Construction of an ethogram of the poultry red mite *Dermanyssus gallinae* and study of his terrestrial locomotion.

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**Study presentation**

**Introduction**

*Dermanyssus gallinae* (De Geer, 1778), known as the “poultry red mite,” is considered one of the most important welfare and health problems for poultry worldwide, particularly laying hens\(^1\) and causes large economic losses worldwide\(^2\). This hematophagous mite parasitizes chickens, residing on its host only during blood meals, then retreating into hiding in farm buildings. A characteristic of red mite infestation is that once they are present in a flock, it is almost impossible to eradicate them\(^3\). The control of the poultry red mite is mainly based on the use of acaricides, such as organophosphates, carbamates, pyrethroids, and formamidines. The lack of new acaricides, resistance to acaricides, and increasingly stringent requirements for chemicals used on food animals greatly limit the options for controlling this pest\(^4\). Therefore, alternative methods for the control of *D. gallinae* are urgently needed\(^5\).

**Objectives and hypothesis**

During the last decades, very few progress have been made on the control of this pest who stayed the world major ectoparasite on hens. Similarly, the studies of behavior on acari stayed very rare, with only few reports on a handful of acari only, mainly some plant parasites. We hypothesis than the improvement of the knowledge of the behavior of acari and its comparisons with other arachnids or insects would lead in some new field of studies who could have repercussions on other study fields. For instance, concerning *D. gallinae*, it could lead to improve our way to control it, or even more to new ways of control. Using this knowledge, it could also lead to new approaches of some studies, as the comparison of the behavior of mites harboring some symbionts versus other free of them.

Thus, the objectives of this work are to establish the first ethogram of *D. gallinae* and the average gait diagram to know the uses of the mite legs during the locomotion.

**Material and methods**

To define the *D. gallinae* main behavioral actions and to establish a worksheet for use in future studies, the observations will be conducted in short sessions using a stereomicroscope. Longer observation will be video recorded and analyzed afterward.

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Individual ethograms of mites will be studied using mites collected from poultry farms and maintained in our laboratory. They will be either individually or by pair mounted between 2 glass slides in a little arena and observed and/or monitored with a video camera recorder under a stereomicroscope, either more smites on a larger area between 2 larger glass slides and recorded using a video camera recorder.

All basic behaviors will be characterized and recorded on video to establish the ethogram and compare it between larvae, nymphs and adults.

Concerning the study of the locomotion and the use of their legs, individual mites will be video recorded under a stereomicroscope walking on a flat raceway. Then times and speed will be measured, as well as the way the mites are using their legs to establish average gait diagrams of the locomotion.

**Expected results**

Results will be the first ones about behavioral studies on *D. gallinae* and will contribute to improve our knowledge on the behavior of this mites and to have new tools to study and compare the effects on different stimuli on these mites. It will be the base of future studies of more complex and interactive behaviors. Indeed, it will lead to the emergence of comparative and fundamental studies on acari behavior but also, in the specific case of *D. gallinae*, could lead to new ways of control it or to measure some way to control it. Finally, it will also be used in the study of the effect on some bacterial symbionts we recently found in some *D. gallinae* isolates. The average gait diagrams of *D. gallinae* will be also the first step in the study of the role of the first pair of legs, as it seems these legs could have other roles than only the locomotion.

**Research laboratory and Publications**

The project takes place in the Biometry and Evolutionary Biology laboratory (LBBE). Research topics of the laboratory encompass various aspects of Biometry (or Biostatistics) and Evolutionary Biology, and research themes in the lab are clustered around a methodology (emphasizing the importance of modeling and informatics in life and medical sciences), and an evolutionary perspective, regardless of the investigation level (from molecules to communities). Our lab is studying *Dermanyssus gallinae* since many years and is currently part of a COST action (European Cooperation in Science and Technology) FA1404 “Improving current understanding and research for sustainable control of the poultry red mite *Dermanyssus gallinae*” (COREMI).

**Five major publications on this field**