INSTITUT DES SCIENCES ANALYTIQUES

UNIVERSITÉ DE LYON

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Lyon 1

Détecter la bilharziose : les sciences analytiques pour les maladies infectieuses
Detecting schistosomiasis: analytical sciences for infectious diseases

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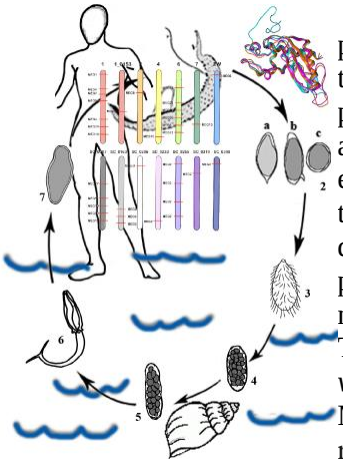

Schistosomiasis is a vector borne disease, 3rd only to malaria and COVID-19 per number of infected individuals worldwide. It is caused by worms able to adapt to an invertebrate and a mammalian host and to hijack them to succeed perpetuation.[1] They do not elicit humoral immune response, hence re-infection is a threat. Moreover, they require permissive temperatures that global warming are enlarging outside tropics, moving the health threat in unsuspected zones, such as the mediterranean region.[2] For a correct surveillance, reliable and quick diagnostic tests are mandatory, since early clinical signs are shared among several pathogens. The diagnostics in commerce detect the late stages of infection by microscopy (eggs count in urine/stools) or time consuming laboratory tests.[3] Therefore, we propose to develop a rapid early diagnostic test of schistosomiasis *via* a collaboration between 2 teams at ISA (BioSys and Micro&Nanobiotechnology). The immunosensor will be based on antibody (Ab) recognition of Venom allergen-like proteins (VAL), specific to parasitic worms, absent from the human genome. The pilot device is based on polyclonal Ab already produced by BioSys against two of the 29 VAL isoforms, VAL11 and VAL13. The Ab will be immobilised by Micro&NanoBiotechnology team on the transducer using a novel strategy, free-click chemistry based.[4] Electrochemical impedance spectroscopy will be used for label free detection. In parallel, VAL structure by means of macromolecular crystallography (MX), Small angle X-ray scattering (SAXS), NMR will be solved. Moreover, Ab-VAL interactions will be studied by means of Circular Dichroism (CD), Dynamic Light Scattering (DLS), surface plasmon resonance (SPR) in order to characterize the epitopes responsible for specific recognition.

The project will be hosted by the Institute of Analytical Sciences (ISA) located in Lyon/Villeurbanne (France). This new institute comprise around 200 researchers and is among the largest analytical science center in Europe. The lab is fully equipped for heterologous expression and purification of proteins as well as cutting edge instruments for structural and functional analyses, like High field NMR spectrometers, CD, DLS (http://nmrbiolchem.univ-lyon1.fr/equipment.html). The thesis project will be developed inside the Biosys group and will benefit from the expertise of the group members as well as of Micro&NanoBiotechnology team members. The successful candidate should have completed (or in stage of completion) M.Sc. degree either in biochemistry, physical chemistry, structural biology, or related fields.

References

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4. Razmshoar P et al. Novel platform based on polystyrene electrospun nanofibrous mats doped with PAMAM dendritic polymer for enhanced immunosensing **Applied Surface Sci.** 2022; 579:152221. doi: 10.1016/j.apsusc.2021.152221