

Research Topic for the ParisTech/CSC PhD Program

***Field** (Biology, Biophysics and Bio Chemistry):

Subfield: (Molecular Physiology)

Title: Neurotransmitter signaling pathways in tick salivary gland

ParisTech School: AgroParisTech

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Short description of possible research topics for a PhD: In this research proposal we aim to study salivary gland (SG) neural control in the *Ixodes ricinus*, the most prominent tick vector of disease-causing viral, bacterial, and protozoan agents in Europe. The relationships between tick species and the pathogens they transmit are complex, as pathogens depend upon the tick's saliva for their transmission into the host. The signalling between synganglion (the tick central nervous system) and SGs is very complex, and holds vital clues to understanding key aspects of SG functionality. The neural controls regulating tick SGs are crucial in both on- and off-host stages and therefore characterizing their molecular elements along with G-protein coupled receptor (GPCR) transduction events is of particular importance, and has a strong potential to elucidate key aspects about parasitic tick lifestyles. Specific aim of this project is to explore the relationship between the tick's central nervous system and SGs. Such approach is expected to uncover the molecular nature of tick SG control, and uses highly innovative tools to investigate its impact on functioning of this tissue. The data obtained in this study are expected to provide potential targets to disturb and control the ectoparasitic lifestyle of multiple tick species worldwide.

Required background of the student: Experience in basic molecular biology and/or biochemistry techniques. This includes but is not limited: cDNA synthesis, qRT-PCR, molecular cloning, immunohistochemistry, heterologous expression. Familiarity with imaging and bioinformatique is preferable. The applicant has to have solid writing and speaking skills in English.

A list of 5(max.) representative publications of the group: (Related to the research topic)

Gulia-Nuss M., et al., (*Ixodes scapularis* genome sequencing consortium), Genomic insights into the *Ixodes scapularis* tick vector of Lyme disease. *Nature Communications*. 7:10507, doi:10.1038/ncomms10507, 2016

Šimo L., Koči J., Kim D. H., Park Y., Invertebrate specific D1-like dopamine receptor in control of salivary glands in the black-legged tick *Ixodes scapularis*, *Journal of Comparative Neurology* 522(9):2038-52, 2014

Šimo L., Koči J., Park Y., The receptors for neuropeptides myoinhibitory peptide and SIFamide in the salivary glands of the blacklegged tick, *Ixodes scapularis*, *Insect Biochemistry and Molecular Biology* 43:376-387, 2013

Šimo L., Koči J., Žitňan D. and Park Y., Evidence for D1 dopamine receptor activation by a paracrine signal of dopamine in tick salivary glands, *PLoS ONE* 6(1): e16158, 2011

Šimo L., Žitňan D. and Park Y., Two novel neuropeptides innervate the salivary glands in the blacklegged tick *Ixodes scapularis*: Myoinhibitory peptide and SIFamide, *Journal of Comparative Neurology* 517:551–563, 2009