RED SQUILL V. THE SUSCEPTIBILITY OF HOGS TO RED SQUILL.*

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For some years past, the Control Methods Research Laboratory of the United States Biological Survey has occasionally received reports of animal losses presumably caused by the consumption of red squill baits exposed for rat control. References in the literature (1), (2), (3) indicate that red squill is not readily taken by animals, other than rats, and if consumed the emetic principle in the squill causes vomiting, which usually saves the animal.

The literature, however, is deficient in specific references to the toxicity of red squill powders and extracts to hogs (4). The observations we are reporting will deal with this particular point.

Our early tests were carried on with one hog which had been maintained in the laboratory on an adequate diet. The results of these studies confirmed published observations in that the animal took more than three hours to eat two pounds of bait. It consumed the entire bait, however, before stopping, and in that form had obtained a dose of 1888 mg. of red squill powder per Kg. of hog. The hog showed marked depression for five hours, but did not vomit during that time. The following morning, however, evidence was present to show vomiting had been profuse during the night. The hog was still very sick, and remained so for four days. Recovery was complete, however, and the appetite was restored on the fifth day.

Further reports of suspected losses of hogs caused a renewal of our interest in this matter, and coöperative studies were undertaken with Dr. I. E. Newsom and his associates in the Department of Veterinary Pathology, Colorado State College at Fort Collins, to learn more of the possible hazards of red squill to hogs.

The animals used were purchased on the Denver market and trucked to Fort Collins for penning and observation. After they had been proved to be normal they were starved for from 24 to 72 hours to attempt a stimulation of acceptance. This treatment was without avail in every case, since it was necesssary to force feed all the animals tested. The following table gives the results of the dosages administered:

TABLE I.—THE EFFECT OF RED SQUILL POWDER ON HOGS.

Animal No.	Animal Weight Kg.	Dose Mg./Kg.	Result.
4	39.55	1,500	Found dead 2½ hours
3	46.40	750	Found dead 2½ hours
2	52.30	500	Died 4½ hours
1	53.20	250	Died 7 hours
6	50.90	175	Died 5 hours
5	65.50	100	Survived

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Animals 1 to 4, inclusive, were starved 24 hours, while animals 5 and 6 were held without food for 48 hours. It seemed to make very little difference in the acceptance rate, only small quantities of bait being taken before complete refusal was observed. A period of an hour and a half was allowed to elapse before force feeding was instituted, but when no further inclination to eat naturally was in evidence, the animals were stomach-tubed.

This method of dosage caused sufficient irritation that emesis was induced in all animals very promptly. Animal No. 1 started vomiting in 8 minutes; No. 2 in 3 minutes; No. 3 in 5 minutes; No. 4 in 4 minutes; No. 5 in 13 minutes; and No. 6 probably within an hour although an exact observation was not obtained. Vomiting was profuse and repeated, but did not save the animals involved. This was undoubtedly due to the fact that considerable of the bait had passed into the intestines.

To test the effect of extracting the rat-killing fraction from the squill powder and feeding only that portion to hogs, two additional animals were used.

An extract was made from the powder used in the experiment above, by the use of an alcohol, glycerine and water-combined menstruum. This menstruum was concentrated in vacuum to 40% fluidextract strength. This was then mixed with a scratch feed in equal proportion, giving a bait carrying the equivalent of 200 mg. of dry squill powder per Gm. Weighed quantities were offered to hogs, but only samples were taken. Boluses were then made and placed on the back of the tongue and washed down with water.

These animals did not vomit while being watched for over an hour.

TABLE II.—THE EFFECT OF RED SQUILL EXTRACT IN HOGS.

Animal No.	Animal Weight. Kg.	Dose. Mg./Kg.	Result.
8	35.90	500	Died in 2 days.
7	48.20	250	Survived.

The symptoms of red squill poisoning are well illustrated by a discussion of the history of animal No. 1, which died in seven hours from a dose of 250 mg./Kg. This hog was given its poison by stomach tube at 10:37 A.M. It began vomiting at 10:45 A.M. Following that, until 1:45 P.M. when it bedded down, it remained quiet but tense in a standing position. During the period following 1:45 P.M. it ground its teeth violently, showed an increased respiration and frequently gave a mild expiratory grunting. At 2:45 P.M. the animal began a rolling about the longitudinal axis, rolling to the left. Then a posterior paralysis developed, which gradually proceeded toward the anterior portion of the animal.

Frequent defecation of normal feces occurred every few minutes during the afternoon from 1:45 until 3:00 P.M. The passages became watery and stringy after this time and persisted until almost death.

Signs of respiratory failure started at 5:15 P.M., and the hog died at 6:00 o'clock. It was autopsied at 10:00 P.M.

The post-mortem appearances of the hogs all closely resembled that of number one, so a description of this same animal will be sufficient.

There were no external lesions.

Cerebral vessels were distended with dark-colored blood. Parotid lymph nodes slightly reddened. Lungs light colored and emphysematous. Heart showed diffuse hemorrhage near the coronary vessels on each ventricle.

The oral cavity, trachea and esophagus were all normal.

Strands of fibrinous exudate were prominent in the serosa of the intestines. Numerous 0.1–0.5 cm. hemorrhages were present in serosa of small intestines.

Stomach was nearly empty. The mucosa was covered by a thick, grey, tenacious exudate. Diffuse hemorrhagic inflammation was present throughout the intestinal tract, most pronounced anteriorly. Mesenteric lymph nodes were very hemorrhagic. The dark kidney surface was irregularly mottled with white spots. The other organs were apparently normal.

The pathology followed the indications seen in the post-mortem, in that practically all the sections showed only congestion.

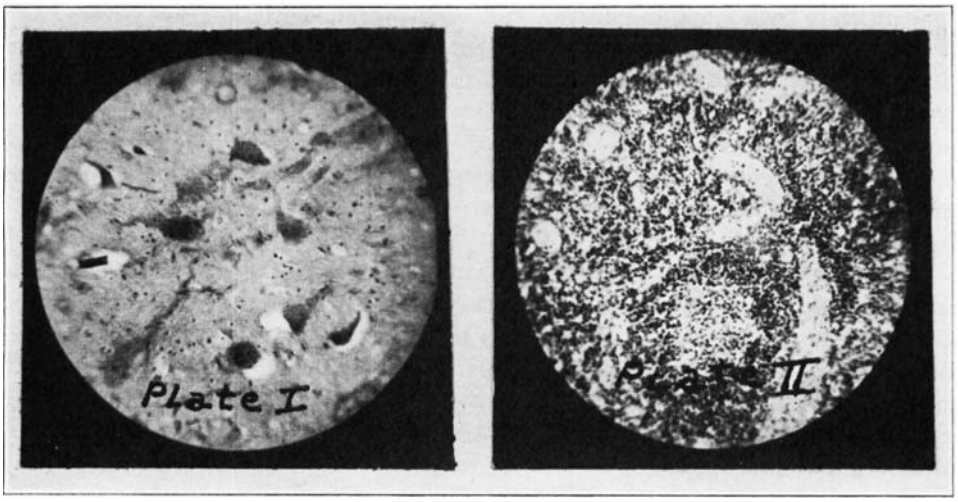

Plate 1. Plate 2.

Plate No. 1 shows the congested capillaries in the grey matter of the central thoracic portion of the spinal cord of animal number one.

Plate No. 2 indicates the extreme congestion in the parotid lymph node, shown by capillary wall distension, in animal number six.

CONCLUSIONS.

1. Red Squill powder is lethal to hogs when given by stomach tube in doses of 175 mg./Kg. and above.

2. Red Squill extract is lethal to hogs when given by stomach in doses of 500 mg./Kg.

3. Most hogs will not eat enough red squill rat poison voluntarily to cause death.

4. Red Squill powder causes emesis in hogs, which tends to protect the animals, when baits are consumed normally.

BIBLIOGRAPHY.

(1) Munch, Silver and Horn, *U. S. D. A. Tech. Bull.* 134 (1929).
(2) Bocker, *Soap*, 8, 95–97 (1932).
(3) Munch, Silver and Horn, JOUR. A. PH. A., 19, 837–840 (1930).
(4) Cornavin in Koller, "Das Rattenbuch" (1932).