

VERONIKA MICHALKOVA

Institute of Zoology Slovak Academy of Sciences

> Project number 1175/01/02

Project duration 2/2022 - 1/2025

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"I have vast experiences in molecular physiology which can be used by implementation of the SASPRO project and possibility to extend my knowledge also in neuropeptid studies and enrich this way the information about general biology of tsetse flies, as important insect disease vector. The obtained data can be modern tool implemented later in applied research."



BIOGRAPHY

After the successful defence of a dissertation thesis I was employed at the Institute of Zoology in the position of scientific researcher where in the short time I won the prestigious Postdoctoral positions at Yale University (New Haven, USA) under the leadership of Prof. Serap Aksoy. During the post doc position my experiences and knowledge enriched by new knowledge and trends, particularly in the field of molecular physiology. The most important achievement during my research was identification of enzyme SMASe in tsetse milk that is also localized in mammal's breast milk, so the tsetse flies may serve as a potential model for lipid metabolism during lactation in mammals. The reduction in this enzyme also has an impact on the fitness of the offspring, and reduces the number of offspring what can be used in the context of biological control, targeted to reduce the population of tsetse flies and reduce the incidence of sleeping sickness in Africa. I also proved that amelioration of reproductionassociated oxidative stress in a viviparous insect is critical to prevent reproductive senescence, defined genes contributing to this process. I also assessed importance of vitamin B-6 produced by obligate endosymbionts which is critical for maintaining proline homeostasis and fecundity in tsetse flies. My research was also focused on lipid metabolism and mobilization of nutrients during lactation, identification and characterization of new milk proteins, and the role of symbionts in the production of milk. I was also a member of International Glossina Genome Initiative, where I took part in annotating the metabolism genes.

After my postdoc at Yale University I was awarded by 4 year postdoc at Florida International University in Miami where I conducted research on juvenile hormone biosynthesis in mosquitoes, namely in Aedes aegypti and was given the opportunity to provide research in Center of Research on Infectious Diseases in Cuernavaca, Mexico on Anopheles albimanus and study host- parasite interactions with Plasmodium berghei and proved that JH controls ovarian development in Anopheles female.

PROJECT SUMMARY

Neuropeptide regulators: revealing the secrets of neuronal control and behaviour of tsetse flies

Neuropeptides play a key role in all physiological processes but little is known about their identity, expression and function in vectors of pathogens, such as tsetse flies. Decoding the tsetse genome is already a big step in right direction of finding new perspective target genes for biological control and neuropeptides may hold the main point to controlling tsetse populations and eventually eradicating trypanosomiasis. They are also promising targets for the development of new environmentally-safe insecticides because they regulate all of the tsetse fly's crucial processes. Interfering with neuropeptides' proper functioning may allow us to decrease the fly's fitness and thereby shrink populations. 39 neuropeptide genes and 43 receptor genes have been already annotated in six Glossina species' genomes and future unrevealing the tsetse fly's neuropeptide systems undoubtedly contributes to a better understanding of its overall biology.



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PUBLICATIONS

- Nouzova M, Edwards MJ, Michalkova V, Ramirez CE, Ruiz M, Areiza M, DeGgenaro M, Fernandez-Lima F, Feyereisen R, Jindra M, Noriega F (2021) Epoxidation of juvenile hormone was a key innovation improving insect reproductive fitness. PNAS 118 (45) e2109381118. <u>https://doi.org/10.1073/pnas.2109381118</u>
- International Glossina Genome Initiative (2019) Comparative genomic analysis of six Glossina genomes, vectors of African trypanosomes. Genome biology 20: 187.

https://genomebiology.biomedcentral.com/articles/10.1186/ s13059-019-1768-2

- 3. Michalkova V, Benoit JB, Weiss BL, Attardo GM, Aksoy S (2014) Vitamin B-6 Generated by Obligate Symbionts Is Critical for Maintaining Proline Homeostasis and Fecundity in Tsetse Flies. Applied and Environmental Microbiology 80: 5844-5853. https://journals.asm.org/doi/10.1128/AEM.01150-14
- International Glossina Genome Initiative (2014) Genome Sequence of the Tsetse Fly (Glossina morsitans): Vector of African Trypanosomiasis. Science 344: 380-386. https://www.science.org/doi/10.1126/science.1249656
- 5. **Michalkova V,** Benoit JB, Attardo GM, Medlock J, Aksoy S (2014) Amelioration of reproduction-associated oxidative stress in a viviparous insect is critical to prevent reproductive senescence. PLoS One 9: e87554. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0087554











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