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## Necrotic Arachnidism

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NOT OFTEN DO humans die of spider bite, but a more frequent if less appreciated consequence is cutaneous necrosis at the site of venom injections. The lesions are so fulminant and ugly-appearing

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that it is difficult to associate them with anything as small as a spider and they are therefore often mistakenly attributed to other causes.

As a case in point, a patient was admitted to our service with extensive necrotic ulcerations on the foot and buttocks. The history was highly suggestive of an insect bite, but there was no known organism in California that was reported capable of producing so astounding a lesion. However, careful review of medical and zoological literature elicited reports of an arachnid, the *Loxosceles spider*—only endemic in certain midwestern states—whose bite did cause necrotic lesions. There was a most remarkable similarity between history and clinical manifestations in the present case and the necrotic arachnidism reported caused by this midwestern species.

### Etiology and Epidemiology

Necrotic arachnidism (cutaneous necrosis following spider bite) has been known to physicians of South America for many years. Although Prada in 1896 reported the first case of gangrenocutaneous arachnidism in South America resulting from the bite of a small brown spider, it was not until 1937 that Macchiaviello identified the spider *Loxosceles laeta* as the causative agent of Chilean cutaneous arachnidism—"gangrenous spot." Numerous papers, especially from the University of Chile, have subsequently reported upon the incidence of necrotic arachnidism and on its treatment.

In the United States, reports of identical or very similar cases of necrotic arachnidism (caused by some unknown insect or spider) have frequently appeared in the literature. These date back to as early as 1890, when an article appearing in a local journal of medicine in Missouri reported a case of necrotic arachnidism resulting from the bite of a small spider, the species not known.

Until less than a decade ago, *Lactrodectus mactans* (the Black Widow spider) was the only culprit within the United States known to cause necrotic arachnidism. Then, in 1957, the Missouri Brown spider, *Loxosceles reclusa*,<sup>1</sup> was proved to be capable of causing such lesions. Clinically, the lesion produced by the bite of this spider is one of central necrosis—completely unlike that produced by the black widow, which rarely causes necrosis, but similar to the necrotic, cutaneous ulcerations produced by its South American relative, *Loxosceles laeta*.

Interestingly, the geographic incidence of the

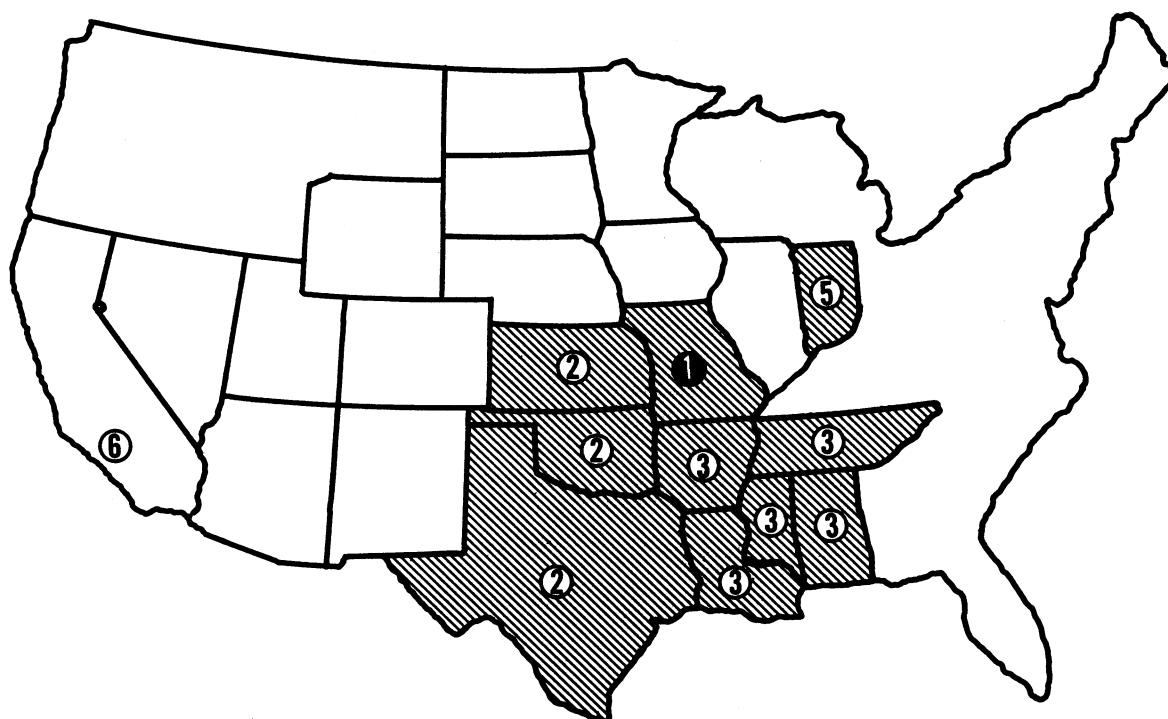


Figure 1.—Known distribution of *Loxosceles reclusa* in the United States. (1) First reported case of necrotic arachnidism—Missouri, 1957.<sup>11</sup> (2) By August 1962 cases of necrotic arachnidism had been reported in Kansas, Texas and Oklahoma. (3) Louisiana, Arkansas, Tennessee, Alabama and Mississippi reported the presence of the spider *L. reclusa* by 1962. (5) Reported case of necrotic arachnidism, Indiana, 1964. (6) Case report in this paper.

necrotic arachnidism caused by *L. reclusa* does not coincide with the reported distribution of the spider (Figure 1). Although in the literature up to 1962 reports of such lesions had been limited to Kansas, Missouri, Oklahoma and Texas, the prevalence of the spider had been recorded in a larger area, including Alabama, Arkansas, Louisiana, Mississippi and Tennessee.<sup>5</sup> Not one case of necrotic arachnidism from these latter five states has been reported. By 1964 an authenticated case of necrotic arachnidism had been reported as far north as Indiana.<sup>9</sup>

In Los Angeles, within the past year, two cases of severe necrotic arachnidism resulting from the bite of a small spider were recorded but were not reported in the medical literature. The lesion produced in both cases was similar to that resulting from the bite of the Missouri Brown spider.

Related to the exotic occurrence of necrotic arachnidism on the west coast, two other species of *Loxosceles*—*L. unicolor* and *L. arizonica*—are known to be endemic to Southern California. It well may be that the cases of necrotic arachnidism reported were due to *Loxosceles unicolor*, Keyserling, which has a distribution covering “. . . West-

ern United States, from New Mexico and Utah to California, southward into adjacent Mexico, at least to Southern Sonora and Baja California and eastward into New Mexico and Texas . . .” (Gertsch,<sup>4</sup> 1958).

A second possibility is that the other, natural

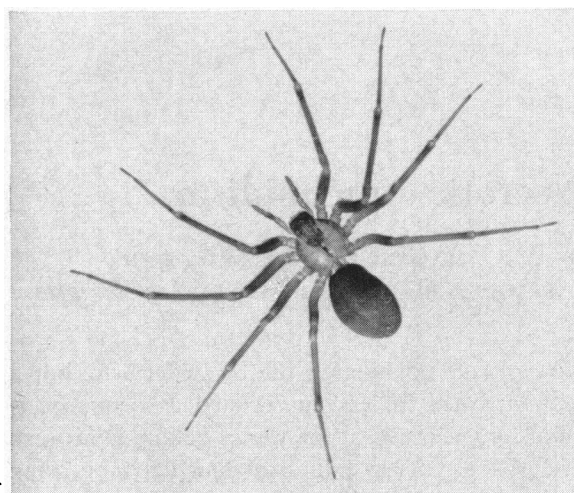


Figure 2.—*Loxosceles reclusa*, female, supplied by Dr. C. W. Wingo, University of Missouri. The body is about 9 mm long.

inhabitant of Southern California, *L. arizonica*, may also be capable of causing necrotic arachnidism. At present, however, neither *L. unicolor* K. nor *L. arizonica* has definitely been implicated. A third possibility is that *Loxosceles reclusa* (the Missouri Brown spider) or two other species (*Loxosceles rufescens* and *Loxosceles devia*) have been transported into the Southern California area.

It must be emphasized that, of the more than 20 species of *Loxosceles* indigenous to the United States, only *L. reclusa* has definitely been identified (by Wingo and coworkers, at the University of Missouri) with necrotic arachnidism in this country. Further, there is now evident a southward and a pronounced westward ecologic migration of this spider beyond the 100th meridian (beyond which, until 1963, this species had never been collected) as far west as the Pacific Coast.

#### The Brown Spider, *Loxosceles Reclusa*

The brown spider, *Loxosceles*, belongs to the family *Scytodidae*, the members of which are characterized by having six eyes and simple, external reproductive organs. The genus *Loxosceles* is further characterized by having a recurved row

of anterior eyes, a low cephalothorax and a yellow-brown body. *L. reclusa* is a small spider, the female usually about 9 mm long and the male about 8 mm. The entire body is covered with hair and is usually dark brown in color. The cephalothorax is close to the ground, and to it are attached eight long legs. A further distinguishing feature is a purple-brown, violin-shaped stigmatum on the dorsum of the cephalothorax. (See Figure 2.)

The *Loxosceles* spiders usually spin a small, irregular web that is not used to capture its prey. They prefer infrequently disturbed places, and usually will be found in storage closets, around old clothing, and at other sites of the house or garage commonly used for storage. They hunt at night. Usually they attack man only in self-defense when disturbed. As might well be expected, most reported bites have occurred in bed at night or when the victim was donning clothes that had not been used for several months, or when he was removing materials from storage.<sup>3</sup>

#### Toxicology

The *Loxosceles* spider possesses two large glands connected to its fangs. One gland contains

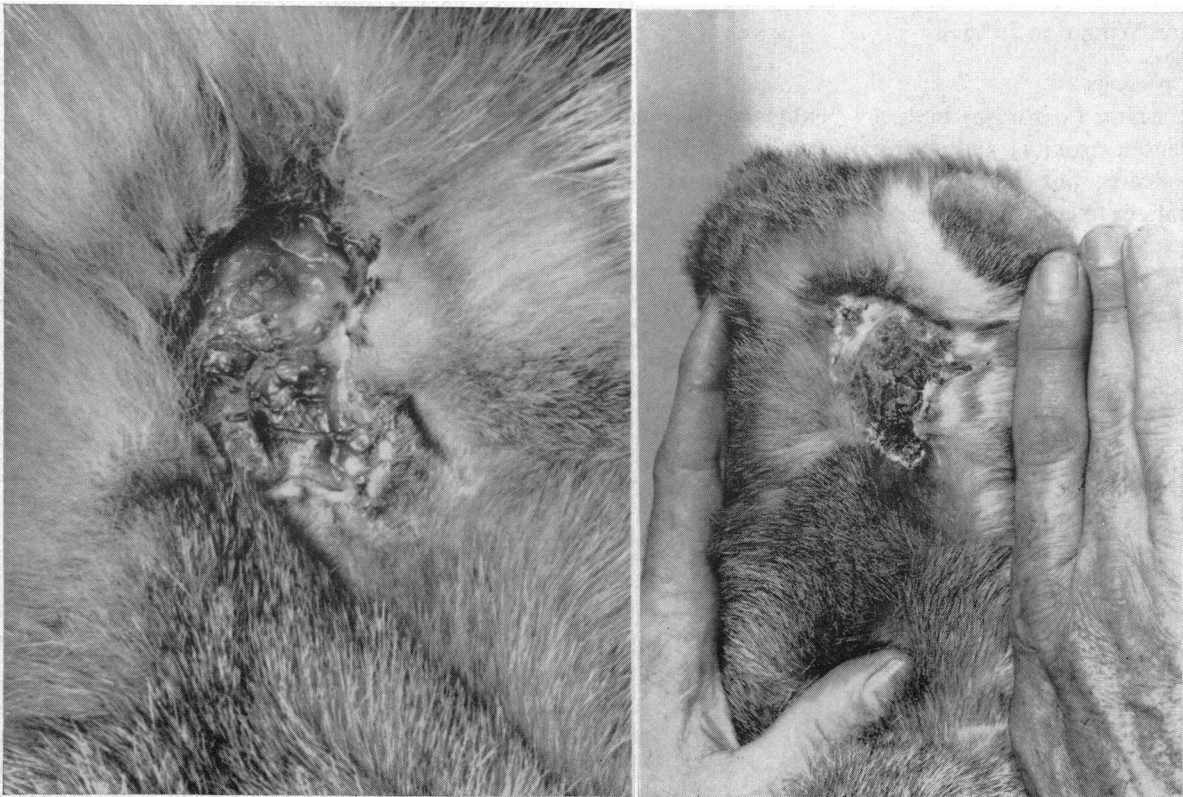


Figure 3.—Typical ulcer in experimental rabbit. Left frame shows lesion 12 days after bite by *Loxosceles* spider; right frame, after 15 days.

only a thick "gum" used to capture prey, the other gland contains the venom. Volume for volume, the venom of the *Loxosceles* spider is more virulent and pernicious than that of the rattlesnake, and is potentially more lethal than even that of the Black Widow spider. The components of the *Loxosceles* venom have not completely been isolated. The venom is known to contain at least three factors: (1) Levarteranol, (2) hemolysins which have not been completely separated, and (3) a "spreading factor" similar to that found in the venom of many snakes.

In laboratory experiments with rabbits, Wingo and Atkins noted that death may ensue within 12 hours after only two or three bites by *Loxosceles* spiders. On postmortem examination of these animals, ecchymosis and petechial hemorrhage was observed in the corporal muscles and gastric mucosa. Erosion of the gastric mucosa also was noted. Wingo and Atkins in addition demonstrated that animals that survived the initial attack by the *Loxosceles* spider had a resistance or immunity to subsequent attacks. Mackennon and Wilkind suggested the existence of a passive immunization to the venom of the *Loxosceles* spider and their observation was confirmed by Atkins and Wingo<sup>2</sup> in 1958.

#### Pathology

Many *Loxosceles* bites are benign (despite the venom toxicity) and, therefore, are of no medical concern; but a few are serious enough for the patient to consult a physician.



Figure 4.—Characteristic ulcer, about 4×5 cm, in a patient three weeks after bite by *Loxosceles reclusa* spider.

There are two clinical variants of necrotic arachnidism produced by the bite of the *Loxosceles* spider: The localized cutaneous necrotic arachnidism, the most commonly seen form, and severe systemic viscerocutaneous arachnidism.

The severity of the bite is directly proportional to the depth of penetration by the fangs and to the duration of the exposure. The bite of the *Loxosceles* spider produces a sting which is milder than that of the average bee, and for this reason may go completely unnoticed by the victim. Within several hours, a small bleb surrounded by an area of erythema appears at the site of toxic injection, later to be replaced by a white, edematous area. This edematous area will ultimately progress to a violaceous-to-black reaction which in turn will gradually be supplanted by the typical, brown-black eschar. The eschar usually sloughs within two to three weeks, leaving the deep, necrotic ulcer, characteristic of necrotic arachnidism (Figures 3 and 4).

The ulceration may extend down to the underlying muscle, but in the main does not involve the muscle itself. These ulcerated areas are characterized by extensive fat necrosis and are extremely slow to heal. Usually complete granulation and scar tissue formation takes from several weeks to months. Cultures of material taken from the area of ulceration will usually be negative for bacterial organisms during the early stages; however, secondary infection, usually with a species of *Staphylococcus*, may occur during the chronic stages.

Secondary ulceration may appear proximal to the primary lesion, perhaps due to the spreading factor in the venom.

Occasionally, the bite of the *Loxosceles* spider may result in a fulminating, systemic viscerocutaneous form of necrotic arachnidism. Such reactions usually consist of arthralgia, nausea, vomiting, restlessness, fever ranging up to 40°C (104°F), proteinuria, hemoglobinuria and a generalized scarlatiniform rash. Schenone,<sup>10</sup> in reporting 40 cases of necrotic arachnidism from Chile, Uruguay and Peru, described four in which the systemic viscerocutaneous form of the disease developed. Hemolytic anemia developed in two patients, but there were no deaths in the series. Minton<sup>8</sup> in 1964 reported a case of hemolytic anemia associated with necrotic arachnidism in a seven-year-old boy from Indiana.

## Therapy

The treatment of necrotic arachnidism thus far has been primarily supportive and symptomatic. Since the venom of the *Loxosceles* spider is a viscerotoxin (cytotoxin), rather than a neurotoxin as is the venom of the Black Widow spider, calcium gluconate is not effective in treating the bites. Vasodilators have been used in an attempt to counteract the effects of the norepinephrine-like component of the venom. There have been reported instances of excellent results obtained from the use of local infiltrations of phentolamine (Regitin®) into the site of the bite. Steroids and antihistamines have both been tried. The results, however, are questionable.

In the severe, viscerocutaneous form of necrotic arachnidism treatment is again principally supportive and symptomatic. There has been a specific antivenom developed in South America which has been demonstrated to be very effective against the systemic effects of the venom of the *Loxosceles laeta* spider—the South American counterpart of *L. reclusa*.

When the eschar sloughs, leaving a large, ulcerative area with extensive fat necrosis, treatment consists of surgical debridement and skin-grafting. The debridement should be radical, including a wide area extending down to the fascia of the underlying muscle. Debridement and skin grafting may also be indicated if healing results in proliferative scar-formation.

Antibiotics are usually not indicated in the localized form of necrotic arachnidism, inasmuch as the areas of ulceration are usually sterile. If

subsequent cultures from the ulceration should demonstrate the presence of a secondary infection, then appropriate therapy is certainly indicated.

## Report of a Case

A 20-year-old white man was admitted to Queen of Angels Hospital in May 1964. After spending a night in a motel in San Diego, California, he discovered a blister on the sole of his right foot and a reddened area over the left buttocks. (The patient had not recently been in any area known to be a habitat of the *Loxosceles* spider.) The following day, the bleb on the sole of the right foot opened, and a clear, whitish fluid was expressed. During the next several days this area enlarged progressively and ulceration began. By the end of the third week, an irregular cutaneous ulcer, 5×12 cm, with extensive fat necrosis, occupied a large part of the lateral aspect of the right foot (Figure 5). During this same period the patient had increasing pain over the foot and buttocks. Within the next two weeks the area over the left buttocks showed progressive erythema, becoming violaceous. By the end of the second week a dark brown-black eschar had formed over this area. The eschar then sloughed, leaving a deep ulcerated area of extensive fat necrosis (Figure 6). The patient refused surgical therapy and returned home.

Figures 5 and 6 were submitted to Dr. C. W. Wingo at the University of Missouri. Dr. Wingo said: "The ulcers in your photographs are typical of those we see in Missouri and adjoining states

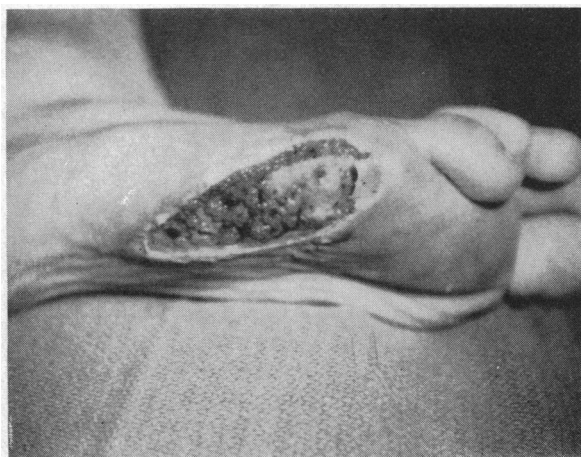


Figure 5.—Extensive ulceration with fat necrosis over the lateral aspect of the right foot three weeks after what appears to have been a spider bite.



Figure 6.—Extensive ulceration with fat necrosis over the left lumbosacral area three weeks after what is assumed to have been a spider bite.

following bites of *Loxosceles reclusa*. I know of no insect or other arthropod in the United States capable of causing necrotic ulcers. I doubt very much that it was caused by any agent other than a spider, and I feel strongly that it was a species of *Loxosceles*."

### Summary

Bites by Missouri Brown spider, *Loxosceles reclusa*, which has not yet been reported found in the Western United States, can cause extensive necrotic ulcerations at the site of injection.

Necrosis of the kind reported from such bites was observed on the foot and buttocks in a patient who several days earlier had wakened in a San Diego motel to find what appeared to be stings of some sort at the sites where the more severe lesions later developed. Pictures of the necrotic ulcers were sent to a Missouri physician who was conversant with necrotic arachnidism, and he said that they were "typical of those we see . . . following bites of *Loxosceles reclusa*."

### GENERIC AND TRADE NAME OF DRUG

Phentolamine—*Regitin*.

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