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Toxic Algae Poisoning

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Late in October 1952, large numbers of waterfowl were found dead upon the water and shores of Storm Lake, Iowa. Several of the dead birds, two semi-conscious Franklin gulls and a bucketful of the water which had a thick greenish scum of algae on the surface were submitted to the Iowa Veterinary Diagnostic Laboratory at Ames for investigation. Water-bloom poisoning was suspected as being the cause of death of the birds.

The first occurrence of algae poisoning was reported in 1878 by George Francis of Adelaide, Australia. Since that time infrequent cases have been reported in Canada, South America, South Africa, New York, Minnesota, North Dakota, Texas and Iowa.

Water-bloom is the common name applied to the prolific growth of the algae. There are many genera and species of algae present in all bodies and streams of water, whether it be a puddle in the barn yard or your favorite lake for vacationing. However, many of the algae are not toxic. The toxic algae most often found are *Anabaena*, *Mycrocystis* (now referred to as the genus *Polycystis*), and *Aphanizomena*. *Anabaena*, the most common of these, is a toxic blue-green algae and should not be confused with *Chlorella*, a non-toxic green algae now being considered as a possible source of protein and vitamins for chicks.

*Anabaena* is thermophilic, requiring a little warmer condition for growth than other types of algae. Sunlight is also quite essential for its propagation. These two growth factors greatly account for the presence of the algae on the surface of the water rather than at a greater depth. In addition, *Anabaena* needs an abundance of nitrates, and this condition is best provided in bodies of water less than 20 feet deep, in the fertile prairie regions. Bodies of water receiving a large amount of sewage supply considerable amounts of nitrates for this algae.

The algae may be found distributed over the entire body of water during calm weather, as in this incident, or only along the leeward shore on a windy day. *Anabaena* does not usually reach a toxic concentration in the water except in windy weather. On a windy day, the green masses of the algae are blown toward the shore, and water near this shore will become highly toxic. At the same time water from the windward shore will not be as toxic, if at all. Stagnation of the water enhances the algal growth.

All of these conditions were present at Storm Lake in 1952. There had been no rain in the area for 75 days, resulting in stagnation of the lake. The prolonged “Indian Summer” had aided the growth of the algae. The lake is shallow, ranging up to 18 feet at the deepest point, and there is high influx of sewage from the city.

The toxic principle of *Anabaena* is unknown. A toxin is produced which is non-volatile, relatively heat stable, water
soluble, negative to chemical tests and passes through cellophane and animal membranes by dialysis. According to previous reports, all animals and man are susceptible to this toxin. Generally, cold weather destroys the toxin, and a windy day or two will mix the water, diluting the toxin so that the water becomes safe for consumption.

The symptoms vary depending on the amount of toxic material ingested. If the dose is large, the animal will exhibit peracute prostration and convulsions followed by death. Those mildly affected show restlessness, weakness, deep breathing and rigid paralysis. Two gulls were presented in a semi-conscious state; one showed symptoms of poisoning and had suffered mechanical injury also. It died very soon. The other gull, when teased about the head with a stick, would grab the stick in its mouth and could be suspended in this manner, this indicating that there was tonic spasm and not paresis. This gull recovered and was set free three days later; after four or five unsuccessful attempts to take flight, it was able to take-off and make its progress in the air.

There are no chemical tests to confirm a clinical diagnosis of water-bloom poisoning. Biological assay on laboratory animals is the only aid available at present. This consists of intraperitoneal or oral inoculation of laboratory animals with a bacterial filtrate of the suspected toxic water. Dr. L. D. Jones of the Iowa Veterinary Diagnostic Laboratory conducted biological assays on affected animals and water from the lake. Several mice were injected intraperitoneally with 0.1 cc. of filtrate; death followed in two to three minutes. When force fed to a chicken, 10 cc. caused death in 48 hours. One guinea pig refused to consume any of the water voluntarily. When force fed or injected intraperitoneally, the filtrate killed the guinea pigs within 24 hours. In one instance 0.2 cc. of ingluvies fluid from a dead Mallard duck was given intraperitoneally to a mouse and death followed within three minutes.

The symptoms observed in the assays were quite similar to those shown by the animals that had drank from the lake. Most subjects refused to drink the filtrate voluntarily. It required larger doses and a longer period of time to produce death in animals inoculated orally than in those injected intraperitoneally. Neutralization tests with botulinus antitoxins A, B, and C were negative.

There are no lesions produced and no known treatment is available.

Fortunately, from an economic standpoint, there was no great death toll of domestic animals at Storm Lake. Earl Rose, Fisheries Biologist for the Iowa State Conservation Commission, said that there were killed and buried 5,000-7,000 Franklin gulls, 500 ducks (mostly Mallards, with a few Bluebills, Ruddy ducks, Green-winged Teal), 400 Coot, 200 pheasants, 50 fox squirrels, 18 muskrats, 15 dogs, four cats, two hogs, two hawks, one mink and one skunk. A dog was seen drinking from the lake at the time the birds were being gathered and died only a few yards from the shores while trying to escape from the workers.

Public health authorities are concerned about algae poisoning, especially in those communities that rely upon lakes for their water supply. Dr. Olson reports that algae poisoning was suspected in the Ohio Valley during the drought years of 1930-31, where several thousand people suffered from gastro-intestinal disorders. It has been only in the last ten years that Storm Lake discontinued using the lake for their city water supply. Combating algae growth was a never ending problem for the city. Copper sulfate treatment of the water was carried out periodically, but proved to be quite costly. It is estimated that at present prices this would cost about $3500 for each application, and several applications would be necessary each season. During the summer, samples are taken periodically for assay on laboratory animals. As soon as toxicity occurs, the beaches are closed for the summer. As yet, no one has determined the minimum lethal dose for humans.

References

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The medical profession is experimenting with the use of transparent plastic surgical instruments which have been developed for use in neurosurgical operations. They are easy to make, inexpensive, light and easily handled, transparent so that underlying matter can be seen, they reflect light poorly, do not conduct the electrocoagulating current and last well.

The dog normally carries 40 cc. of blood for each pound of body weight. Therefore, a 20 pound dog has 800 cc. of blood.

Lindane poisoning in dogs has been successfully treated by giving several intraperitoneal injections of calcium, phosphorus and magnesium.

It has been found from a study at George Washington University Hospital that the addition of antihistamines prevents some allergic and feverish reactions occurring from whole blood transfusions. The experiments were made after the theory was advanced that an increase in histamine resulted from the introduction of new blood.

Streptomycin is the first drug to be of real value in treating tuberculosis.

Using insecticides on cattle insects often increases beef production half a pound a day and milk by 10 to 15 percent.

Antibiotics given orally are not effective in calves after rumination begins.

Mastitis control is primarily a herd problem, and one of the important phases of a successful program is client education.