Research Group: Insect Molecular Genetics and Biotechnology

Personnel

Luc Swevers, Research Director

Vasiliki Labropoulou, Senior Research Scientist

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Research Interests

1. Physiological, developmental and immunological processes are studied in lepidopteran insects, with the silkworm, *Bombyx mori*, as the major model, with the aim of the identification of molecular targets that can be exploited for insect pest control.

2. Analysis of small RNA (miRNA, siRNA, piRNA) pathways in Lepidoptera with the aim of developing methods for improvement of RNAi efficiency in lepidopteran insects.
3. Analysis of the immune response against RNA and DNA virus infections in lepidopteran insects.
4. Production of bio-active proteins by the baculovirus expression vector system for

functional characterization: antimicrobial peptides, enzymes involved in insecticide resistance, viral-like particles (VLPs).

5. Development of screening systems for the identification of antiviral compounds.
6. Production of recombinant RNA viruses and “viral-like particles” (VLPs) for enhanced delivery of RNAi.

Recent Research Activity

Analysis of the antiviral defense in silkworm (*Bombyx mori; Lepidoptera) by high-throughput technologies*

- Transcriptomics and small RNA sequencing of silkworm midgut persistently and pathogenically infected with cytoplasmic polyhedrosis virus (*Cypovirus; Reoviridae)*

PLoS ONE 10: e0121447 (2015)

J. Virol. 89, 11473-11486 (2015)

- Metabolomics of silkworm-derived Bm5 cells during persistent infection with cricket paralysis virus (*Cripavirus; Dicistroviridae*) and comparison with pathogenic infection in *D rosophila*
S2 cells

J. Insect Physiol. 115, 1-11 (2019)

Viruses 11, 861 (2019)

Viruses 12, 393 (2020)

- Metabolomics and single cell transcriptomics of silkworm hemolymph and hemocytes during systemic infection with *B. mori* nucleopolyhedrovirus (BmNPV; *Baculoviridae*)

Front. Immunol. 12, 645359 (2021)

Viruses 13, 841 (2021)

Front. Immunol. 13:852702 (2022)

- Analysis of the piRNA response during infection of silkworm fat body and midgut with *B. mori* nucleopolyhedrovirus (BmNPV; *Baculoviridae*)

Insect Science 28, 662–679 (2021)

- Analysis of RNAi (siRNA and piRNA) as an antiviral defense mechanism in lepidopteran cell lines

J. Insect Physiol. 93-94, 81-93 (2016)

Sci. Rep. 8: 2423 (2018)

Mol. Genet. Genomics 294, 887-899 (2019)

Viruses 11, 738 (2019)

New methods for increased delivery of RNAi in insects: recombinant DNA/RNA viruses and viral-like particles (VLPs)

- Use of recombinant *B. mori* nucleopolyhedrovirus (BmNPV; *Baculoviridae*) for delivery of RNAi in an agricultural pest

PLoS ONE 8, e73834 (2013)

- Reverse genetics system for production of recombinant Flock house virus (FHV; *Nodaviridae*) as RNAi vector

Front. Physiol. 9, 805 (2018)

- Production by the baculovirus expression system and functional testing of VLPs based on the capsid shell protein of silkworm cytoplasmic polyhedrosis virus (*Cypovirus*; *Reoviridae*)

Mol. Genet. Genomics 294, 887-899 (2019)

J. Gen. Virol. 102, 001542 (2020)

Front. Physiol. 12:749387 (2021)

Production and functional testing of insecticide metabolic enzymes and anti-viral effectors by the baculovirus expression vector system

- Mosquito carboxylesterases

Insect Biochem. Mol. Biol. 74, 61-67 (2016)

- Mite carboxylesterases

Pest Manag Sci. 276, 1142-1153 (2020)

- Antimicrobial peptides and cytokines

Appl. Microbiol. Biotechnol. 103, 8473–8483 (2019)

Front. Immunol. 11, 2030 (2020)

Main Collaborators

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- Dr. D. Santos and Dr. J. Vanden Broeck, Research Group of Molecular Developmental Physiology and Signal Transduction, KULeuven, Belgium
- Dr. M. Feng and Dr. J. Sun, Guangdong Provincial Key Laboratory of Agro-animal Genomics and Molecular Breeding, College of Animal Science, South China Agricultural University, Guangzhou, China
- Dr. J. Vontas, Institute of Molecular Biology and Biotechnology, Foundation for Research and Technology-Hellas, Heraklion, Greece; Pesticide Science Lab, Department of Crop Science, Agricultural University of Athens, Greece