An interview with Prof. Marie-Pierre HAYETTE

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Could you tell us about your expertise?

A pharmacist and clinical microbiologist by training, I hold a doctorate in biomedical sciences and combine three domains of activity: managing the clinical microbiology laboratory at CHU Liège, teaching at the University of Liège and conducting research in medical mycology and parasitology. As far as mycology is concerned, my laboratory is a National Reference Centre (NRC) for mycoses in collaboration with the KU Leuven. In Liège, we are specialized in superficial mycoses, and particularly in dermatophytes, which cause infections of the nails, hair and skin and affect 20-25% of the world population. We currently pay particular attention to the emergence of resistant dermatophytes strains which are currently emerging in Europe. We also focus our attention on *Candida auris*, a multi-resistant yeast causing nosocomial infections that can be serious, with risks of sepsis and death.

In terms of parasitology, my laboratory focusses on malaria and echinococcosis. Malaria has been the subject of two 5-year research projects (development of a molecular detection assay to detect *Plasmodium* strains resistant to antimalarial drugs in Republic Democratic of Congo (DRC) and feasibility of systematic screening of patients by studying mutations in the malaria genome producing resistance to treatment). Finally, we are a reference laboratory for echinococcosis, transmitted to humans by foxes and dogs with tapeworm-infected intestines and whose alveolar form is endemic in Wallonia, the Southern part of Belgium.

Could you give us a few examples of current research projects?

Following on from the two malaria projects mentioned above, a third 5-year project is

looking at the risk of resistance of *Plasmodium falciparum*, the lethal species of the malaria-causing parasites, after exposition to long-term use of artemisia-based herbal teas by African populations. This project, in collaboration with the University of Kinshasa (Unikin) in the Democratic Republic of Congo, also includes a pharmacological study of the plants grown on site (*Artemisia annua* versus *Artemisia afra*) and an anthropological analysis including populations who take it versus populations who do not. The results will show whether there is a proven risk of the emergence of resistance in *P. falciparum*, so that the WHO recommendations in this area can be refined.

Considering echinococcosis, we launched a regional project about the detection of asymptomatic carriers of cystic echinococcosis, in Belgian residents originating or regularly visiting endemic countries like Morocco, Turkey or the Balkans. Regarding alveolar echinococcosis, we recently conducted a study comparing EsmB microsatellite genotypes from humans and animal hosts, such as foxes and rodents, to gain a better understanding of transmission dynamics in Belgium.

What research collaborations are you involved in?

As part of the CEDAR project, we are working in collaboration with other European reference centers for dermatophytes, under the coordination of the Danish one. The aim of this project is to characterize strains of *Trichophyton indotineae*, a species of Indian origin, which is emerging in Europe and the USA. This species is causing extensive skin lesions, can be transmitted from person to person and is difficult to treat because of resistance to terbinafine. This project follows another study which validated a standardized microdilution assay for susceptibility testing of dermatophytes strains to antifungal agents.

Another project concerns dermatophyte strains transmitted by sexual intercourse in the homosexual male population, in collaboration with the Saint-Pierre Hospital in Brussels and the Hôpital La Pitié-Salpêtrière in Paris. The aim here, is to collect as many strains as possible over the course of a year to characterize them, inform clinicians and define the determinants of the affected population using a specially designed questionnaire.

Finally, we are participants of a Franco-Belgian research group on dermatophytes, made up of members from my laboratory, Sciensano, and the Hôpital Saint-Antoine in Paris. This group is discussing the scientific studies to be carried out, trends, emerging strains or infections. It has even decided to offer lectures on dermatophytes at the next Trends in Medical Mycology (TIMM) conference, which will be held in October 2025 in Bilbao.

What are the main challenges in your field of research?

In microbiology, the major challenge is the development and spread of multi-resistant bacterial strains: according to various modelling studies, deaths linked to infections by multi-resistant bacteria should exceed those due to cancer by 2050. Yet there are few new antibiotics on the market, and even then, resistance develops rapidly. We therefore need to find another way for therapy, such as to combine antibiotics with enzyme blockers to inactivate bacterial enzymatic inhibitors, while we need also to improve hygiene conditions and prevent hospital-acquired infections.

Other challenges include the control of malaria resistance, particularly important for Africa. It is important to control antimalarial drug delivery (quality of the drugs delivered, respect of the posology and duration of administration). These are all concerns that need to be passed on to the public and to decision-makers.

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