AHI parasite control survey – the results

Animal Health Ireland's Natascha Meunier, programme manager, Beef Healthcheck and James O'Shaughnessy, chairman of Parasite Control Technical Working Group, report on the findings of a parasite control survey carried out among private veterinary practitioners

Private veterinary practitioners (PVPs) play an important advisory role in parasite control in livestock but best practice on this topic has changed through the years, particularly with the rise in the level of anthelmintic resistance. The Parasite Control Technical Working Group of Animal Health Ireland distributed a survey to PVPs in late 2018 and early 2019 in order to gain an understanding of what is currently being advised to farmers with regards to parasite control for cattle. PVPs were approached through conferences and discussion groups and 131 people participated in the survey. The majority of PVPs were in mixed practice (79%), worked in the provinces of Leinster (38%) and Munster (34%) and had been in practice for a period of 10-20 years (32%).

ADVISING CLIENTS

Many PVPs routinely gave parasitological advice on the sale of anthelmintics (58%) and reported that at least 30% of their cattle-farming clients have sought this information from them in the previous year. This advice was usually given in response to a current problem on farm (63%). Eighty per cent of PVPs reported that fewer than 30% of their clients had established a formal parasite-control plan with them and that this was rarely reviewed annually, many having been drawn up as part of a Knowledge Transfer Programme. Short-acting macrocyclic lactones (eg. ivermectins) were reported as the anthelmintic group most commonly sold by PVPs (66%) for gut worms, followed by benzimidazoles (19%) and levamisoles (8%). The majority of PVPs (92%) advised rotation of drug classes. Farmers may be tempted to dose animals frequently because of the perceived production benefits and low cost of anthelmintics. However, this approach is unsustainable as exposure to anthelmintics risks an increase in the development of resistance. In Ireland, levels of resistance to drug classes seem to reflect the usage as seen in this survey, with ivermectin resistance commonly detected in studies. The veterinary profession needs to encourage the prudent usage of anthelmintics to minimise production losses while also slowing the reduction in the long-term efficacy of anthelmintics associated with the emergence of resistance. While the majority of farmers that sought advice reported a current problem on the farm, there is an opportunity for PVPs to discuss strategic parasite control as part of a wider herd health plan as a service to farmers. This supports a shift in focus to preventative veterinary medicine. If parasite-control plans are being followed, they need to be reviewed on a regular basis as worm burdens are highly dependent on environmental conditions and, therefore, may change from year to year.

GRAZING MANAGEMENT

Questioned on grazing management, 20% of PVPs supported immediately moving first grazing season calves to new pastures after treatment with an anthelmintic for stomach/gut worms. This is no longer considered best practice as it encourages anthelmintic resistance because any resistant worms are likely to become dominant on the clean pastures. Rather, the concept of parasites *in refugia* is now being promoted, which involves leaving a proportion of the worm population unexposed to an anthelmintic. This can be achieved by not dosing 10-20% of animals before moving to new pastures, or by leaving animals on the original pastures after treatment for a number of days to dilute any potentially resistant worm populations in the animals. Adult animals, which often do not require treatment for stomach/gut worms, can also be a source of *refugia*. Additionally, rotational grazing practices, such as calves following adult animals or sheep, or not placing high risk dairy calves on the same pastures each year, can reduce the reliance on anthelmintics by matching the animal risk with the pasture risk.

FAECAL EGG COUNTS

Survey responses concerning faecal egg counts (FEC) were extremely varied. For the FEC treatment threshold for gut worms in first-season dairy calves, the responses ranged from 50-2,000 eggs per gram (EPG) of faeces, with the majority of PVPs advising treating above an FEC threshold of 200 EPG. Many PVPs advised FEC monitoring in spring-born suckler (66%) and dairy calves (76%).

The varied responses for an FEC treatment threshold was understandable as a definitive cut-off oversimplifies the additional considerations when interpreting FECs, such as whether samples have been pooled, the age of the animals and what type of roundworm eggs are seen in the sample. The concentration of eggs (EPG) is further influenced by the volume of faeces produced and the distribution of eggs in the faeces. Additionally, overdispersion in groups is common ie. a few animals may account for the majority of the parasite burden. FEC values often do not correlate well to the individual worm burden in an animal and eggs are only seen if mature female worms are present. In the cases of *Nematodirus* or lungworm for example, pathology is usually associated with immature parasites and FECs are then not reliable during times of clinical disease. FECs can be a useful tool to determine the optimal timing of treatments or whether anthelmintic treatment is necessary but should be interpreted with an understanding of the limitations of the test alongside the animal or group history, clinical signs and the epidemiology of the parasites. For cattle, general guidelines for ranges of FEC are summarised in Table 1.

Table 1: Guidelines for faecal egg count ranges in cattle, given as eggs per gram.

Worm species	Low	Medium	High
Mixed infection	100	200-700	700+
Ostertagia ostertagi	150	200-500	500+
Trichostrongylus spp.	50	50-300	300+
Cooperia spp.	500	500-3,000	3,000+

PVPs reported advising dosing of first grazing season calves: at intervals (26%); based on clinical signs of scour or weight loss (11%); on FEC (15%); and on FEC and liveweight gain (46%). Production losses due to parasitic gastroenteritis may be significant before clinical disease becomes apparent. Therefore, dosing based on FEC and liveweight gain or other performance measures are considered best practice, although dosing at strategic intervals is a practical alternative for many farms. The timing of these intervals can be reviewed alongside FEC results. The majority of PVPs (63%) advised that the first sampling for FECs should be performed six to eight weeks after turnout for spring-born dairy calves. This is in line with current advice, as FEC during the early summer for first grazing season calves can be a good indicator of parasitic gastroenteritis risk later in the season. Spring-born suckler calves, in contrast to dairy calves, do not routinely require intensive monitoring or dosing in their first grazing season until weaning approaches.

LUNGWORM

When lungworm is suspected, the majority of PVPs advised immediate treatment with or without sampling (88%). Death in acute cases of lungworm challenge can occur before larvae appear in faecal samples and bronchoalveolar lavage is the preferred diagnostic test for prepatent infection. Detection of antibodies in serum or milk by ELISA is not useful in acute cases, as seroconversion may take four to six weeks after infection and antibody titres persist for up to seven months. Treatment based on clinical signs and grazing history is advised.

CONCLUSIONS

It is encouraging that most PVPs are following best practice guidelines in the sphere of parasite control although they can be challenging to implement. A recent report by the Health Products Regulatory Authority[1] found that antiparasitic medicines in food-producing animals should not be exempt from prescription. For this reason, the role of the PVP in advising on anthelmintic treatments may become even more important in the future. PVPs should, therefore, be familiar with dosing guidelines and anthelmintics available beyond the reactionary treatment of immediate parasite problems on-farm.

AHI would like to thank those PVPs who participated in the survey.

1) HPRA (2020). Antiparasitic Veterinary Medicinal Products. http://www.hpra.ie/homepage/veterinary/special-topics/antiparasitic-veterinary-medicinal-products. Accessed 2020/03/06

Poultry red mite – prevalence, problems, prevention

Maureen Prendergast MVB CertVR CertES (Orth) PhD MRCVS, technical manager for Integrated Livestock at MSD Animal Health, highlights the prevalence of and the dangers posed by the poultry red mite

Dermanyssus gallinae or the poultry red mite (PRM) is the most significant ectoparasite pest of laying hens worldwide and represents a severe threat to poultry production in Europe.[1] In addition, PRM infestations pose serious animal health and welfare concerns and are an increasing public health risk.[2] These extremely destructive nocturnal ectoparasites suck blood from host birds at night and then hide in the cracks, crevices and litter of poultry houses when they are not feeding during the day.[3] They locate their host by means of temperature, vibrations and lower atmospheric carbon dioxide.[4] Adult mites measure about 1mm long, weigh about 76µg (unfed) to 280µg (after a single blood meal), and are red in colour after feeding, but they appear black, grey or white without host blood in their system.[2]

HIGH PREVALENCE

Recent surveys have confirmed the high and increasing prevalence of infestations of PRM. The average overall infestation rate of European layer houses has been estimated at 83% to 94%. Extrapolation of these estimates suggests that about 300 million hens in Europe are potentially suffering from mite infestations at any point in time. PRMs are found in all production types, from backyard or organic farms to intensive, enriched cage or barn systems.[2]

POULTRY RED MITE LIFE CYCLE

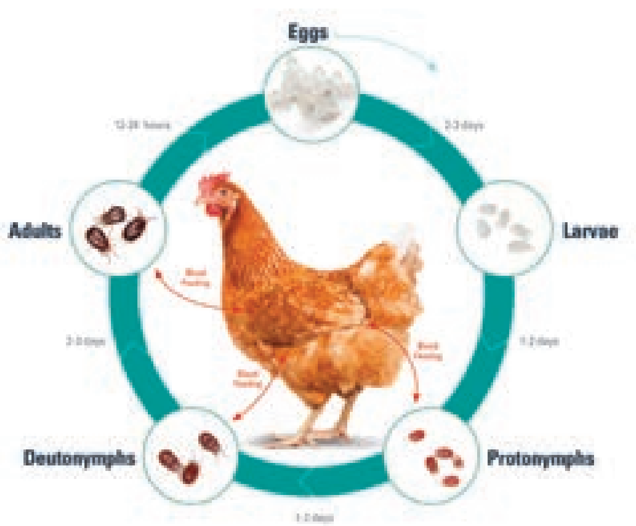

Figure 1: Poultry red mite life cycle. Four life cycle stages: larva, protonymph, deutonymph, and adult. Larvae hatch with six legs and do not feed. Both nymphal stages and adults have eight legs. Protonymphs, deutonymphs and adult females routinely feed on host blood, but males only occasionally feed.[2] Based on Sparagano, et al.[1]

The direct mite life cycle can be as short as seven days at ideal temperatures above 20oC (see Figure 1), which allows for rapid growth of mite populations. Heavy infestations of around 50,000 mites/hen in caged systems and up to 500,000 mites/hen in severe cases have been reported. Typical mite density ranges between 25,000 and 50,000 mites/hen, levels that can induce aggressive feather-pecking and cannibalistic behaviour, changes in feed and water intake and decrease general condition. The most severe infestations occur in the warm season, from May to October, but mites can survive between flocks without a blood meal for up to eight months.[3] While females may lay eggs at 5oC the eggs will not hatch until the temperature reaches 15oC and the mite reproduction cycle is greatly increased by increasing temperatures up to 35oC.[5]

PHYSIOLOGICAL DAMAGE

Chickens can develop anaemia due to repeated mite bites, with laying hens possibly losing more than 3% of their blood volume every night and disrupting their sleep patterns. In extreme cases, infestations may be so high that hens become severely anaemic and die from blood loss alone.[3]
Mite bites are also painful and induce skin irritation contributing to high stress levels in infested birds. Increased self-grooming and head scratching both day and night are associated with a 1.5-fold increase in corticosterone blood levels and a 22% decrease in β-globulin levels, indicative of somatic stress and immunosuppression. The adrenaline levels are also more than twice as high than in control animals, indicating psychogenic stress.[6]

Figure 2. The total cost of *D. gallinae* infestation can be up to €1 per laying hen per year.

ECONOMIC DAMAGE

PRM infestations severely affect the egg industry. Consequences of red mite infestation in a layer operation produce a negative impact on feed conversion ratio, reduced egg production, an increase in downgraded eggs and increased susceptibility to poultry diseases. A 2013-2014 FAO poultry census estimates the number of layer chickens in the 17 largest egg-producing countries in Europe to be 431 million. Recently, a large layer genetics supplier estimated that productivity losses can reach €0.57 per hen per year in case of moderate mite infestation. The total cost of *D. gallinae* infestation can be up to €1 per laying hen per year, depending on the housing system, the infestation intensity and the control methods used.[8] Based on the recent poultry census data, the updated average infestation prevalence (83%[2]), and recent per bird cost calculations, it has been estimated that the current cost of red mite infestation for the egg industry in Europe to be about €200 million for productivity losses and up to about €360 million for overall costs.[7,9]

POULTRY RED MITES AS VECTORS OF DISEASE

In addition to their effects on poultry production, PRMs can spread an array of diseases to humans and poultry.[2,10] Many bacterial and viral pathogens that affect both humans and poultry have been either isolated from red mites or had mite-vectored transmission demonstrated in laboratory settings, including: *Salmonella gallinarum* and *enteritidis, Pasteurella multocida, Escherichia coli, Mycoplasma synoviae, Erysipelothrix rhusiopathiae, Borrelia burgdorferi* and viral diseases including Newcastle Disease and avian influenza.

HUMAN HEALTH CONCERNS

PRM infestation is increasingly responsible for human dermatological lesions (gamasoidosis), particularly in people living or working in close proximity to poultry. In fact, red mites in poultry production buildings are recognized as a significant occupational hazard to poultry workers. In a 2011 report, 19% of poultry workers[10] reported pruritic skin eruptions from PRMs.[11] A recent survey reported an increasing incidence of gamasoidosis worldwide that is exacerbated by the persistence of mite infestation, treatment failures and the potential transmission of zoonotic diseases by the mites (such as *Borrelia burgdorferi*, the cause of Lyme disease; *Babesia* spp.; *Bartonella* spp.).[9]

Figure 3: Chemical control of mites is often attempted, involving treatment/spraying of the local environment including walls, floors, roosts, nest boxes and birds.

CONTROL OF PRMS

PRMs are difficult to control as they can be transferred between flocks by crates, clothing and wild birds, and they can be difficult to detect unless birds are examined at night when mites are feeding. Most methods for managing red mites fail to keep infestations under control in poultry farms.[2] Simply removing the host from an area will not eliminate the mites, as deutonymphs and adults are known to resist desiccation and live as long as eight months without feeding.[2] Furthermore, recent European legislation (2012) banning use of traditional cages for poultry birds (European Council Directive 1999/74/EC) has favoured the use of housing systems incorporating more complex environments. While these animal welfare measures represent positive advancements for poultry husbandry, such housing systems appear to favour red mite proliferation and exacerbate infestation problems by providing mites more hiding possibilities, thus enabling them to more easily escape control measures.[2,3]

Chemical control of mites is often attempted, involving treatment/spraying of the local environment including walls, floors, roosts, nest boxes and birds. Organophosphates are commonly used but many products have been withdrawn because they did not comply with European or national regulatory requirements regarding human consumer and user safety. Users need to wear protective clothing during treatment and cannot re-enter the treated house for at least 12 hours after treatment and a 12-hour egg withdrawal period must be observed after treatment.[2,3]

Precautions also apply for most other premises-spray/pesticide approaches to red mite control. Several acaricidal spray products (pyrethroids, carbamates, abamectin and spinosad) are available in some European countries for the treatment of the poultry house and equipment (not birds), mainly for use during the unoccupied period between flocks. If used when the hens are present, if there is no residue limit for eggs, there may be a risk of contamination of feed or hens. Many chemical applications have a short residual activity, exert little or no effect on mite eggs and are prone to resistance development due to the selection of resistant mites that survive exposure to sublethal concentrations due to uneven spraying, especially inside crevices and cracks.[3] Even new alternative solutions developed in recent years, including essential oils, predator mites, heat treatments, intermittent lighting programs and inert dusts (eg. silica, diatomaceous earth) while reducing the level of mites in houses, will not fully control the populations.[2]

TREATMENT

A novel licensed product containing fluralaner can be used for the destruction of PRMs biting the hens by systemically treating host birds via drinking water instead of treating the animal facilities.[12] Fluralaner is a potent inhibitor of the arthropod nervous system and acts antagonistically on ligand-gated chloride channels (GABA-receptor and glutamate-receptor). The product is approved for treatment and control of PRM infestation in pullets, breeders and layers when provided in drinking water administered twice seven days apart killing mites for the 15 days that the product is bioavailable in the hens. This second application is designed to kill a new wave of mites that have hatched and will be biting the hens following the death of the adults on the first day of application. Moreover, the product has a zero-day withdrawal period for eggs and a 14-day withdrawal period for meat and a high safety profile for the operator and the birds. Free-range birds need to be housed for the period that they are consuming the product.[12]

Always use medicines responsibly. Seek advice from your prescribing vet regarding the most appropriate control measures to implement on your farm.

REFERENCES

1. Chauve C. (1998) The Poultry Red Mite *Dermanyssus gallinae* (De Geer, 1778): Current situation and future prospects for control. Vet Parasitol 79:239-245.
2. Sparagano OAE, George DR, Harrington DWJ, Giangaspero A. (2014) Significance and control of the Poultry Red Mite *Dermanyssus gallinae*. Annu Rev Entomol 59:447-466.
3. Flochlay AS, Thomas E, Sparagano OAE. (2017) Poultry red mite (*Dermanyssus gallinae*) infestation: a broad impact parasitological disease that still remains a significant challenge for the egg-laying industry in Europe. Parasites & Vectors 10: 357
4. Kilpinen O. (2005) How to obtain a blood meal without being eaten by a host: the case of Poultry Red Mite, *Dermanyssus gallinae*. Physiol Entomology 30:232-240.
5. Tucci EC, do Prado AP, de Araújo RP (2008) Thermal requirements of *Dermanyssus gallinae* (De Geer, 1778) (Acari: Dermanyssidae). Rev Bras Parasitol Vet. 17:67-72.
6. Kowalski A, Sokol R (2005) Influence of *Dermanyssus gallinae* (Poultry Red Mite) invasion on the plasma levels of corticosterone, catecholamines and proteins in layer hens. Polish J Vet Sci; 12:231-235.
7. Sparagano OAE et al. (2009) Prevalence and key figures for the poultry red mite *Dermanyssus gallinae* infections in poultry farm systems. Exp Appl Acarol. 48:3–10
8. Mozafar F. (2014) Poultry Red Mite, a big challenge for egg producers. Frühjahrveranstaltung; Deutchen Vereinigung für Geflügelwissenschaft. Leipzig, 11-12 März 2014
9. Van Emous R. (2017) Verwachtte schade bloedluis 21 miljoen euro. Pluimveeweb.nl. https://www.pluimveeweb.nl/artikelen/2017/01/schade-bloedluis-21-miljoen-euro/. Accessed 16/04/20
10. George DR et al. (2015) Should the Poultry Red Mite *Dermanyssus gallinae* be of wider concern for veterinary and medical science? Parasites & Vectors 8:178.
11. Cafiero MA, et al. (2011) Why dermanyssosis should be listed as an occupational hazard. Occup Environ Med. 68:628.
12. Thomas et al. (2017) Field efficacy and safety of fluralaner solution for administration in drinking water for the treatment of poultry red mite (*Dermanyssus gallinae*) infestations in commercial flocks in Europe. Parasites & Vectors. 10:457