ignored, none will be satisfactory, and all can be harmful if mishandled. The grower contemplating the use of such drugs should explore the situation well and use the drug as directed by the manufacturer. Three drugs offered as aids to the control of blackhead in 1956 are identified chemically as 2-acetylamino-5-nitrothiazole, furazolidone, and 4-nitro-phenyl arsonic acid.

If an outbreak occurs, the first thing to do is to get a diagnosis. Take 2 or 3 typical sick birds to your nearest poultry diagnostic laboratory, your State Experiment Station, or to a veterinarian who includes poultry in his practice. Other diseases cause symptoms resembling some of those of blackhead.

Isolate sick birds. Quarantine all pens or plots in which such birds have appeared. Always care for the unaffected flocks first, then those from which sick birds have been removed, and last of all those in the isolation quarters. Allow no traffic in the reverse order.

Intensify all measures recommended for preventing blackhead. You are now faced with preventing its spread. Claims have been made regarding the value of a few drugs in treating affected birds, but prevention must still be the major means of attack.

Be prepared to move the birds at least once a week. Cecal worms are almost certainly present, and any droppings are potentially infective within a few days of their passage.

Record carefully the houses, pens, or plots in which outbreaks have occurred or which are used later by birds from such sources. They must not be reused until they are made free of cecal worm eggs.

The successful interruption of an outbreak of blackhead may not be apparent until 2 to 3 weeks after the strict control measures have been invoked. Do not be discouraged or relax your efforts. It sometimes takes 3 weeks from the time a turkey takes in the cecal worm eggs containing the blackhead parasites until the bird is obviously ill: What you have done probably has not influenced the course of the disease in this bird, but you have saved others and your continued efforts will save still others.

Everett E. Lund joined the Department of Agriculture as a parasitologist in 1946. He received his training at Iowa State College and the University of California at Berkeley.

Hexamitiasis of Turkeys

Everett E. Lund

Hexamitiasis is an intestinal disease caused by a microscopic, single-celled animal (Hexamita meleagridis).

The parasite remained unnoticed until about 1938. The disease it caused was confused with other diseases for several years thereafter. Hexamitiasis was seldom reported in some large areas in which the turkey industry was extensive, but reports of it became more frequent after 1954—probably because it was recognized more generally.

Hexamitiasis is usually most serious in poults still in the brooder house, where losses as high as 75 percent have been reported. Poults on the range are also affected, and losses may continue
until the birds are 14 to 16 weeks old, or occasionally even later. Mature birds often harbor the parasite but seldom show symptoms. They are a source of infection for younger birds. Light cases usually show no symptoms, and outbreaks commonly start this way because only a few parasites were introduced. These infected birds soon shed many parasites, however; contamination increases, and other poult's pick up enough organisms to be affected seriously. They soon have a ragged appearance, are nervous, keep on the move, and chirp incessantly, but do not gain. Small poult's especially tend to crowd close to the hover.

As the infections become more severe, the droppings become fluid and foamy and often are yellow. Water is voided faster than it is replaced, and the poult's lose weight rapidly. In the later stages of the disease, the birds stand with heads drawn in, feathers ruffled, and wings drooping, as they do with several other disorders, particularly those of the lower digestive tract. Chirping is less frequent and more muffled than before.

In the final stages, the birds go into a coma, struggle convulsively, and die. The greatest changes internally are in the upper intestine, just below the gizzard. The intestinal wall is inflamed, and the cavity contains mucus, which may be thin and watery or heavy and like phlegm. The flesh of birds dying with hexamitiasis is usually dark and dry.

The diagnosis of hexamitiasis depends on finding the organism, which is very small, even as parasites go, and hard to identify. If hexamitiasis is suspected, several sick birds should be taken to the nearest diagnostic laboratory, State agricultural experiment station, or a veterinarian who includes poultry in his practice.

Turkeys get hexamitiasis by consuming food, water, or soil contaminated with the droppings of infected birds. Several kinds of wild, game, and domestic birds harbor hexamita, but the parasites often are of different species than that of the turkey. Consequently, while it is still necessary to regard some of those other fowl as possible carriers, none is nearly so dangerous as the mature turkey or the poult of a previous brood that may be carrying the parasite and showing no symptoms.

If most infections started only after the poult's were placed on the range, one might believe that wild fowl or visitors were responsible for the first introductions of hexamita into flocks of turkeys. But so many outbreaks occur or appear to have originated in the brooder house that it seems likely the grower himself introduces the parasite by tracking it in from a nearby yard occupied by older birds. Or it may be carried in with utensils used in both places. Mud or fresh droppings clinging to boots, tires, or on the bottom of buckets or other utensils could keep the parasites alive for several hours.

Growers who raise two or more broods of turkeys a year, using the same brooder houses and equipment, frequently suffer the most difficulty with hexamitiasis in the second brood. The parasites may have been introduced with the first brood, but the buildup in numbers of parasites was not rapid enough to do much damage until the second brood of poult's was exposed to contamination.

Thorough cleaning, disinfecting, and drying of houses and equipment between broods eliminates the hazard of passage by means of the house and its equipment, but parasites may still be introduced from the birds of the first brood, now possibly carriers, and on the range.

The prevention or control of hexamitiasis need not be difficult. Hexamita are fragile and apparently have no resistant forms or protective devices, other than the body of the bird they inhabit. Consequently, once they have been shed in the droppings, they live but a few hours in air that is warm and dry, and only a few days, at most, in moist soil or litter.
To minimize the danger of the introduction and spread of hexamitiasis into your flock, do these things:

Dispose of all breeding stock and other mature turkeys at least 2 weeks before starting your first brood of poults, or else keep the mature stock on a distant part of the farm that has its own equipment and caretaker, so traffic between the two operations is unnecessary.

Have your feed house so arranged that men delivering supplies need not enter buildings or yards occupied by your turkeys or handle equipment that your birds use.

Have feeders and watering devices so constructed that they stay free of droppings.

Start each brood with houses and equipment scrupulously clean.

Keep litter clean and dry always.

Isolate all sick birds, quarantine all affected pens, and bury or burn all birds that die. Always take care of clean stock first, pens having shown sick birds next, and isolation quarters last of all.

Move birds on the range frequently to avoid excessive contamination of the ground. As far as hexamitiasis is concerned, plots may be reused safely 2 to 3 weeks later, but if blackhead or coccidiosis also are present that should not be done.

Some growers have had satisfactory results with the use of Aureomycin (chlortetraycycline) administered at levels of 180 to 200 grams per ton of ration.

Other growers have preferred to administer the medicant in the water, because birds will sometimes drink after they no longer feed. They use 10 grams of soluble Aureomycin for 50 gallons of water. In either instance, the drug may constitute only a small part of the preparation available on the market, so the mixture must be made to contain the stated amount of the active ingredient. If the drug is effective, improvement usually is noted in 2 or 3 days.

Frequently other disorders accompany or follow hexamitiasis. If control measures or treatment fail after 3 or 4 days, a second diagnosis may be necessary for the situation may have changed.

EVERETT E. LUND is a parasitologist in the Department of Agriculture.

Pullorum Disease of Chickens and Turkeys

J. E. WILLIAMS, PAUL B. ZUMBRO, AND A. D. MACDONALD

PULLORUM DISEASE, which occurs in all parts of the world, is caused by a microscopic organism, Salmonella pullorum. The chicken seems to be the natural host of the organism, but the disease has become increasingly serious among turkeys as the commercial hatching of turkey eggs has increased.

Pullorum disease may also strike ducks, guinea fowl, pheasants, sparrows, quail, bittern, geese, pigeons, doves, parakeets, and canaries. The organism, which was discovered in 1899, is rarely found in mammals.

Pullorum disease causes heavy death losses in chicks and poults and reduces the productivity of adult birds. The deaths occur mainly during the first 3 weeks after hatching. Losses may be as high as 80 to 90 percent of the brood. Pullorum disease is not commonly encountered in the acute form in birds