Joint WG3-WG4 workshop

August 21st-22nd, 2018 - Ljubljana

Focus and concept

Objective

Drafting guidelines to novice people interested in conducting **molecular epidemiological studies** on PRM, **with a focus on spread routes of PRM and associated organisms in the poultry industry.**

Challenge

Why is it interesting to determine how populations of a hematophagous arthropod are connected to each another?

- **Theoretical background**: acaricide resistance, pathogen vector competence, pathogenicity of hematophagous arthropods typically result from the level of pre-existing heritable diversity in resident population and the frequency at which interbreeding occurs with other populations
- **Operational outcomes**: improving prophylaxis by identifying contaminant sources (of PRM and of accompanying pathogens) and better managing acaricide resistance by identifying patterns of spread among farms
- **Need for inter-/multidisciplinary skills:** general epidemiology, population genetics, acaricide resistance, parasitology, microbiology and vector biology

Justification of the epidemiological perspective

"Epidemiologists describe distributions of health states in populations, make inferences about the causes, and intervene to change those causes to improve population health" (Lynch 2006).

- Here the "health state" of hens is affected by a hematophagous mite (PRM) and possibly associated organisms (e.g. pathogenic microorganisms), not to mention the "health state" of man may also be affected by either PRM or PRM-associated microorganisms (e.g. salmonella) → **agent = PRM and/or accompanying pathogens**
- "Inferences about the causes" mainly rely on the identification of PRM source and PRM-infestation channels → **focus on PRM spread routes**
- "Intervene" mainly consists of prophylaxis and treatments. Prophylaxis may be improved thanks to a better knowledge of the PRM-source and infestation channels. As for treatments, resistant populations developing under the selective pressure of acaricides in a few farms may spread among farms, which is an important cause of general decrease of treatment efficiency
  → **gaining understanding of PRM spread routes is expected to help both improve prophylactic actions and manage resistances.**

Design and programme

Group works will be designed to allow the conception and writing of short guidelines which will be available to everybody online, and maybe could be also printed as a booklet.

During the two days there will be an introductory session and 6 topic sessions. For each topic an expert will introduce the available knowledge and methods related to that topic. Together with the participants present, the experts will try to answer the questions related to that topic using the method of round table discussions. A novice person should be able to clearly write down the answers to the questions and therefore should get the opportunity to asking for clarifications. The novice person will effectively draft the guidelines related to the topic he/she is responsible for, retaining the crucial points and popularize

the points of vigilance. A person responsible for the process will be designated for each topic session to control time and organize discussions.

Consortium composition and roles of participants

Present are twelve participants, including three organizers (Danijela Horvatek-Tomic, Monique Mul, Lise Roy). Four participants have the role of "novice" or nearly "novice" participant. Seven specialists have the role of "experts" in different fields. Note that everyine here is expert in something. The term "expert" is to be considered in terms of an expertise in a field related to molecular epidemiology:

- "novice" participants: Aleksandar Dodovski, Martina Lichovnikova, Monique Mul, Miroslav Radeski
- nearly "novice" participant: Eleanor Karp-Tatham (young investigator in PRM molecular epidemiology)
- "experts" participants:

	Field of interest here	**Use of molecular tools**	**Experience in PRM molecular epidemiology**
Relja Beck	parasitology	yes	no
Pascal Hendrikx	epidemiology	no	no
Danijela Horvatek-Tomic	microbiology, poultry health	yes	no
Øivind Øines	parasitology	yes	yes
Lise Roy	ecology of arthropods in agrosystems	yes	yes
Patricia Salgueiro	ecology of insect vectors	yes	no
Thomas Van Leeuwen	acaricide resistance	yes	no

Role of the "Responsible Novice participant": This participant will write down what has been said about the topic and what the answers were to the questions. This person produces the guideline related to the topic. This participant asks for clarification if necessary. Besides answering the questions related to the topic (see below), the following **general questions** should be answered:

- What are the main typical "traps" for parasitologists and microbiologists planning to conduct a study to explore spread route of a hematophagous pest and/or of its accompanying pathogens and/or of its resistances using molecular tools?
- What can be done using "basic" molecular tools?
- What can be done with new tools?

The responsible novice participants will submit their guidelines on September 15th, 2018.

The Responsible Person for the Process (= facilitator) of the round table is taking care of the process and the questions to be answered. This persons is responsible for not exceeding the time (presentations and topic), but also should take care about time in order to have all questions answered. Moreover, the facilitator takes care about the involvement of all persons in the discussion and helps the novice participants in writing down the answers on big flap overs.

Day 1: Tuesday August 21st

8.30 – 10.30 **Introduction**

- **Problem statement:** Why tracking spread routes of PRM using molecular markers? Why a multidisciplinary workshop? (**Lise,** 10 minutes)
- **Identification of who knows what**: each participant describes the knowledge/ experience/methods he or she has/uses related to the topics in 5-7 min.

10.30-10:45 **Coffee break**

10.45- 12.45 **Topic no 1: Epidemiology and molecular epidemiology** (45 min. presentation + round table)

- Questions to be answered: What is the link between epidemiology and molecular epidemiology? What questions can and cannot be answered using the methods of molecular epidemiology to general understanding of the epidemiology of a given pathogen? What are the main points to be considered in order to conduct a relevant molecular epidemiology study?
- Resource person: **Pascal**
  → State of the art on PRM: **Lise and Øivind** (15 min)
- Responsible Novice: Eleanor
- Responsible for the process of the round table: Danijela

12:45-14:00 **Lunch**

14.00 – 16.00 **Topic no 2: Molecular ecology** (40 min. presentation + round table)

- Questions to be answered: What is molecular ecology and how such approaches may help progress understanding the general epidemiology of vector arthropods and associated microorganisms? Why is increasing knowledge of the ecology of micropredator arthropods such as mosquitoes and PRM of great interest? Examples from mosquitoes.
- Resource person: **Patricia**
- Responsible Novice: Miroslav
- Responsible for the process: Monique

16.00-16:15 **Coffee break**

16.15 – 18.15 **Topic no 3: Acaricide resistance** (30 min presentation + round table)

- Questions to be answered: What is acaricide resistance? What are the known genetic bases of resistance in mites and their relation to phenotypes? What molecular tools allow to follow and/or to state in terms of epidemiology of a given pest mite?
- Resource person: **Thomas Van Leeuwen**
  → State of the art in PRM: **Lise Roy** (10 min)
- Responsible Novice: Martina
- Responsible for the process: Miroslav

20:00-… **Dinner**

Day 2: Wednesday August 22nd

8.30 – 10.30 **Topic no 4: Phylogenetics and population genetics (using "basic" techniques)** (40 min presentation + round table)

- Questions to be answered: How may phylogenetics and populations genetics tools help tracking spread routes of PRM? What is a phylogenetic tree, how is it constructed? What is a haplotype network? What population genetics approaches involving allelic frequencies add as information? How may these tools help understanding the epidemiology of PRM infestations, PRM acaricide resistance, of PRM-associated microorganisms? Which question can these different tools answer and which they cannot?
- Resource person: **Patricia, Lise**
- Responsible Novice: Monique
- Responsible for the process: Aleksandar

10.30-10:45 **Coffee break**

10.45 – 12.45 **Topic no 5: new molecular tools and** techniques (format: *pending*)

- Questions to be answered: what could new or recent molecular techniques, genomics and transcriptomics tools add / bring to single gene phylogenetic (and/or networks)? How may population genetics benefit from these? (what is single gene phylogenetic)
- Resource person: **Øivind, Thomas**
- Responsible Novice: Danijela
- Responsible for the process: Martina

12:45-14:00 **Lunch**

13.45 – 15.45 **Topic no 6: Vector competence and pathogen microorganisms associated with hematophagous arthropods** (40 min presentation + round table)

- Questions to be answered: what is vector competence? How to state which pathogenic microorganism a hematophagous arthropod may transmit? What molecular tools are commonly used to explore parasites and pathogenic microorganisms in general? What's the state of the art on PRM?
- Resource person: **Relja Beck**
  → State of the art in PRM: **Danijela Horvatek Tomic**
- Responsible Novice: Aleksandar
- Responsible for the process: Eleanor

15.45 – 16:00 **Coffee break**

16:00 – 17.30 **General discussion to finalize and sharpen the answers.**

All novices need to take one topic and ask if something is not clear (or bilateral or group discussion on demand). Keep in mind that all the general and the topic-specific questions (see above) should be answered.

The novices submit their guidelines on September 15th, 2018.