

Proposition de stage

Parcours Master 2 « Microbiologie, Environnement, Santé »

1. Laboratoire / Entreprise d'accueil :

Intitulé : ANSES – Laboratoire de Santé Animale – UMR BIPAR, Equipe Mitick, Groupe Vectotiq

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Co-encadrant éventuel :

2. Description du stage (2 pages maximum) :

Titre : Development of isothermal amplification methods for diagnosis of arthropod-borne diseases of livestock

Mots clés : RT-LAMP PCR, Ticks, Tick-borne viruses

Contexte et objectifs généraux :

Threat of arthropod-borne diseases

Arthropod-borne diseases, many caused by viruses, are (re)-emerging in various parts of the world, including Europe, and thereby form a threat for animal and human health. Examples include mosquito-borne viruses such as West Nile virus, chikungunya virus, Zika virus, Rift Valley fever virus and dengue virus, and midge-borne viruses such as bluetongue virus and Schmallenberg virus. Rapid detection of these viruses is critical to implementation of appropriate control measures. Molecular detection methods such as RT-PCR and RT-LAMP (Johnson et al., 2012) have made significant improvements to the early detection of these pathogens.

Utility of RT-LAMP for rapid detection of viruses

RT-LAMP was developed as an isothermal method for amplifying short fragments of DNA (Notomi et al., 2000). The reaction is initiated by binding of a minimum of four primers to six separate regions of target DNA followed by strand elongation by a DNA polymerase with strand-displacement activity. The loops created by the inner primers can establish further primer sites for strand elongation that subsequently increase the speed and sensitivity of the reaction. The amplification reaction results in the formation of long DNA structures comprising multiple repeats of the DNA target that appear as a distinctive ladder when separated and visualised on agarose gels. The specificity of the primers and rapidity of the method, often generating measurable product within 30 minutes, makes the method useful as a diagnostic tool. The addition of a reverse transcription step has enabled its application for detecting a range of RNA viruses, many of which are pathogens of livestock (Mansour et al., 2015).

Projet de stage : Isothermal amplification assays will be designed and then evaluated in the laboratory. The M2 student will focus on the development of this technic for 2 tick-borne viruses : Tick-borne encephalitis virus (TBEV) and Eyach virus (EYAV). This project belongs to an European project funded by ANSES. During the project, each partner will develop his the RT-LAMP method(s) for selected viruses. Information on successful methods, including evaluated primer combinations, will be shared within the consortium for potential adoption by all contributing members.

Les objectifs de ce stage M2 sont : The M2 student will have to develop two RT-LAMP system for the detection of 2 tick-borne viruses : Tick-borne encephalitis virus (TBEV) and Eyach virus (EYAV).

Bibliographie :

Sélection d'autres publications de l'équipe sur le sujet:

L'équipe est spécialisée dans le développement de nouveaux outils de détection à haut débit des agents pathogènes vectorisés par les tiques et/ou les moustiques et leur utilisation dans des projets collaboratifs d'étude à large échelle de l'épidémiologie de ces agents pathogènes en Europe.

Hein Sprong, Manoj Fonville, Arieke Docters van Leeuwen, Elodie Devillers, Adolfo Ibañez-Justicia, Arjan Stroo, Kayleigh Hansford, Benjamin Cull, Jolyon Medlock, Paul Heyman, Christel Cochez, Lisa Weis, Cornelia Silaghi, **Sara Moutailler**. 2019. Detection of pathogens in *Dermacentor reticulatus* in northwestern Europe: evaluation of a highthroughput array. *Heliyon* 4 (2019) e01270. <https://doi.org/10.1016/j.heliyon.2019.e01270>

Mathilde Gondard, Sabine Delannoy, Valerie Pinarello, Rosalie Aprelon, Elodie Devillers, Clemence Galon, Jennifer Pradel, Muriel Vayssier-Taussat, Emmanuel Albina, **Sara Moutailler**. 2019. Upscaling surveillance of tick-borne pathogens in the French Caribbean islands. Preprint BioRxiv. doi: <https://doi.org/10.1101/532457>

Alejandro Cabezas-Cruz, Eléonore Allain, Abdullah S. Ahmad, Muhammad A. Saeed, Imran Rashid, Kamran Ashraf, Lena Yousfi, Wasim Shehzad, Lea Indjein, Manuel Rodriguez-Valle, Agustin Estrada-Peña, Dasiel Obregon, Abdul Jabbar, **Sara Moutailler**. (2019). Low genetic diversity of *Ehrlichia canis* associated to high coinfection rates in *Rhipicephalus sanguineus* s.l. *Parasit Vectors*. 12(1):12. doi: 10.1186/s13071-018-3194-9.

Nicholas Johnson, Mar Fernández de Marco, Armando Giovannini, Carla Ippoliti, Maria Luisa Danzetta, Gili Svartz, Oran Erster, Martin H. Groschup, Ute Ziegler, Ali Mirazimi, Vanessa Monteil, Cecile Beck, Gaele Gonzalez, Sylvie Lecollinet, Houssam Attoui and **Sara Moutailler**. (2018). Emerging Mosquito-Borne Threats and the Response from European and Eastern Mediterranean Countries. *Int. J. Environ. Res. Public Health*, 15, 2775; doi:10.3390/ijerph15122775.

Gondard, Mathilde; Michelet, Lorraine; Nisavanh, Athinna; Devillers, Elodie; Delannoy, Sabine; Fach, Patrick; Aspán, Anna; Ullman, Karin; Chirico, Jan; Hoffmann, Bernd; van der Wal, Fimme; de Koeijer, Aline; van Solt-Smits, Conny; Jahfari, Seta; Sprong, Hein; Mansfield, Karen; Fooks, Anthony; Klitgaard, Kirstine; Bødker, Rene; **Moutailler, Sara**. (2018). Prevalence of tick-borne viruses in *Ixodes ricinus* assessed by high-throughput real-time PCR. *Pathogens and Disease*. Doi: 10.1093/femspd/fty083.

Ce stage peut-il se poursuivre par une thèse ? : NON