DISCONTOOLS

# Poultry Red Mite (*Dermanyssus gallinae*)
## Summary

### Introduction

This note provides a brief summary of the Disease and Product analysis prepared by a DISCONTOOLS group of experts on Poultry Red Mite. They reviewed the current knowledge on the disease, considered the existing disease control tools, identified current gaps in the availability and quality of the control tools and finally determined the research necessary to develop new or improved tools. Full details are available on the web site at http://www.discontools.eu/.

### Disease profile

Infestation of laying hen houses with poultry red mites (*D. gallinae*) causes major animal welfare and economic problems for the egg-producing industry worldwide, costing in excess of €231 million per year in the European Union alone in control and production losses. *Dermanyssus gallinae* is a strictly hematophagous (blood-feeding) mite and is a reservoir and/or vector of important avian and zoonotic diseases, including *Salmonella* Enteritidis and avian influenza virus, and can serve as a reservoir for fowl typhoid between sequential hen flocks. The mites spend most of their lives off of the host, returning during the hours of darkness to feed on hens for short periods of time (<1h), and can form large populations in the accommodation of birds in commercial egg laying operations. Moderate infestations of mites (approximately 50,000 parasites per hen), can impact on the welfare of the birds, inducing behaviours such as increased restlessness, feather pecking and cannibalism whereas in severe infestations (500,000 mites per hen) substantial welfare issues such as anaemia and death are seen as well as losses in production. Once introduced into farm buildings, the mites are extremely difficult to manage successfully. Even in empty animal accommodation, the mites can survive for prolonged periods without a bloodmeal and under cold conditions - *D. gallinae* is able to survive fasting for at least nine months in the environment without any host available; a number of individuals die after 3 weeks of fasting, but part of the population persists and nymphs, especially, can survive for prolonged periods.

Zoonotic infestations of humans (“gamasoidoses”) due to *D. gallinae* have occurred worldwide for some time, though maybe with an increasing frequency recently.

### Risk

Infestation of commercial egg-producing flocks with *D. gallinae* is both endemic and epizootic; in Europe 83% of egg production units report infestation. Distribution is worldwide, with a quite homogeneous genetic structure of mite populations in poultry farms on different continents resulting from long distance spread via trade activity. Inert objects such as cages and any object involved in poultry transportation are implicated in spreading the mites. Everything which is moved could transfer poultry red mites from one premises to another - crates, hens, rodents, flies, dust, transport, conveyor belts. Infestations with *D. gallinae* have been reported from birds of various species. Nevertheless, the populations that develop in poultry farms are strongly genetically isolated from populations in the wild birds, in Europe at least. Dissemination of *D. gallinae* infesting commercial hens is tightly associated with the poultry trade activity.

### Diagnostics

Most diagnosis is by visual inspection of shed furniture (undersides of feeding troughs, perches etc) and simple visual scoring methods can be used as a rough guide to the scale of the problem. There are also various types of mite traps which can be used to monitor populations. Manual traps rely on regular checking for presence of live mites and some companies offer a counting service. More recently, automated traps have become commercially available which monitor the size and development of a poultry red mite population in the house, and determine a time for optimal treatment on the basis of the population size. These automated monitors can also be used to determine the effect of a treatment on the decrease in the population post-application. Given the current availability of relatively simple-to-use techniques, few gaps and opportunities exist in this sector, though

there may be some place for additional automated, low cost technologies with high sensitivity and specificity for either the parasite or the pathogens that they carry.

**Vaccines**

An experimental autogenous vaccine based on soluble mite extract has demonstrated some efficacy (reduction in mite populations by >75%) in an experimental setting but is not suitable for large-scale commercial production. Multiple recombinant antigens have been trialled in both laboratory and field conditions but none, as yet, has demonstrated suitable efficacy for exploitation. Vaccines have the potential to play a major role in future control methods for poultry red mite control in integrated pest management systems, but major gaps exist in: Identification of optimum antigen constituents; optimisation of routes of vaccine administration for prime and booster vaccinations to provoke effective, long-term immunity; modelling of different vaccine efficacies/modes of action on population; analysis of cost of goods/potential profitability of vaccines.

**Pharmaceuticals**

Most acaricides on the market are not for direct application to birds, so the number of authorised treatment options in the EU is quite limited. There are sprayed pesticides for application to the premises (organophosphates and the spinosyn spinosad) and an orally-applied acaricide, supplied through the drinking water and licensed as a veterinary medicine (the isoxazoline fluralaner). Efficacy of the latter is high, currently. Efficacy of the sprayed chemical treatments is variable and dependent on multiple factors including operator skill level and existence of resistant mite populations. A number of other treatments and preventative interventions are available including predatory mites; plant-based feed or drink additives; sprayed silica dust; standard hygiene measures; use of detergent and water to clean hen houses and equipment; physical barrier systems; use of heat treatments in empty hen houses etc. Gaps exist in standardisation of sanitation/treatment methodologies and adoption of integrated pest management strategies; knowledge of off-target ecosystem effects (especially following the use of hen manure); analysis of the potential for resistance against the newer actives; development of new classes of actives; potential for “lure and kill” technologies.

**Knowledge**

Good levels of knowledge exist around the pathogen but some gaps still exist; chemical interactions with the host and with the remaining environment; chemical interactions between mites (aggregation and oviposition pheromones); interactions with natural enemies, especially naturally-occurring predatory mites; parameters of the temporal and spatial dynamics of populations and how these are affected by environmental conditions; zoonotic aspects of infestation and disease transmission; the true vector capacity of the mites for bacterial and viral pathogens; effect of numbers of mites per hen on production and mortality.

**Conclusions**

Poultry red mites are important pathogens in the poultry industry worldwide, particularly in the egg-laying industry, causing significant losses and welfare issues. New developments, particularly in the areas of integrated pest management, vaccine and pharmaceutical development represent promising options for improved control of this parasite.