White Snakeroot Poisoning

Circular 436

University of Illinois
College of Agriculture
Agricultural Experiment
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MILK SICKNESS in man and “trembles” in farm animals occur each year in Illinois. These two diseases are really identical and are caused by a toxic substance known as tremetol, a constituent of white snakeroot, a plant widely distributed throughout the wooded sections along rivers in Illinois. Milk sickness occurs as a result of consuming milk or meat products from animals that have been eating white snakeroot. Extreme care should therefore be exercised in keeping food-producing animals away from fields where white snakeroot grows.

Trembles and milk sickness are more prevalent during the late summer and early fall months than at other times of the year. This is particularly true after drought, when pastures are short and animals are forced to feed on plants which they ordinarily would refuse.

To prevent these distressing and often fatal diseases in farm animals and in man, the white snakeroot plant must be exterminated or animals kept out of pastures in which it is growing.

Urbana, Illinois

White Snakeroot Poisoning

By ROBERT GRAHAM and V. M. MICHAEL

WHITE SNAKEROOT or Eupatorium poisoning, commonly called "trembles," is primarily a disease of cattle, sheep, and horses, which may occur also in man as the result of drinking milk or eating meat or milk products from affected animals.

Altho the poisonous character of white snakeroot has been recognized for many years, the plant is still abundant in many woodland pastures of Illinois. Many owners choose to protect their animals by avoiding the use of infested pastures rather than by exterminating the plant. Others have not been aware of the presence of the plant until their animals became affected with the disease.

Serious outbreaks of white snakeroot poisoning in man and animals have led to feeding tests with the fresh plant by the U. S. Bureau of Animal Industry and by several state experiment stations, including the Illinois Station. These tests have proved definitely the poisonous nature of the plant and its potential danger to man and animals.

History of Poisoning in One Illinois Township

How white snakeroot may affect men and animals in a community over a long period of time is illustrated by the following history of outbreaks of trembles and milk sickness in Button township, Ford county, from 1862 to 1922, supplied by Dr. E. C. Park, of Paxton, Illinois:

"At intervals of every few years for the past sixty years or more, cases of milk sickness in persons and trembles in livestock have occurred in Button township. This township is an uneven country of loamy soil, small streams and wooded pastures in which Eupatorium urticaefolium (white snakeroot) grows in abundance.

"In two of the pastures in Button township, the plant grows in such abundance as to exclude almost all other vegetation. Stock pastured in..."
these fields are forced to eat the weed or go without sufficient food. Most of the wooded land has been cleared and cultivated until there are only a few of the pasture fields in which the weed will grow. As a result, in recent years the cases of milk sickness have been traced easily to two or three of the inclosed pasture fields in the community and all of the cases which occurred in the last four years to certain pastures on one or two farms. It was the practice in years gone by, when the stock would sicken and die of the disease, to transfer it to some other pasture, or fence off the portion of the field where the snakeroot grew thickest. A temporary fence, a remnant of the effort to check the disease, still remains on one farm.

"Some twenty years ago a resident of one of these farms died of milk sickness. In 1922 two children living on the same premises suffered severe attacks of the disease which lasted several weeks and were followed by a long and tedious convalescence."

An inspection of the cattle in the 1922 outbreak on this farm revealed two milk cows that were emaciated, but symptoms of trembling were not observed. Simultaneously with the illness of the children and the emaciated condition in the cattle, two horses in the same pasture died after displaying symptoms suggestive of Eupatorium poisoning.

Each year similar outbreaks of white snakeroot poisoning occur in late summer and fall in some locality in the state, emphasizing the urgent need for prevention of this disease.

White Snakeroot a Slender Perennial

White snakeroot (Eupatorium urticaefolium) is a slender, erect, perennial herb which grows from 1 to 5 feet high. The leaves are opposite each other, 3 to 5 inches long, broadly ovate, and have sharply toothed or serrated edges. The upper surface is somewhat dull, while the under surface possesses a slight luster. Each leaf has three main veins, which are prominent on the under surface and which extend from the base of the leaf and give off many branches. The leaf stalks are about one-fourth to one-half as long as the leaf. In the late summer the small white flowers of the plant appear as compound clusters, having eight to thirty flowers. The roots are coarsely fibrous and usually shallow. Pastures in heavily infested woodland areas present an attractive appearance and it is not uncommon for persons to select clusters of white snakeroot flowers for home decoration. The diagrammatic illustrations in Fig. 1 show the characteristic features of the plant.

White snakeroot grows profusely in the damp rich soil of woods, swampy areas, shady ravines, and in groves along streams. Altho pre-
WHITE SNAKEROOT
(Eupatorium urticaefolium)

Courtesy New York State Museum
Albany, N.Y.
ferring shady places, it has been found on cleared hillsides and somewhat sparingly in orchards and orchard pastures over a wide area of the more highly cultivated agricultural sections of the state.

Closely related nonpoisonous plants of the Eupatorium genus grow abundantly in open pastures and are often mistaken, upon casual ob-

**FIG. 1.—CHARACTERISTIC DETAILS OF WHITE SNAKEROOT**

White snakeroot (*Eupatorium urticaefolium*) is a slender, erect perennial herb which grows from 1 to 5 feet high. In the late summer the small white flowers appear as compound clusters, having 8 to 30 flowers. The roots are coarsely fibrous and usually shallow.

Specimens of suspected plants may be sent to the Agronomy Department, University of Illinois, Urbana, for identification.
Tremetol Is the Active Principle in Poisoning

Three toxic substances have been isolated from green *Eupatorium urticaefolium* (white snakeroot). Two of these, a volatile oil and a resin acid, do not produce “trembles” in animals and have no relation to milk sickness. The third, tremetol, is held responsible for both.\(^1\)

Tremetol (\(C_{16}H_{22}O_4\)) is an aromatic straw-yellow oily liquid which is insoluble in water, acid or alkali, but soluble in common organic solvents, such as alcohol, ether, chloroform and benzene. It may be altered by heat or chemical reagents and when so changed loses its poisonous properties. Drying also rapidly destroys tremetol, and completely dried plants are rarely capable of producing trembles. Tremetol is a cumulative poison; while no ill effects, or only slight symptoms, are observed if less than the lethal dose is ingested, several small amounts at various feedings may produce typical poisoning.

*Tests for Tremetol.*—The nonpoisonous plants of the *Eupatorium* genus have been shown to contain no tremetol, whereas the poisonous plant does contain tremetol. The following test has been described by Couch\(^1\) for the detection of tremetol:

“The suspected material is shaken with purified petroleum benzine and the solution is floated on the surface of 2 or 3 cubic centimeters of concentrated sulfuric acid in a dry test tube. If tremetol is present, the interface or surface between the two liquids is colored red. When the two liquids are mixed by shaking the tube, the petroleum benzine solution becomes a transient red, while the acid layer acquires a cherry red, more or less intense according to the amount of tremetol present. This color should develop as soon as the solutions are mixed. If only minute amounts of tremetol are present, a yellow or orange color may be the result.”

The presence of tremetol can be confirmed by feeding the suspected material to guinea pigs.

Varying Susceptibility of Animals

In studies conducted at the Illinois Agricultural Experiment Station with domestic animals, marked variations occurred in susceptibility of the individual animals to white snakeroot poisoning. Some died after eating amounts of the plant equivalent to only 1 to 2 percent of their body weight; other animals, especially the guinea pigs, ate the equivalent of 15 to 18 percent of their weight before death ensued.

Fresh and dried snakeroot fed experimentally to horses, cattle, sheep, and guinea pigs frequently produced symptoms of white snake-\(^{1}\)

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root poisoning, altho some of the animals, particularly the milk cows, did not succumb to an acute type of the disease. Cattle and guinea pigs especially seemed to exhibit a tolerance to the poisonous constituent of the plant, altho some of the guinea pigs refused to eat the fresh leaves in amounts sufficient to produce death. Hogs are highly resistant and seldom suffer from white snakeroot poisoning.

Aqueous and alcoholic extracts of white snakeroot, as well as the expressed sap and the residue of alcoholic extracts, when fed to guinea pigs and goats, did not consistently produce illness and death, altho an occasional death suggested that the poisonous property of the plant was present in the extracts. A tolerance of animals to these extracts comparable to their tolerance to the feeding of the fresh plant was observed.

When twenty-two pigs were fed carcasses of a cow and ewe which had died of white snakeroot poisoning, symptoms suggestive of poisoning were produced in two of them.

Symptoms and autopsy findings in a nursing lamb, the mother of which had been fed fresh white snakeroot, indicated that the milk was the source of the poison; but experimental animals receiving milk from cows eating the plant were not consistently poisoned. Milk, milk serum, and casein from cows fed white snakeroot injected subcutaneously into guinea pigs in amounts of 2 cubic centimeters frequently failed to induce symptoms of white snakeroot poisoning. Butter prepared from milk of cows pastured on white snakeroot did not produce illness when fed in small amounts (.5 gram) to guinea pigs.

**Symptoms of White Snakeroot Poisoning**

White snakeroot poisoning appears only in pastured animals—horses, cattle, and sheep being the ones usually affected. White snakeroot is not well liked by grazing animals, but during periods of drouth, or if a field is overpastured, they may be forced to eat it. If the plants are numerous, the animals may eat the leaves from time to time even tho pasture grass is abundant (Fig. 2).

Attempts to disclaim the poisonous character of white snakeroot may be due partly to the fact that symptoms somewhat resembling those of poisoning by this weed may result from other causes. The symptoms described in this circular, however, are based upon experimental work which proved conclusively the poisonous character of the weed. The symptoms exhibited by the experimental animals could not be distinguished from those appearing in animals that have had access to the plant in pastures.
Cattle.—Cattle grazing on pastures infested with white snakeroot often become chronically affected. In this chronic form the disease is marked by sluggishness and fatigue following exercise. The animal is listless, and when forced to walk, the movements are slow and stiff. One method of diagnosing suspicious cases consists of forcing the animal to move and observing the tone of the voluntary muscles. A trembling of these muscles often indicates that the animal has white snakeroot poisoning. This trembling, however, usually disappears after a rest.

Severely affected cattle are constipated, lose appetite and weight, become increasingly weak, and finally are unable to stand. The animals may sink to the ground and remain lying for hours or days, and when helped up often show marked symptoms of trembling, standing with body arched and hind feet placed close together well under the body. Respiration is difficult, and the breath has a peculiar, pungent, fetid odor due to acetone. Frequently profuse nasal discharges are observed. Animals in this stage usually die. Not all the cattle in a herd, even tho kept under the same conditions, develop the disease, while the severity of the symptoms generally varies among animals. Three stages of the disease in cattle are illustrated in Fig. 3.

Horses.—The disease runs a more rapid course in horses than in cattle. Affected horses often die within two or three days after the symptoms of illness appear. The first symptoms are an unsteady gait, suggestive of weakness, and difficulty in swallowing, accompanied
frequently by excessive slobbering and distressed and heavy breathing. The breath of affected horses has the same pungent odor that is noticeable in cattle. The animal appears gaunt and dejected, loses weight rapidly, and moves reluctantly. These symptoms usually are accompanied by constipation and by trembling of the large body muscles, altho the trembling generally is intermittent and not so marked as in cattle and sheep. Death generally follows in a few hours after the affected animals "go down."

**Sheep.**—Symptoms observed in sheep generally resemble those of cattle. One of the first symptoms is loss of appetite and grinding of the teeth. The animal becomes sluggish and disinclined to move. A trembling of the muscles may be especially noticeable following exercise, tho affected sheep usually lie quietly. When helped up, the animal stands with the feet spread apart laterally and the hind feet placed

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**Fig. 3.—Typical Symptoms of White Snakeroot Poisoning**

Animals in the first stage of white snakeroot poisoning (A) become weak, tremble, and lie down frequently. B shows a calf in the advanced stage, in a semiconscious state. The calf shown in C is suffering from acute poisoning. The closed eyes, semicomatose attitude, weakness, emaciation, and trembling are characteristic of the last stage of the disease.
well under the body. The back is bowed, the neck outstretched, and the head lowered (Fig. 4). After two or three days, or in the latter stages of the disease, the animal becomes comatose and may lie on its side until death occurs. When coma starts, a frothy discharge from the nostrils is not uncommon.

**Fig. 4.—Sheep Poisoned With White Snakeroot**

Sheep in the late stages of white snakeroot poisoning assume a sleepy attitude.

**Hogs.**—The symptoms observed in hogs are similar to those in cattle and sheep. The animal is listless and remains in a prone position unless urged to rise. There is no marked decrease in appetite. The animal stands with the hind feet well under the body, eyes half closed, head lowered and back bowed. In the initial stages of the disease, the hind legs appear stiff; later the stiffness may spread to the front legs. After the pig stands a few minutes, trembling begins and becomes so severe that the animal falls on its knees or sits on its haunches, then falls to the ground. Coma precedes death.

**Guinea Pigs.**—The disease is first evidenced in guinea pigs by their refusal to eat. The animal becomes listless and crouches in the cage with eyes half-closed. The hair becomes rough. Muscular tremors, altho present, are not especially noticeable. Complete lack of muscular coordination and stupor precede death (Fig. 5).

**Man.**—The onset of the disease in man is gradual and is characterized by a restless, weak, and languid feeling. Later excessive vomit-
ing occurs, accompanied by loss of appetite and obstinate constipation. The peculiar fetid odor of the breath is considered diagnostic. Respiration may be labored, the pulse weak, and the temperature abnormal. Severe cases sometimes resemble typhoid fever. The patient may be delirious, and coma generally precedes death, which may follow two days to three weeks after the first symptoms. Patients who recover seem to have lasting debility. One attack of the disease produces no immunity to subsequent poisonings.

**FIG. 5.—GUINEA PIGS SUFFERING FROM WHITE SNAKERoot POISONING**

These pigs ate approximately five leaves of white snakeroot plant each day for four successive days. They were photographed on the fifth day a few hours before death occurred.

**Prevention of White Snakeroot Poisoning**

*Avoid Food Products From Sick Animals.*—Prevention of milk sickness in man depends upon the avoidance of milk, meat, and milk products from animals that have had access to white snakeroot, for tremetol may be transmitted thru the milk of cows which show no definite symptoms of poisoning. Since the toxic principle is destroyed only very slowly at the temperature of boiling water, milk pasteurization is of little value in destroying the toxin. In a general milk supply or in creamery butter, however, the toxic principle is so diluted that it may become harmless. The disease appears to result from the continued use of milk or butter from affected animals, rather than from the occasional consumption of a small amount in a mixture of milk from diseased and healthy animals. The occurrence of the disease in rural families and its absence in cities is doubtless explained in this manner.
A careful observation of the herd from August to November should enable the owner to detect obscure cases. Likewise inspection of animals and pastures in localities where white snakeroot is prevalent is recommended.

*Exterminate Weed.*—The clearing of underbrush and the cutting of trees to permit ample sunlight discourages the growth and spread of white snakeroot. Cropping is also an aid in checking the growth of this plant. It has been noted that the plant increases on partially cleared land and disappears after cultivation. If the pasture is small and the infestation limited, white snakeroot, which has very shallow roots, can be eradicated with little effort by pulling. This should be done in August or September, when the flowers are in bloom, and repeated in October. After the plants have been pulled and allowed to dry, they should be burned in order to destroy the seeds. Pulling and burning should be repeated each fall until the plant is eradicated. Since white snakeroot is a perennial, it cannot be eradicated by cutting.

If large pastures are heavily infested with white snakeroot, making it impractical to pull the plants, it is advisable to move the stock to new pastures about the first of July and keep them there until December 1, or until the pastures are freed of the weed.

**No Satisfactory Treatment for the Disease**

The treatment of animals and man for white snakeroot poisoning is far from satisfactory. For animals suffering from white snakeroot poisoning, veterinarians recommend purgatives such as castor oil or soybean oil, with repeated doses of stimulants. It should be borne in mind, however, that partial throat paralysis may occur, and the oral administration of drugs may therefore be a dangerous procedure. Each case should be treated individually under the direction of a veterinarian. When symptoms of the disease appear, the animals should be moved promptly to noninfested pastures, and as a precautionary measure should be given laxative food for ten days to two weeks.

In human cases of *Eupatorium* poisoning an early diagnosis is essential to recovery. Whenever symptoms similar to those of white snakeroot poisoning develop within two to fifteen days after drinking milk or eating meat or dairy products from a herd which has had access to white snakeroot, a physician should be called immediately and treatment given. The progress of the disease is usually rapid and mortality high; in one state 24 percent of the reported cases ended in death.