allude to the tree's perennial habit of shedding ***bolo*** fruit copiously.	Crushed leaves are rubbed on snake bites, victim chews leaves and swallows the juice. BOO 456 (NAI)
Bidens pilosa L.	Asteraceae	***nyanyiek mon***: ***onyiego***. The names in Luo literally mean 'jealousy of women' because of the seed's sticky nature.	Crushed leaves of this plant are rubbed on fresh cuts as an astringent, snakebite antidote, and antiseptic. The seeds are used in many antiwitchcraft and aphrodisiac preparations. BOO 485 (NAI)
Combretum collinum Fresen.	Combretaceae	***adugo***, from Luo word ***duogo*** 'gum'. The tree produces gum and hence the name.	The roots are used in preparing a snakebite antidote that is usually effected by scarification. BOO 647 (NAI)
Conyza sumatrensis (Retz.) E. Walker	Asteraceae	***yadh asere*** 'arrow wound medicine'; ***yadh tong*** 'spear wound medicine'	A leaf infusion of the plant is drunk as an antidote for puff adder (*Bitis arietans*) bites and stomachache. BOO 534 (NAI)
Corchorus trilocularis L.	Tiliaceae	***apoth*** 'slimy', referring to the mucilaginous nature of the plant when rubbed in the fingers or cooked as a vegetable	An infusion of *C. trilocularis* and *Hyptis pectinata* Poit is dropped or sprinkled into the eye to neutralize snake venom ejected into the eye. Afterwards, the victim is scarified on the buttock. Claims of intense pain, temporary blindness and watery eyes were linked to this type of venom poisoning. BOO 559 (NAI)
Dichondra repens J.R. Forst. & G. Forst.	Convolvulaceae	No Luo name given.	The plant leaves are rubbed onto snakebites to "remove snake fangs" and also as an antidote. BOO 536 (NAI)

TABLE 1.—Continued.

Plant	Family	Luo name	Preparation/specimen no.
Ensete edule (J.F. Gmel.) Horan	Musaceae	***kitembe***. The Luo name appears to be of Bantu origin; the neighboring Abagusii ethnic group calls the plant ***egetembe.***	The sap exuding from the cut stem is used in treating snakebite; it is wiped into the bite. BOO 181 (NAI)
Erythrina excelsa Baker	Fabaceae	***roko*** (alludes to the spiny nature of the tree); ***yuoma***	The bark sap is an antidote for snakebite. BOO 691 (NAI)
Fuerstia africana T.C.E. Fr.	Lamiaceae	***abunga-useke*** (may derive from the Abagusii name for ***Orthosiphon hildebrandtii***, ***ekebungabaiseke***); ***aremo*** (Luo name alludes to its sap, which takes the color of blood.)	A filtered infusion is prepared from crushed leaves and administered orally as an antidote. BOO 523 (NAI)
Grewia sp.	Tiliaceae	***powo***	The leaves are a snakebite antidote. Leaves are also used in cooking envenomed carcass as a treatment to prevent secondary poisoning. Livestock bitten by snakes are drenched with a leaf/bark decoction/infusion and the mucilaginous crushed leaves are used to wipe the bitten area. BOO 248 (NAI)
Indigofera circinella Baker f.	Fabaceae	***odolo*** (alludes to the plant's curved seed pod)	Poultices made from the leaves are chewed and pasted on snakebite as an antidote. BOO 566 (NAI)
Justicia calyculata (Deflers.) T. Anders.	Acanthaceae	***apiwo***, ***piu piu***. The Luo root for these names is the word ***piyo*** 'fast'; the herb has a short life span, flowering and fruiting within a fortnight.	Crushed aerial plant parts are used as a snakebite antidote, rubbed onto the snake bite to facilitate the removal of the snake's fangs. BOO 486 (NAI)
Laggera brevipes Oliv. & Hiern.	Asteraceae	***adupa rabuor***	The roots of the plant are employed as a snakebite antidote. BOO 304 (NAI)

TABLE 1.—Continued.

Plant	Family	Luo name	Preparation/specimen no.
Maesa lanceolata Forssk.	Myricaceae	***katera***	Root decoction administered as follow-up treatment for puff adder (*Bitis* spp.) bites. BOO 292 (NAI)
Microglossa pyrifolia (Lam.) Kuntze	Asteraceae	***nyabung odidi***, ***nyabung odit***. A small singing bird, ***odidi*** (*Cisticola cantans*), frequently perches on this scrambling shrub.	The leaves are chewed, juice swallowed, and the macerate placed well into the snakebite. BOO 463 (NAI)
Pellaea viridis (Forssk.) Prantl	Adiantaceae	No Luo name given.	The plant leaves are pulped and rubbed well into a snakebite. BOO 570 (NAI)
Sansevieria parva N.E.Br.	Dracaenaceae	***twoch bungu*** 'wild sisal'	Leaf sap applied on snakebite wound. BOO 127 (NAI)
Senna siamea (Lam.) Irwin & Barneby	Fabaceae	***ndege owinu*** 'arboreal ***owinu***', in contrast to the more common and smaller ***'owinu'*** (*Senna didymobotrya*); ***oyieko*** (refers to its rattling seed pod)	The roots of this tree and those of *Zanthoxylum chalybeum* Engl. are used as antidote for snakebite. BOO 401 (NAI)
Solanecio mannii (Hook. f.) C. Jeffrey	Asteraceae	***maroo***, ***marowo***. The name alludes to its easy propagation by cuttings and its succulent nature.	Crushed or chewed leaves rubbed into snakebite as antidote. BOO 681 (NAI)
Tithonia diversifolia (Hemsl.) A. Gray	Asteraceae	***maua madongo*** (***maua*** applies to all exotic ornamental plants; its big flowers are captured with the epithet ***madongo***; the plant is South American); ***akech*** (refers to its bitter leaf infusion)	Leaf infusion administered orally as antidote for snakebite. BOO 541 (NAI)
Vernonia glabra (Steez) Vatke	Asteraceae	***olusia***	The leaf ash or crushed leaves rubbed into scarifications around the snakebite as an antidote. BOO 759 (NAI)

materia medica into the bite. The medicine is held in place with strips of cloth or bark. The poultice can be replaced frequently. In other treatments, infusions or decoctions are administered orally after attention to the bite. Eighty-three percent of the oral administrations reported in the study were infusions. All respondents claimed no side effects or overdose due to traditional medication. This claim has implications for the most difficult problems of allergy and organ function loss encountered in modern serum treatments and the ''cut and suck'' snakebite therapy. Similar treatment procedures appear in medicinal plant compendia from other parts of eastern and southern Africa (Kokwaro 1976; Watt and Breyerwandijk 1962) as well as in West Africa (Ayensu 1978; Burkill 1985; Oliver-Bever 1986).

Generally, plant material procured from dry environments was considered more efficacious due to habitat hardiness. Healers credit the pharmacological action of *Conyza sumatrensis* and *Bidens pilosa* to haemostatic and antiseptic action. *B. pilosa* has been shown to have anti-inflammatory activity (Geissberger and Sequin 1991; Jager et al. 1996). Painkillers, largely administered orally, increase urination and sweating, resulting in poison release. Pure substances from plants shown to protect mice from ophitoxaemia are generally nitrogen-free, low molecular-weight compounds: phenolics, phytosterols (b-amyrin and sitosterol) and triterpenoids (Alam and Gomes 1998a, 1998b; Haruna and Choudhury 1995; Perreira et al. 1994; Selvanayagam et al. 1996). However, Batina et al. (2000) report an odd case of a nitrogen-containing substance, the alkaloid 12-methoxy-4-methylvoachalotine. These substances possess venom-inactivating, analgesic and anti-inflammatory action (Ferreira et al. 1992; Vilegas et al. 1997).

In addition, the Luo people believe in instantaneous mystical snakebite healing. Such healing is performed by touching the ***jalemo*** (plural ***jolemo***) or prayer specialist acting as a healer, by being touched by him, or without physical contact of any kind (for example, by touching the healer's clothes). The use of a black stone in treating snakebites was also reported. This practice however appears to have been borrowed from the neighboring Abagusii community. How such treatments occur challenge modern treatments especially because victims reportedly resume their normal activities immediately, unhindered by the venom in any way. The biblical parallel of this therapy appears in Acts 28:1–6; the Apostle Paul, shipwrecked and cold on the Mediterranean island of Malta, was bitten by a viper while gathering a pile of brushwood but suffered no harm because of his faith. Similarly, Saint Patrick, the patron saint of Ireland, according to legend banished snakes from Ireland with supernatural powers while tending the sheep of chief Milchu (Sánchez 1963).

Since the latter half of the twentieth century, some Luo, as a result of missionary efforts, adopted the Christian faith. Nonetheless, they maintained submission to their god, Nyasaye, and reverence to spirits of the departed. Soon enough, suspicion and lack of dialogue between Luo and Christian belief led to breakaway African Independent Churches in the 1930s (Barrett 1982). Adherents of these churches practice Christian healing rites. Healing by touching performed by ***jolemo*** constitutes what we categorize as mystical therapies similar in nature to those of scriptural tradition and ecclesiastical history. In this regard such Luo traditional snakebite therapies are associated with religious syncretism between African religion and Christianity.

Preventive snakebite treatments were also reported; one such treatment involves scarifications with ***mikinga*** ash (etymology of the name alludes to a shielding effect) derived from ***mweny*** (*Ocimum gratissimum*). This practice of preventive treatment is common in other parts of Africa and is closely associated with religious belief. Similar therapies based on religious belief and folk etiology is reported among the Fulani of West Africa (Nuwanyakpa et al. 2000). Martin (1995) notes that special protective qualities are commonly ascribed to plants with anomalous morphology or those common in ecological niches created by human disturbance. *Bidens pilosa, Tithonia diversifolia* (an introduced species), and *Conyza sumatrensis* fit the latter category.

Lack of commercial antiserum and high cost of biomedical services, together with the cultural acceptability of local therapies, further motivate the resort to traditional treatments. The situational approach of William I. Thomas and Florian Znaniecki explains and illustrates the conditions of rural people and persistence of traditional medicine in most developing countries (Bogardus 1963). Human behavior is viewed as situationally defined—when the patient is confronted with a snakebite in an unprepared state the phenomenon assumes the aspect of a crisis. In South Nyanza, where this study was conducted, there are inadequate health facilities (Sindiga 1995). Consequently, in deciding between traditional and modern methods, patients generally choose the closest source of relief.

DISCUSSION

Although herbal remedies are espoused as inexpensive alternatives or complementary to antivenom serum and potential sources of new treatments, their status remains weak due to insufficient evidence of their safety and efficacy. Yet serum therapy may have serious side effects: fever, rash; severe and sometimes fatal allergic reactions due to production contaminants (horse or chick proteins) (Russell 1989). Krifi et al. (1999) note the inadequacy of purification by enzyme digestion and other contaminant extraction procedures. Moreover, Consroe et al. (1995) report that even purified immunoglobulin antivenom evokes hypersensitivity. Therefore, by failing to seek new envenomation cures we may be in danger of ignoring potentially valuable remedies. It seems the search for pharmacological deliverance from snake venom is far from over. More substantive and careful investigation of traditional therapies is critical to determine their viability as alternatives.

Among the Luo, the choice of snakebite remedies and local perceptions of the efficacy of the medicines that are used consistently by healers reflect their physiological activity. Johns et al. (1990) conducted a study using consensus and validation techniques among Luo interviewees; they found that 5% (2 out of 37) of the snakebite remedies fit their consensus criterion—confirmation through independent reports from three or more individuals. In our independent, similar study of snakebite remedies, 9 out of 24 (38%) were independently reported by three or more individuals. As the two studies show, the use of a variety of species could well be a feature of the body of traditional snakebite remedies. The greater the consensus among herbalists and laypersons about the efficacy of particular

plants in the treatment of snakebite, the more likely it is that these remedies will prove to have bioactive chemicals.

CONCLUSION

Traditional medicine continues to be used by the Luo people in rural western Kenya against snakebites. We note that poor hospital infrastructure, lack of antiserum, high medical fees, and a deep-seated confidence in local healers based on cultural conceptions and values are responsible for continued medicinal plant use among the Luo people. The success of local practitioners lies in their knowledge of the consequences of a snakebite, the patient's confidence in their treatment, and their grasp of the snakebite situation, all of which give the victim hope and help recovery from fright in such a dire time. The chemical and pharmacological properties of their therapies remain uninvestigated. The lack of interest in traditional snakebite therapy by biomedical practitioners lies partly in the complexity of the art of mystical healing.

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REFERENCES

Abubakar, M.S., M.I. Sule, U.U. Pateh, E.M. Abdurahman, A.K. Haruna, and B.M. Jahun. 2000. In vitro snake venom detoxifying action of the leaf extract of *Guiera senegalensis*. *Journal of Ethnopharmacology* 69(3):253–257.

Agnew, A.D.Q. and S. Agnew. 1994. *Upland Kenya Wild Flowers,* 2nd ed. East African Natural History Society, Nairobi.

Alam, M.I. and A. Gomes. 1998a. Viper venom-induced inflammation and inhibition of free radical formation by pure compound (2-hydroxy-4-methoxy benzoic acid) isolated and purified from *anatamul* (*Hemidesmus indicus* R. Br.) root extract. *Toxicon* 36 (1):207–215.

———. 1998b. Adjuvant effect and antiserum action potentiation by a (herbal) compound 2-hydroxy-4-methoxy benzoic acid isolated from the root extract of the Indian medicinal plant 'sarsaparilla' (*Hemidesmus indicus* R.Br.). *Toxicon* 36(10):1423–1431.

———. 2003. Snake venom neutralization by Indian medicinal plants (*Vitex negundo* and *Emblica officinalis*) root extracts. *Journal of Ethnopharmacology* 86(1):75–80.

Ayensu, E.S. 1978. *Medicinal Plants of West Africa.* Reference Publications, Algonac, Michigan.

Barrett, D.B. 1982. *World Christian Encyclopedia.* Oxford University Press, Nairobi.

Batina Mde, F., A.C. Cintra, E.L. Veronese, M.A. Lavrador, J.R. Giglio, P.S. Pereira, D.A. Dias, S.C. Franca, and S.V. Sampaio. 2000. Inhibition of the lethal and myotoxic activities of *Crotalus durissus terrificus* venom by *Tabernaemontana catharinensis*: identification of one of the active components. *Planta Medica* 66(5): 424–428.

Beentje, H. 1994. *Kenya Trees, Shrubs and Lianas.* National Museums of Kenya, Nairobi.

Bogardus, E.S. 1963. Some pioneer American sociologists. *Sociology and Social Research* 47:25–33.

Burkill, H.M. 1985. *The Useful Plants of West*

Tropical Africa, vol.1, 2nd ed. Royal Botanic Garden, Kew.

Chippaux, J.P. 1998. Snake-bites: appraisal of the global situation. *Bulletin of the World Health Organization* 76:515–524.

———. 2000. Prevention of snake bites and management of envenomations in Africa. *African Newsletter* 1:12–15.

Cohen, D.W. and E.S. Atieno-Odhiambo. 1989. *Siaya: The Historical Anthropology of an African Landscape.* Heinemann Kenya, Nairobi.

Consroe, P., N.B. Egen, F.E. Russell, K. Gerrish, D.C. Smith, A. Sidki, and J.T. Landon. 1995. Comparison of a new ovine antigen binding fragment (Fab) antivenin for United States Crotalidae with the commercial antivenin for protection against venom-induced lethality in mice. *American Journal of Tropical Medicine and Hygiene* 53:507–510.

Ditmars, R.L. 1946. *The Snakes of the World.* Macmillan, New York.

Ducker, G. 1975. *Grzimek's Animal Life Encyclopedia,* vol. 12. Van Nostrand Reinhold Co., New York.

Ferreira, L.A.F., O.B. Henriques, A.A.S. Andreoni, G.R.F. Vital, M.M.C. Campos, G.G. Habermehl, and V.L.G. de Moraes. 1992. Antivenom and biological effects of ar-turmerone isolated from *Curcuma longa* (Zingiberaceae). *Toxicon* 30(10): 1211–1218.

Fitz Simmons, V.F.M. 1970. *A Field Guide to the Snakes of South Africa.* Cape and Transvaal Printers (Pty) Ltd, Cape Town.

Geissberger, P. and U. Sequin. 1991. Constituents of *Bidens pilosa* L.: do the components found so far explain the use of this plant in traditional medicine? *Acta Tropica* 48(4):251–261.

Guerranti, R., J.C. Aguiyi, E. Errico, R. Pagani, and E. Marinello. 2001. Effects of *Mucuna pruriens* extract on activation of prothrombin by *Echis carinatus* venom. *Journal of Ethnopharmacology* 75(2-3):175–180.

Haruna, A.K. and M.K. Choudhury. 1995. *In vivo* antisnake venom activity of a furanoid diterpene from *Aristolochia albida* Duch (Aristolochiaceae). *Indian Journal of Pharmaceutical Sciences* 57(5): 222–224

Jager, A.K., A. Hutchings, and J. van Staden. 1996. Screening of Zulu medicinal plants used for medicinal purposes. *Journal of Ethnopharmacology* 52(2):95–100.

Johns, T., J.O. Kokwaro, and E.K. Kimanani. 1990. Herbal remedies of the Luo of Siaya district, Kenya: establishing criteria for quantitative consensus. *Economic Botany* 44:369–381.

Kawango, E.A. 1995. Ethnomedical remedies and therapies in maternal and child health among the rural Luo. In *Traditional Medicine in Africa,* eds. I. Sindiga, C. Nyaigotti-Chacha, and M.P. Kanunah, pp. 80–94. East Africa Educational Publishers, Nairobi.

Knox, E. 1996. *List of East African Plants.* National Museums of Kenya, Nairobi.

Kokwaro, J.O. 1972. *Luo-English Botanical Dictionary.* East African Publishing House, Nairobi.

———. 1976. *Medicinal Plants of East Africa.* East Africa Publishing House, Nairobi.

Kokwaro, J.O. and T. Johns. 1998. *Luo Biological Dictionary.* East African Educational Publishers. Nairobi.

Krifi, M. N., M. El Ayeb, and K. Dellagi. 1999. The improvement and standardization of antivenom production in developing countries: comparing antivenom quality, therapeutical efficiency, and cost. *Journal of Venomous Animals and Toxins* 5(2):128–141.

Mahanta, M. and A.K. Mukherjee. 2001. Neutralisation of lethality, myotoxicity and toxic enzymes of *Naja kaouthia* venom by *Mimosa pudica* root extracts. *Journal of Ethnopharmacology* 75(1):55–60.

Martin, G.J. 1995. *Ethnobotany: A Methods Manual.* Chapman and Hall, London.

Nuwanyakpa, M., N. J. Toyang, S. Django, C. Ndi, and C. Wirmum. 2000. Ethnoveterinary healing practices of the Fulani pastoralists in Cameroon: combining the natural and the supernatural. *IK Monitor* 8(2):3–6.

Ocholla-Ayayo, A.B.C. 1976. *Traditional Ideology and Ethics among the Southern Luo.* Scandinavian Institute, Institute of African Studies, Uppsala.

Ogot, B.A. 1967. *Peoples of East Africa, History of the Southern Luo,* vol. 1. East Africa Publishing House, Nairobi.

Oliver-Bever, B. 1986. *Medicinal Plants in Tropical West Africa.* Cambridge University Press, Cambridge.

Onuaguluchi G. 1989. Preliminary study of

an extract from *Diodia scandens* on some toxic effects of *Echis carinatus* venom. *Journal of Ethnopharmacology* 26(2):189–196.

Onyango-Ogutu, B. and A.A. Roscoe. 1974. *Keep My Word.* Heinemann Kenya, Nairobi.

Owuor, B.O. 1999. An Ethnobotanical and Phytochemical Study of the Herbal Remedies of Migori District, Kenya. Msc. Thesis (Department of Botany), University of Nairobi.

Pereira, N.A., B.M. Pereira, M.C. do Nascimento, J.P. Parente, and W.B. Mors. 1994. Pharmacological screening of plants recommended by folk medicine as snake venom antidotes; IV. Protection against jararaca venom by isolated constituents. *Planta Medica* 60(2):99–100.

Russell, F.E. 1989. Snake venom immunology: historical and practical considerations. *Journal of Toxicology Toxin Reviews* (7):1–82.

Sánchez, J. 1963. St. Patrick. In *Encyclopedia International.* Grolier, New York.

Selvanayagam, Z.E., S.G. Gnanavendhan, K. Balakrishna, R.B. Rao, J. Sivaraman, K. Subramanian, and R.K. Puri. 1996. Ehretianone, a novel quinonoid xanthene from *Ehretia buxifolia* with anti-snake venom activity. *Journal of Natural Products* 59(7):664–667.

Sindiga, I. 1995. Managing illness among the Luo. *Traditional Medicine in Africa,* eds. I. Sindiga, C. Nyaigotti-Chacha, and M.P. Kanunah, pp. 64–79. East Africa Educational Publishers. Nairobi.

Snow, R.W., R. Bronzan, T. Roques, C. Nyamawi, S. Murphy, and K. Marsh. 1994. The prevalence and morbidity of snake bite and treatment-seeking behavior among a rural Kenyan population. *Annals of Tropical Medical Parasitology* 88: 665–671.

Stace, C.A. 1996. *Plant Taxonomy and Biosystematics.* Cambridge University Press, London.

Taylor, N. 1970. Snake root. In *Encyclopaedia Britannica. Volume 20.* William Benton, Chicago.

Tits, M., J. Damas, J. Quetin-Leclercq, L. Angenot, and L. Limerick. 1991. From ethnobotanical uses of *Strychnos henningsii* to antiinflammatories, analgesics and antispasmodics. *Journal of Ethnopharmacology* 34(2-3):261–267.

Turrill, W.B. and E. Milne-Redhead, eds. 1952. *The Flora of Tropical East Africa.* Crown Agents, London.

Vasanthi, H.R., A. Jaswanth, V. Krishnaraj, G.V. Rajamanickam, and A. Saraswathy. 2003. *In vitro* snake venom detoxifying action of some marine algae of Gulf of Mannar, south-east coast of India. *Phytotherapy Research* 17(10):1217–1219.

Vilegas, J.H.Y., F.M. Lançasa, W. Vilegas, and G.L. Pozettib. 1997. Further triterpenes, steroids and furocoumarins from Brazilian medicinal plants of *Dorstenia* genus (Moraceae) *Journal of the Brazilian Chemical Society.* 8(5):529–535.

Watt, J.M. and M.G. Breyer-Brandwijk. 1962. *The Medicinal and Poisonous Plants of Southern and Eastern Africa,* 2nd ed. E.& S. Livingstone, Ltd., Edinburgh and London.

Whisson, M.G. 1964. Some aspects of functional disorders among the Kenyan Luo. In *Magic, Faith and Healing: Studies in Psychiatry Today,* ed. A. Kiev, pp. 283–304. The Free Press, New York.