



ORIGINAL PAPER

Sicarius (Six-Eyed Crab Spider): A homeopathic treatment for Ebola haemorrhagic fever and disseminated intravascular coagulation?

C Richardson-Boedler^{1*}

¹10101 Courtwick Drive, St Louis, MO 63128 - 1610, USA.

Keywords: *Sicarius*; *Crotalus*; Ebola fever; disseminated intravascular coagulation

Introduction

The homeopathic remedy *Crotalus horridus*, which causes severe coagulation disturbance and haemorrhage, is potentially applicable to Ebola fever and other haemorrhagic fevers, and to disseminated intravascular coagulation (DIC). A biological source not yet investigated as a homeopathic remedy, the *Sicarius* spider, causes symptoms of envenomation very similar to those of Ebola haemorrhagic fever, and may be of potential use against this deadly disease. Biochemical studies of the toxicology of *Sicarius albospinosus* Purcell and *S. testaceus* Purcell in experimental rabbits are compared to the biochemical effects the Ebola virus causes in rhesus monkeys. *Sicarius* envenomation and Ebola viral infection both led to a decline of factor VIII (platelet cofactor) in the plasma.

The *Sicarius* spider of the family Sicariidae inhabits regions of South Africa, Central America, and western and southern parts of South America. In South Africa, where the spider's danger to humans has demanded most attention, the three common species are *S. hahnii* Karsch (north-western Cape, South West Africa/Namibia), *S. testaceus* Purcell (western and southern Cape), and *S. oweni* Newlands (Transvaal).¹ The species *S. spatulatus* Pocock (southeastern Cape) had also been noted as causing extensive tissue necrosis; a presumptive bite by this species was responsible for the loss of a victim's arm due to advancing necrosis.² *S. hahnii* is known as extremely toxic; along with *S. albospinosus* Purcell, another species occurring in the southwestern coastal region of Africa, it is regarded as potentially lethal.

During the period 1976–1986, one citizen of South Africa, clinically diagnosed as victim of a *Sicarius* bite, died; another with a suspected *Sicarius* bite had been in

a critical condition.³ Locally, the bite causes tissue destruction and haemorrhage; it may also cause severe systemic reactions marked by DIC with internal haemorrhage and necrosis of organs, yet not accompanied by haemolytic anemia, as observed in the systemic reactions caused by loxoscelism.⁴

Source

The *Sicarius* species prefers arid and semi-arid regions. The spider is described as six-eyed, dorsoventrally compressed, leathery, and firm; it can reach the age of twelve years. It grows to a size of 15 mm and has a leg span of 50 mm; the legs are held in a crab-like, somewhat sprawling fashion. The dorsal side is marked by a visible pattern; the abdomen is rounded. The leathery outer skin has a yellowish, reddish-brown color and shows tiny, protruding spines which trap sand particles, thus, providing camouflage. The spider appears inactive, does not make webs nor cling to the underside of rocks but prefers to lie motionless under sand. Unlike most spiders, it buries its egg sac in the sand as well. It is not considered aggressive toward humans and remains impassive when handled or interfered with.^{1,2}

Effects of *Sicarius* envenomation

In 1990, Newlands and Atkinson published a key for spider bite diagnosis in Africa south of the equator.⁵ The following symptoms were indicative of a bite by *Sicarius*: within the first two hours, the bite site shows purple discoloration of 6 mm, as well as a surrounding weal of 20 mm, but no local oedema or redness. Six to eight hours after the bite, still no redness or oedema are visible at the bite site, yet local symptoms are very intense; necrosis develops at the center of a haemorrhagic region of darkened skin. One to three days after

*Correspondence: Dr Cornelia Richardson-Boedler, 10101 Courtwick Drive, St Louis, MO 63128-1610, USA.

the bite, the necrotic area forms a black scab, still surrounded by a darkened area of intense haemorrhage, with only minimal oedema or inflammation. The systemic reaction of DIC may occur. Seven to ten days after the bite, the bite site is subjected to a massive tissue destruction. In addition to DIC, generalized oedema may develop. The systemic symptoms may result in death.

Extensive biochemical data on the spider's toxic effects in humans have yet to be collected. However, by use of experimental rabbits, laboratory data have been gathered that provide parameters probably applicable to humans.^{2,6}

Symptoms caused by *S. albospinosus*

In 1982, Newlands published the first data of the toxicological effects caused in experimental rabbits by a bite by *S. albospinosus*. The local symptoms showed the following evolution: at the bite site, a small purple discoloration appeared, surrounded by a weal with a glossy and reticulated appearance and, an hour after the bite, reaching a size of 20 × 30 mm. By then, the darker middle zone had become haemorrhagic and had reached a size of 6 × 25 mm. Five hours after the bite, a black eschar of 8 × 15 mm had begun to form, then becoming hard two hours later. At this point, the eschar was surrounded by a haemorrhagic area, and the formerly glossy and reticulated skin was now showing signs of ecchymosis over a zone of 50 mm. Yet, in contrast to *Loxosceles* bites no oedema or redness of the skin were visible until eighteen hours after the bite.

The surviving rabbits shed the eschar nine days after the bite, exposing a crater up to 60 mm across that entailed significant damage to the subdermal tissue and skeletal muscle. Most of the rabbits died four to sixteen hours after the bite, with the symptoms of slight paralysis of hind limbs, generalized cyanosis, shallow breathing, and a lowered body temperature that could drop to 34.7 °C. Apparently, death was caused by respiratory failure.

Autopsies revealed a widespread petechial haemorrhage affecting the abdomen, dermis, and several systemic organs, indicating DIC. The organs involved were the lungs, heart, alimentary canal and mesentery, liver, spleen, and kidneys; the subconjunctiva of the eye was also affected. In contrast to DIC caused by *Loxoscelism*,⁷ no haemoglobinuria occurred.

Inflammatory cells and signs of necrosis were detected in the kidneys and spleen; the small intestine was affected by petechial haemorrhage; the lungs presented with oedema, significant inflammatory cell infiltrates and eosinophilic micro-abscess formation; in the liver, there was evidence of massive damage to liver cells that seemed to have occurred soon after the bite. There were signs of eosinophilic micro-abscess formation and necrosis and of fibrin thrombi in the portal vessels; the heart showed subendocardial

haemorrhage and mononuclear cell infiltrates indicating interstitial myocarditis.

The strong necrotic action of the venom, causing parts of the epidermis to disappear within six hours of the bite, was attributed to the venom's proteolytic properties; the paralysis of the hind limbs was related to a possible neurotoxic component of the venom. Biochemically, a deactivation of clotting factor VIII was noted. This is considered a unique feature of *Sicarius* envenomation which, according to Newlands, resulted in DIC. DIC was confirmed by thrombocytopenia, depletion of fibrinogen, and the unusual activity of the clotting factors, prolonged prothrombin (PT) and partial thromboplastin times (PTT). Fibrinogen degradation products, another sign of DIC, were not present, but according to Newlands, had been detected in a single experiment studying the effects of a bite by *S. hahnii*.

Symptoms caused by *S. testaceus*

The effects of the venom of *S. testaceus*, when tested in experimental rabbits, were as follows:⁶ within one to three hours after the bite, a subcutaneous haemorrhage was visible at the site of the bite, forming a lump. A small necrotic lesion developed at the site.

Thrombocytopenia with a dramatic drop of the platelet count was observed. Between five and six hours after the bite, fibrinogen levels almost doubled and clotting time had increased from two minutes to over twenty minutes. There were no significant changes in the blood cell count, hematocrit, or hemoglobin.

Two out of seven rabbits bitten by *S. testaceus* died five and a half and ten hours after the bite. Autopsies showed that petechial bleeding, which the authors related to the thrombocytopenia rather than to DIC, had occurred in the lungs, liver, duodenum, and kidneys. Histopathological findings at the bite site were: extensive fresh haemorrhage; the walls of blood vessels showed signs of necrosis with surrounding inflammatory cells; blood clots had formed inside the blood vessels; and inflammatory cells had infiltrated muscle and adipose tissue.

Contrary to Newlands' findings,² Van Aswegen and collaborators did not find clear evidence for DIC, as fibrinogen levels almost doubled after five to six hours following envenomation.

Homoeopathic application of *Sicarius* to Ebola haemorrhagic fever

A remedy made from the spider, particularly from a species shown to be capable of causing DIC, may prove of value in the treatment of the potentially fatal Ebola haemorrhagic fever which emerged in central Africa in 1976, since then causing recurring peaks of epidemic outbreaks in Sudan and Zaire. The Ebola virus is serologically different from, yet related to, the Marburg virus first observed in the German town of Marburg in

1967. Vervet monkeys, imported from Uganda, were found to be carriers.⁸ The natural reservoir of the Ebola virus, has not yet been identified, though captive monkeys have been found to be carriers.⁹

Among humans, transmission of the virus occurs by contact with skin or bodily fluids of clinically ill persons and most likely not by airborne transmission.⁹ The illness does not necessarily end in death,¹⁰ but the mortality rate is high, as a reliable and successful treatment or immunization procedure has not yet been established.

Symptoms of Ebola haemorrhagic fever

Petechial haemorrhage is a typical feature of haemorrhagic fevers. The Ebola virus causes a generalized haemorrhage in most organ systems. Necrosis without significant inflammation, mostly located in the liver, lungs, kidneys, and lymphoid organs, is also a common occurrence. DIC is usually observed. The illness has an incubation period from five to ten days, is marked by a sudden onset, high fever, muscle pain, headache, sore throat, vomiting, abdominal pain, diarrhoea, and mental changes; an inflammatory rash, without itching, may develop within five to seven days of onset.¹¹ Likewise, on the fifth day, a tendency to bleed from the gums, needle puncture sites or other sites may appear; pregnant women abort and may suffer massive uterine haemorrhage. Jaundice does not occur.¹²

The pathophysiology of shock and haemorrhage has been studied in rhesus monkeys infected with Ebola virus.¹³ A preceding study in infected rhesus monkeys showed that failure of platelet and endothelial cell function were precursors to the development of shock and haemorrhage and that DIC was late and variable in extent.¹⁴ Of eleven monkeys, ten died on the eighth day of the experiment.¹³ On the fourth day after being infected, they had presented with anorexia and lethargy. Between days four and seven, all had a petechial rash around the eyes, on the chest, abdomen, and flexor aspects of upper limbs. There was no bleeding from venepuncture sites, and no local oedema could be detected. All animals suffered from dehydration. A strong, early rise in neutrophil counts could be observed; lymphopaenia was present.

Coagulation studies revealed that the prolongation of the PTT was greater than PT. The levels of factors VII and VIII were measured in two animals and found diminished in proportion with coagulation disturbance. Fibrinogen degradation products were present from day four. The platelet count fell in all animals, and failure of platelet function was a precursor of thrombocytopenia.

By day six of the experiment,¹³ there was a total absence of platelet aggregation in those rhesus monkeys that died; a sudden and progressive failure of platelet aggregation was also observed *in-vitro* by use

of standardized plasma rich in platelets. Shortly before death, the endothelium showed an all-pervading loss of integrity, thus allowing effusion of blood, with sudden onset of hypovolemic and hyponatremic shock. No organ system was found with sufficient damage to account for the sudden collapse and death.

Comparing the results compiled by Newlands² with those of Fisher-Hoch and collaborators,¹³ one notices the pathological similarities. The most striking similarity is found in the apparent triggering role played by the declining levels of factors VII and VIII. Newlands points out that factor VIII deactivation is only rarely observed in DIC. However, as coagulation disturbance was found to increase proportional to the decline in factors VII and VIII in the Ebola virus infected monkeys, a key role of these factors in Ebola haemorrhagic fevers can be assumed. Likewise, the unique feature of the *Sicarius* venom, according to Newlands, is deactivation of factor VIII.

Symptoms of crotalid envenomation

Another homeopathic remedy, *Crotalus horridus*, prepared from rattlesnake venom, has been suggested as an appropriate agent against the Ebola fever.¹⁵ The remedy is used in haemorrhages of dark blood with a lack of clot formation. Blood may ooze from the nose, ears, rectum, urinary canal, from the skin; intraocular haemorrhages may occur; sweat, stomach matter are tinged with blood.

Indeed, crotalid envenomation generates coagulopathies with signs of thrombocytopenia. Following a bite by *Crotalus horridus horridus* (timber rattlesnake), a syndrome resembling DIC was observed by Hasiba and collaborators in 1975,¹⁶ presenting with profound thrombocytopenia with low levels of fibrinogen in the blood and simultaneous appearance of fibrinolysis products. The levels of products were high during the first few days and fell thereafter. However, the case studied by these authors showed no evidence of thrombin formation, essential for the diagnosis of DIC, and therefore was referred to as showing 'DIC-like' symptoms. The patient, treated with antivenom, also presented with conjunctival petechiae and bleeding from the gums; the affected limb was swollen and discolored, showed petechiae and tender axillary lymph nodes. After four days, widespread itchy urticaria developed.

The homoeopathic literature points to blood decomposition and jaundice as important symptoms of the remedy *Crotalus horridus*; haemorrhage in connection with jaundice is even given as a guiding symptom;¹⁷⁻¹⁹ the icteric discoloration of the skin and sclera has been related to the presence of damaged red blood cells;²⁰ and, as the symptoms resemble those of yellow fever, *Crotalus horridus* has found

successful application in this disease, as well as, reportedly, a prophylactic action when used in low material dose.^{18,20} Generally, neither jaundice nor haemolytic reactions have been found in victims of Ebola haemorrhagic fever or of *Sicarius* spider bite.

The medical literature mainly notes the morphological changes of red blood cells (echinocytosis) in response to crotalid envenomation and related in degree to the amount of venom absorbed, as observed in envenomation by *C. atrox*.²¹

In contrast to the *Sicarius* venom, the venom of *C. horridus horridus* has definite neurotoxic effects, causing an involuntary quivering of muscles most frequently reported after envenomation by *C. horridus horridus* and *C. atrox* (western diamondback rattlesnake).²² Ebola haemorrhagic fever affects the muscles but rather creates muscle pain. In addition, it is noteworthy that a lack of inflammation at necrotic sites was observed in victims of the Ebola virus as well as to some extent in victims of *Sicarius* spider bite which caused a delayed inflammatory response in skin tissues.

Thus, the venom of *C. horridus horridus*, which acts mainly by mimicking detrimental intravascular activity of thrombin, is to be differentiated from the venom of *S. albospinosus* which appears to directly deactivate factor VIII and trigger the subsequent coagulation disorder, thus more closely resembling the pathology of Ebola haemorrhagic fever. The lethal species *S. hahnii* and *S. albospinosus* should be of curative value also in other forms of haemorrhagic fever and in DIC. The well-established remedy *Crotalus horridus* should still be considered in these conditions.

The possibility of prophylactic measures

In geographical regions prone to be affected by the Ebola virus, a prophylactic administration of the potentized *Sicarius* spider may be beneficial.

As the Ebola virus can be detected in human blood throughout the acute phase of the illness, a blood nosode or blood isode, if taken from the individual patient, might also have curative effects;²³ a homeopathic preparation of the Ebola virus itself deserves consideration as well.

References

- 1 Newlands G, Atkinson P. Review of Southern African Spiders of Medical Importance, with Notes on the Signs and Symptoms of Envenomation. *S. Afr. Med. J.* 1988; 73: 235–239.
- 2 Newlands G. Preliminary Report on the Medical Importance of *Sicarius* (Araneae: Sicariidae) and the Action of its Venom. *Mem. Inst. Butantan* 1982; 46: 293–304.
- 3 Newlands G, Atkinson P. Behavioural and Epidemiological Considerations Pertaining to Necrotic Araneism in Southern Africa. *S. Afr. Med. J.* 1990; 77: 92–95.
- 4 Madrigal, GC, Ercolani, RL, Wenzl JE. Toxicity from a Bite of the Brown Spider (*Loxosceles reclusus*): Skin Necrosis, Hemolytic Anemia, and Hemoglobinuria in a Nine-Year-Old Child. *Clin. Pediatr.* 1972; 11: 641–644.
- 5 Newlands G, Atkinson P. A Key for the Clinical Diagnosis of Araneism in Africa South of the Equator. *S. Afr. Med. J.* 1990; 77: 96–97.
- 6 Van Aswegen G, Van Rooyen JM, Van der Nest DG, Veldman FJ, De Villiers TH, Oberholzer G. Venom of Six-Eyed Crab Spider, *Sicarius testaceus* (Purcell, 1908), Causes Necrotic and Hemorrhagic Lesions in the Rabbit. *Toxicon* 1997; 35: 1149–1152.
- 7 Vorse H, Seccareccio P, Woodfur K, Humphrey GB. Disseminated Intravascular Coagulopathy Following Fatal Brown Spider Bite (Necrotic Arachnidism). *J. Pediatr.* 1972; 80: 1035–1038.
- 8 Martini GA. Marburg Virus Disease. *Postgrad. Med.* 1973; 49: 542–546.
- 9 Stoeckle MY, Douglas RG. Infectious Diseases. *JAMA* 1996; 275: 1816–1817.
- 10 Emond RTD, Evans B, Bowen ETW, Lloyd G. A Case of Ebola Virus Infection. *Br. Med. J.* 1977; 2: 541–544.
- 11 Sodhi A. Ebola Virus Disease: Recognizing the Face of a Rare Killer. *Postgrad. Med.* 1996; 99: 75–76, 78.
- 12 Staff. Ebola Virus Infection. *Br. Med. J.* 1977; 2: 539–540.
- 13 Fisher-Hoch SP, Platt GS, Neild GH, Southee T, Baskerville A, Raymond RT, Lloyd G, Simpson DIH. Pathophysiology of Shock and Hemorrhage in a Fulminating Viral Infection (Ebola). *J. Infect. Dis.* 1985; 152 (5): 887–894.
- 14 Fisher-Hoch SP, Platt GS, Lloyd G, Simpson DIH, Neild GH, Barrett AJ. Haematological and Biochemical Monitoring of Ebola Infection in Rhesus Monkeys: Implications for Patient Management. *Lancet* 1983; 2: 1055–1058.
- 15 Crothers, D. Ebola Hemorrhagic Fever: A potential for cure. *Resonance* 1995; 17 4–5.
- 16 Hasiba U, Rosenbach LM, Rockwell D, Lewis JA. DIC-like Syndrome after Envenomation by the Snake *Crotalus horridus horridus*. *N. Engl. J. Med.* 1975; 292: 505–507.
- 17 Boericke W. (1927) *Materia Medica with Repertory*. rpt. Boericke & Tafel, Inc., n.d.: Santa Rosa, CA.
- 18 Clarke JH. *A Dictionary of Practical Materia Medica*. 3 vols. 1900–1903; rpt. New Delhi: Homeopathic Publications, n.d.
- 19 Hering C. *The Guiding Symptoms of our Materia Medica*. 10 vols. 1879, 1891; rpt. New Delhi: B. Jain Publishers Pvt. Ltd., 1995.
- 20 Stübler M, and Krug E, eds. *Tierstoffe. Vol. V of Leesers Lehrbuch der Homöopathie*. Heidelberg: Haug Verlag, 1987.
- 21 Walton RM, Brown DE, Hamar DW, Meador VP, Horn JW, Thrall MA. Mechanisms of Echinocytosis Induced by *Crotalus atrox* venom. *Vet. Pathol.* 1997; 34: 442–449.
- 22 Clark RF, Williams SR, Nordt SP, Boyer-Hassen LV. Successful Treatment of Crotalid-induced Neurotoxicity with a New Polyspecific Crotalid Fab Antivenom. *Ann. Emerg. Med.* 1997; 30: 54–57.
- 23 Richardson-Boedler C. The use of Patient-Made Blood Isodes (Nosodes) in Infectious Diseases Including HIV. *Infection Hom.* 1994; 8: 21–23.