

Parasitic diseases of Poultry-Diagnosis and Control

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Modern poultry practices, especially caging of laying hens and confinement rearing of broilers has significantly influenced parasitic infections. However, certain parasites are commonly encountered in poultry, which results in high economic losses due to lowered egg production and higher control costs owing to recurrent use of anti-parasitic drugs.

Endoparasites of poultry

Over the last 50 years, as a consequence of intensification of poultry farming, many helminths that were so common in backyard poultry are now seldom seen in commercial operations. Although confinement rearing on litter, largely prevents infections with helminths that utilize outdoor intermediate hosts, helminths such as *Ascaridia galli* that have direct life cycles or tapeworms that utilize intermediate hosts such as ants, beetles and flies continue to be a problem in modern poultry farms. Of the nematodes, *Ascaridia galli* is the most common parasitic roundworm of poultry. Although, death has been observed in severe infections, the primary damage is mainly due to reduced efficiency of feed utilization that leads to drop in egg production. Although plenty of drugs are available, the treatment of choice is piperazine because many of the available drugs remove only the adult parasite and not the immature form that produces the most severe damage. The caecal worm, *Heterakis gallinae* can be effectively treated with fenbendazole. *Subulura brumpti* that utilizes beetles or grasshoppers as intermediate hosts is also common because beetles are invariably seen in litter material. Another nematode that is common in deep litter houses is *Capillaria* spp. Control is best achieved by using Hygromycin-B and meldane.

Syngamiosis caused by *Syngamus trachea* affects other birds like pheasants, guinea fowl, goose, various wild birds and turkey. Diagnosis is made from the clinical manifestation, from finding eggs in feces and in nasal discharges and also from finding worms in the trachea by directly viewing inside of the trachea through the beak. The eggs are ellipsoidal, operculate at both poles, thin shelled and with segmented embryo. The worms may be seen anywhere in the trachea but

usually at the posterior region. Flubendazole (Flubenol 5%) powder added to feed was highly effective in killing the gape worms.

The change from backyard or free-range management to confinement rearing in large houses has brought on marked reductions in tapeworm infections in chickens. However, tapeworms such as *Railletina sp.*, *Cotugnia digonophora* and *Choanotaenia infundibulum* that utilize ants and beetles as intermediate hosts are fairly common in commercial farms. More than 100 species of beetles belonging to ten families act as intermediate hosts of *Railletina cesticiillus* and small ants, which frequent poultry houses such as *Tetramorium spp.*, *Monomorium spp.* and *Pheidole spp.*, are the intermediate hosts of *Railletina tetragona* and *R. echinobothrida*. Earthworms act as *intermediate hosts* for *Amoebotaenia sphenoides* while beetles and slugs are intermediate hosts for *Hymenolepis carioca* and *Davainea proglottina* respectively.

Preventing the birds from having contact with the intermediate host is the first step to consider in tapeworm control. If *Choanotaenia infundibulum* appears in caged layer facility, house fly control will benefit the producer. If *Railletina spp.* and *Cotugnia digonophora* is present, ant and beetle control measures may help. Removal of old poultry manure to distant places and cleaning of pens and feed rooms as well as discarded feedbags can control beetles. Metaldehyde baits kills slugs and snails. Earthworm is considered as economically valuable invertebrate and its elimination is not advocated. Although several drugs are available for tapeworm control in birds, butynorate is the treatment of choice for six species of chicken tapeworms. Eliminating the intermediate host (beetles and houseflies) from the environment disrupts the life cycle. Chickens and turkeys can be dewormed with flubendazole at 60 ppm in the feed for 7 days.

Ectoparasites of poultry

Although the external parasite problem has changed completely with the evolution of the poultry industry to high-density confinement production units, mites and lice infestation continue to plague the poultry industry. Mites and lice are common external parasites of poultry. Treatment and control programs require use of insecticides on the birds and may also require application of insecticide to the facility. Insecticides for treating mites and lice can be applied to birds as a powder or dust or in a liquid spray. Some products come in either form. When applying the insecticide, part

the bird's feathers so that the dust or spray reaches the skin. To treat facilities or buildings, a liquid spray or wettable powder should be used so that the insecticide can penetrate small cracks and crevices. Floors and bedding may also be treated. Since the louse population is on the host continuously, whatever treatment is used must be applied directly or indirectly to the infested chicken. Several methods of indirect treatment have been reasonably successful. The 'dust box method' employs dust in boxes situated throughout the house on the floor to allow the hens to dust themselves. Similarly, areas of litter where hens tend to dust themselves may be treated with insecticidal dusts. Treatment of the entire litter area with sprays and dusts, provide an indirect treatment. Cages hens can only be treated directly either by sprays or dusts. Dusts include Carbaryl 5%, Coumaphos 0.5%, Malathion 4-5%. Sprays include Carbaryl 0.5%, Coumaphos 0.25%, Malathion 0.5%, Tetrachlorvinphos 0.5%, Tetrachlorvinphos-dichlorvos 0.5% and Permethrin at 0.05%. Other treatments that eliminated infestations include dimectron, parathion as a single application.

Carbaryl dusts offer one easy and low cost method for treating lice and mites on birds. A shaker can provide easy application to the birds. When applying the dust, part the bird's feathers are parted so that the dust, when sprinkled, reaches the skin. The dust should be applied to the entire body for the first time and then subsequently dusted on the vent region and under the wings, upper leg, and to the crest and beard, or wherever pests are observed. A dusting box (24" x 36" x 4") can also be used for periodic treatment of fowl (not recommended more than once per 4 weeks). Powders can be used in the dusting box at a rate of 5 lb/100 birds for 5% dust or 2.5 lb/100 birds for 10% dust. The birds will dust themselves. Organophosphates and permethrins are also available in dust form. Toxicity can occur if these products are over used. Treat all affected birds in a flock. Other approved insecticides for eliminating lice and mites from poultry and poultry facilities include pyrethrins, pyrethroids and organophosphates. Pyrethrins and pyrethroids are very efficacious and non-toxic and come in powder, wettable powder, and liquid forms for use on birds and facilities. Usually, a 0.1% solution is used on facilities and a 0.05% spray is used on birds. Because they are chemically unrelated to the carbamate and organophosphate insecticides, pyrethrins and pyrethroids are a good choice for use in rotation pest control program. Rotating the type of insecticide used will reduce the occurrence of chemical resistance (and the resulting lack of effect) to a particular product. Also apply a general insecticide treatment to inner and outer walls,

ceilings and floors with a 0.1% permethrin spray solution such as Permethrin II or other 0.1% permethrin spray diluted from an emulsifiable concentrate or wettable powder. Impregnation of polyvinyl chloride plastic with permethrin at 10% in the form of bands or strips has been shown to provide long-term efficacy when hung in cages with infested fowls. Two strips about 20.5 cm long, containing 9.6% (wt/wt), established control within 77 days. Closantel, was found to be very effective against feather mites in poultry. For control of chicken mite, treatment should be directed at the premises rather than the host.

Insecticide Recommendations for Poultry Infested with Lice and Mites

Insecticide	Application Method	Rate	Restrictions & Comments
<i>Carbaryl (Sevin)</i>	Dust	5% AI, 1 lb/100 birds	Dust must reach skin.. Treatment interval, 4 weeks.
	Dust Box	5% 2.5 lbs/50 birds	AI
<i>Malathion</i>	Spray	0.5% AI, 57% 1 fl oz/bird	EC
	Dust (in litter)	4% AI, 1 lb/500 sq ft	
<i>Malathion</i>	Dust Box	4% AI, 1 lb/30 birds	
	Tail Dip	0.25% AI, 57% Wet vent and surrounding areas	EC
<i>Permethrin (Ectiban)</i>	Spray	0.05% AI, 5.7% 1 gal/100 birds	EC
<i>Stirofos (Rabon)</i>	Spray	0.5% AI, 24% 1 gal/100 birds	EC Treatment interval 13 days.

In deep litter system of rearing, insecticidal control recommendations as treatments applied to the litter include carbaryl (5% dust), coumaphos (5% dust), malathion 4-5%; tetrachlorvinphos 0.5% spray. Control of mites on hens in cages may be accomplished by sprays or dusts applied directly to the hens. These materials include carbaryl as a spray or dust;

coumaphos as a spray or dust; malathion as a spray or dust; and tetrachlorvinphos-dichlorvos as a spray.

The No Mite Strip is a popular deterrent/treatment for mites only, used by small flock owners. The blue plastic strips are placed near food/water sources and roosting sites so that the birds come in periodic contact with them. The strips reportedly last up to 2 years. Another popular product used by exhibitors to poultry shows to deter mites is Blue Ribbon. Blue Ribbon contains eucalyptus, balsam, organium, and rosemary oils with camphor in a canola extract base. Apply one drop under each wing and around the vent to deter mites/lice. In early days for control of scaly leg mite, various oils from crude petroleum to kerosene were used. With the advent of gamma BHC, a 0.1% emulsion applied for 30 seconds killed the mites. In India, a proprietary herbal mixture in coconut oil (Ectopar) applied to the legs for 3 to 4 days, eliminated scaly leg. Discomfort is relieved by dipping the legs in medicinal grade mineral oil or linseed oil, or by thoroughly coating them with warm Vaseline.

Insecticides Recommended as Residual Facility Sprays for Poultry Insect Control

Insecticide	Application Method	Rate	Restrictions & Comments
Carbaryl (Sevin)	Spray	0.5% AI, 50% or 80% WP	Surface treatment
Malathion	Spray	1.0% AI, 57% EC	
Stirophos (Rabon)	Spray	0.5% AI, 24% EC	Do not contaminate feed or water.

Disinfestations of egg flats and cases have recently received attention. Methyl bromide and sulfur dioxide killed all the mites infesting flats and cases in a closed van. Vans can be closed and treated after loading at the egg plant, let overnight or kept closed during transit, and sprayed at destination or in transit.

Individual birds can be effectively treated for lice using liquid soap and water. Fill a tub large enough to immerse the bird's body and neck with warm water and add liquid soap (not detergent) to make a good lather. Work the soapy water over the bird with your hands to make

sure the bird is wet and repeats the treatment in two weeks to kill newly hatched eggs. The soapy water method has also been used successfully in commercial layer flocks.

Fleas and bugs: Two fleas, namely *Ceratophyllus gallinae*, the hen flea and *Echidnophaga gallinacea* are common in poultry. *Ceratophyllus gallinae* adults and larvae can be found in the nest box material with smaller numbers in the litter under these boxes. The stick tight flea *Echidnophaga gallinacea*, attaches itself to the skin of its poultry host. The skin around the eyes, wattles, combs, the anus and other bare spots are most commonly attached. Ulceration, swelling, and wart like elevations may be of such severity that blindness occurs and death results. Flea control is accomplished most successfully where the material harbouring the eggs, larvae, and pupae can be removed and destroyed. When this is not practical, treatment of these sites with insecticides will remove the source of re-infestation. Titchener (1983) found that 0.25% permethrin spray gave good control of adult and larvae hen flea, *Ceratophyllus gallinae*, in infested nest boxes and litter. True bugs feeding on poultry are relatively unimportant. *Cimex lectularius*, the bed bug is prevalent in our country but this species is more of a nuisance than a pest of economic importance. Improved poultry housing where the hens lay eggs on the bare wire bottom of cages has largely eliminated bed bugs as a problem. Spraying the house with 0.25% phosalone at 100 to 200 ml/m² gave good control. Permethrin was also found to be effective.

Diatomaceous Earth (DE) consists of the sedimentary deposits formed from the skeletal remains of a class of algae (Bacillariophyceae) that occur in both salt and fresh water and in soil. These remains form diatomite, almost pure silica that is ground into an abrasive dust. When the tiny, razor-sharp particles touch an insect, they cause many tiny abrasions, resulting in loss of body water and death by dehydration. Diatomaceous earth is liberally spread in the poultry pen and nest boxes. When an insect ventures into diatomaceous earth, it loses ten percent of the body fluid and dies of dehydration.

Manure breeding flies

The housefly, *Musca domestica*, is a true nuisance in and around poultry farms. Big commercial farms have now gone in for caged system of rearing owing to its inherent advantages. Although caged system of rearing has its own merits, the accumulation of droppings on the floor serves as a very good substrate for fly breeding and fly production becomes astronomical. Problems associated with flies in a poultry farm include; increased cost of deworming as flies transmit helminths especially

tapeworms; increased incidence of fowl cholera and fowl typhoid, reduced life of cages due to high level of ammonia; liquefaction of manure due to movement of fly larvae in the manure and flies are a nuisance to the nearby human population. Moreover, heavy fly populations in caged layer operations may also add to operational costs by making it necessary to wash the eggs to remove flyspecks. Although this can be avoided by regular removal, the method is cumbersome and laborious.

Insecticides should be considered supplemental to sanitation and management measures must be directed to prevent fly breeding. Fly resistance to insecticides has developed at differing levels in various poultry house locations, depending somewhat on prior exposure. The use of a variety of different classes or families of insecticides can minimize the development of resistance. The use of insecticides viz., organophosphate, carbamate, pyrethroid, and other classes of insecticides may be rotated for effective control of flies. Periodical application of insecticides besides, being expensive and laborious also results in the development of insecticide resistance in the fly population.

Residual Sprays

Residual sprays are the most effective and economical method for controlling potentially heavy populations of adult flies of any species present. These sprays should be applied at the beginning of fly season (during summer showers). Application of residual sprays after manure removal will reduce fly buildup that usually follows the removal of manure. A second application should be made five to six weeks later (two sprays are required.) The insecticide may be applied to surfaces, on which flies rest, such as poultry house framework, the ceiling, walls, trusses, wires supporting cages, electric light cords and other areas marked by fly specking. The poultry houses around openings and on shrubs and other plants where flies rest should also be sprayed. Apply coarse, low-pressure sprays to the point of runoff at pressures of 80 to 100 pounds per square inch, using a power sprayer. Depending on the insecticide used and the type of surface sprayed, treated areas may remain toxic for 2 to 15 weeks. Insecticide contamination of feed, water and eggs should be avoided. Water and feed troughs also should be sprayed. Any of these residual sprays are recommended:

1. Cyfluthrin : Use 19 grams of 20% WP per 9 litres of water. Apply 9 litres of diluted mixture per 1,000 square feet as a coarse wet spray. Birds have to be removed from the building before spraying.
2. Dichlorvos : Use 1.1 litre of 40.2% EC per 112.5 litres of water. Apply 1.1 litre of diluted mixture per 1,000 square feet as a coarse, wet spray. Birds do not have to be removed from the building before spraying.
3. Dimethoate (Cygon, Residual Fly Spray): Use 4.5 litres of dimethoate (Residual Fly Spray 2 EC per 112.5 litres of water. Apply 4.5 litre of diluted mixture per 500 to 1,000 square feet of surface as a coarse wet spray. Birds must be removed before spraying. Do not contaminate feed or water.
4. Malathion: Use 75 ml of 57% EC per 4.5 litres of water. Apply 5-9 litres of diluted mixture per 1,000 square feet as a coarse, wet spray. Birds do not have to be removed from the building before spraying.
5. Permethrin : Use 200 ml of 25% WP per 23-45 litres of water. Apply 4.5 litres of finished spray per 750 square feet as a coarse, wet spray.
6. Tetrachlorvinphos & dichlorvos (Ravap): Use 4.5 litres of 28.7% EC per 112 litres of water. Apply 4.5 litres of diluted mixture per 500 to 1,000 square feet as a coarse, wet spray. Birds do not have to be removed from the building before spraying.
7. Tetrachlorvinphos (Rabon): Use 1.8 to 3.6 kgs of 50% WP per 112 litres of water. Apply 5-9 litres of diluted mixture per 1,000 square feet as a coarse, wet spray. Birds do not have to be removed from the building before spraying.

It is often not practical to treat large poultry houses with residual sprays. Portable, lightweight, mechanical fogging machines are convenient, efficient and labor-saving in caged bird operations to quickly reduce adult fly populations, providing quick fly knockdown with poor residual action. Gasoline powered side pack Ultra-Low Volume (ULV) aerosol generator spraying, utilizing micron particle size spray droplets, is a very effective contact application with little or no residual effect. Space applications should fill the room with fog or mist. For indoor space application to kill flies, windows, doors and other ventilators may be shut off. Natural pyrethrins, used inside for adult fly control through a ULV machine, are easy to use at 1% pyrethrins + 5% piperonyl butoxide. The ratio of 1:5 pyrethrin to piperonyl butoxide is the most effective for fly control. When using this equipment, adjusted to deliver aerosol droplets (30 microns or less), apply 30 ml of Pyrethrins 1% per 1,000 cubic feet of space. Leave room closed for at least one hour. Do not remain in treated areas and ventilate before re-entry. Treatments are especially useful in closed egg rooms or other work areas where there is little or no air movement. Use pyrethrum oil-base space sprays (0.06% to 0.1% pyrethrins) plus piperonyl butoxide as a mist or fog in the air throughout the poultry house at the rate of 15 ml per 1,000 cubic feet on an "as needed" basis for best fly control.

Baits are a supplement to residual and aerosol sprays. Place baits outside of cages in the high-rise house. These selective adulticides suppress low fly populations, maintaining them at a low level. Never apply baits where they could accidentally be eaten by the birds or mixed into the feed. Dry sugar baits of methomyl are effective. Methomyl should be rotated with other baits to avoid development of resistance. Methomyl is a carbamate insecticide whereas other baits such as dichlorvos, trichlorfon and tetrachlorvinphos, (Rabon), mixed with sugar are organophosphate insecticides. Apply when mixed as soon as possible and do not store for later use. Ready-to-use dichlorvos (Vapona) 20% resin strips can be used at the rate of one strip per 1,000 cubic feet of enclosed area. Strips will need to be replaced as they lose their effectiveness, which is about every three months. Methomyl fly belts can be attached to surfaces out of reach of food-producing animals. The belt may be cut to any desired length and attached to surfaces such as walls and ceilings. Follow label directions. Both resin strips and fly belts may become dusty and dirty when in use for long periods of time.

Feed Additive: Development of insecticide resistance in the fly population not only renders the chemical ineffective leading to economic loss, needless use of chemical also results in environmental contamination. This interest has resulted in studies on hormonal disruption of insect growth. Insect growth regulators (IGRs) such as the chitin synthesis inhibitor, have been shown to be highly effective. Cyromazine (Larvadex) has been found to be very effective when applied as a pour on for upto 8 weeks or upto 13 weeks. Cyromazine has been said to affect moulting and pupation following ingestion by first stage larvae and control manure breeding flies in and around caged or slatted flooring layer chicken operations and breeder chicken operations. The 1% Larvadex Premix is blended into the feed at the rate of 0.45 kg per ton of feed. Larvadex will provide a high degree of fly control and a feeding program must be followed to prevent potential fly resistance. Never feed continuously throughout the year. Prevalence of adult flies in and near the poultry house should be monitored and when the population reaches a level to cause concern, insecticide should be used to reduce the breeding potential. Manure should be checked for "hot spots" in the pits for maggot activity and if maggots are active, Cyromazine can be used in the ration. Cyromazine can be used continuously for four to six weeks (minimum of four weeks) and this is usually enough to break the fly population life cycle.

Undisturbed poultry manure accumulations normally support large populations of parasites and predators of fly larvae. These parasite/predator populations consist of predaceous beetles, mites, soldier flies and parasitic wasps. Proper manure management is the key to successful fly control. Keeping the manure dry is of critical importance if manure is allowed to accumulate. Proper drainage around poultry houses, maintenance of leak proof water systems, providing good air circulation around the poultry house by vegetation control around the house, and use of fans if necessary, are means of aiding dryness. In poultry houses where weekly manure removal is not practical, natural enemies of the fly may contribute, to a degree, some fly control. The build up of natural enemies is much slower than that of the flies. Populations high enough to substantially benefit fly control will develop only if the manure is not disturbed for relatively long periods of time. Thus to encourage parasites and predators, complete manure removal should take place only during the non fly season efforts should be made to aid the biological control system by leaving some of the old manure to supply a source of natural enemies to invade the new droppings. Chemicals should be applied sparingly and carefully to the resting site of the fly adults. Larvicides should be used only for the treatment of spots of high larval density rather than as a blanket application to the entire manure pit. This will reduce the damage to introduce or naturally occurring parasites and predators and will slow the development of insecticide resistance and insecticide treatment of manure should be totally discontinued as it kills the beneficiaries as well.

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