📣 #PhD Position in Grenoble: Study of Molecular Interactions of Antimicrobial Peptides with Bacterial Targets

🔔The PAMELA doctoral project aims to explore the mechanisms of action of #antimicrobialpeptides (AMP) on Gram-positive and Gram-negative bacteria. This project builds on preliminary results obtained with peptides exhibiting strong antibiotic activity, whose mechanisms of action remain unclear. This interdisciplinary project is set within a unique scientific environment, supported by a Grenoble-based consortium comprising two academic laboratories— Institut de Biologie Structurale (IBS) and SyMMES—and a major research infrastructure, ILL - Institut Laue Langevin. This PhD is funded by Université Grenoble Alpes, as part of the national #France2030 plan.

🚀 **Main duties:**

Study of peptide interactions with the surface of Gram-positive bacteria at IBS: Using model Gram-positive bacteria (Streptococcus pneumoniae), this work will involve fluorescence microscopy to identify molecular targets recognized by these peptides within the bacterial envelope. Complementary electron microscopy will also be used to visualize interaction sites.

Structural analysis of antimicrobial peptides interacting with lipid bilayers at ILL: Two bacterial strains, Gram-positive and Gram-negative, will be cultured under conditions to produce perdeuterated lipids. These lipids will be used to create neutron-invisible nanodiscs, enabling the specific study of antimicrobial peptide interactions with membranes using neutron scattering experiments (SANS) at the ILL - Institut Laue Langevin. This unique approach will allow the investigation of membrane destabilization in Gram-positive (S. pneumoniae or B. subtilis) and Gram-negative (E. coli) bacteria induced by antimicrobial peptides.

Data analysis and design of a new generation of peptides at SyMMES: Based on results from the current peptide generation, new peptide sequences with enhanced antibiotic activity and potential biosensing applications will be designed.

👇 **Desired Profile: Dual Competence in #Physics #Biology**

Education: Engineering degree or Master's in Physics with skills in microbiology, or Master's in Biology/Microbiology with expertise in biophysics and a strong interest in applying physical approaches to biological systems.

Skills: Autonomy, rigor, initiative, communication skills, and the ability to work in a multidisciplinary environment.

Proficiency in scientific English—both written and spoken—is required.

Assets: Experience in optical and/or electron microscopy, biophysics, or small-angle scattering techniques (SANS), biomolecular engineering.

📩 **Application Process:**

Send your CV, a cover letter, and contact details for two references to Claire Durmort claire.durmort@ibs.fr by May 18, 2026.

Detailed project:

The PhD student to be enrolled in the PAMELA project will be the main actor in the project development. As the candidate is expected to be part of a three-member consortium, special attention will be paid to the scientific and practical support provided to the doctoral student in each of the three laboratories. This point is particularly important in the frame of a pluri-disciplinary project as the PAMELA project.

Regarding the scientific background expected from any candidate, partners agreed that a physicist with a strong background in biology, or a biologist expecting to acquire skills in physics applied to biological purposes should manage the skills need to complete the project. At least two partners (the SyMMES laboratory and the ILL) do have successful experience in the recruitment of PhD candidates with similar profiles.

As explained elsewhere in the project description, all partners are based in Grenoble, but they are also all located on the "Polygone Scientific Campus", a few hundred meters (about 5 minutes) apart from each other. It will thus be very easy for the PhD student and the partners to commute from one laboratory to another. We will take advantage of this geographical proximity, in addition to regular progress meetings that will be organized to present the results obtained and the difficulties encountered.

The very first one-two months will be dedicated to a bibliographic survey, safety training, and meeting with all PAMELA members. Then, the PhD candidate will be in charge of the organization of regular meetings (monthly), involving its supervisors and any other researcher involved in the PAMELA project. Presentations and reports will be produced for each meeting.

After joining the Pneumocoque group (IBS), the student will first use fluorescence **microscopy** and various *Streptococcus pneumoniae* **strains** to investigate whether **PACHA peptides** bind Gram-positive cell-wall components. In parallel, he/she will perform **pull-down assays** and biophysical analyses to identify molecular targets in the peptidoglycan or **teichoic acids**. Eventually, he/she will use electron microscopy to analyze cells treated by the PACHA peptides and asses whether peptide binding disrupts cell-wall integrity, providing a comprehensive view of functional effects.

Then, he will join the ILL facility to pursue his/her project by adapting a non-pathogenic strain of *Streptococcus pneumoniae* to growth in perdeuterated conditions. If this is a success, this strain will be the source of Gram+ polar lipids. Otherwise, *B. subtilis* will be used instead. The student will then produce a partially deuterated nanodisc belt protein (csE3) and assemble nanodiscs from both Gram – and Gram + polar lipid mixture. These nanodiscs will be used for SANS experiments to titrate *in situ* the PACHA peptides that have been previously shown to disrupt the cell wall. Rendering the nanodiscs invisible by contrast variation, he/she will be able to follow the structural organization of the peptides in interaction with the membrane mimics and to propose a molecular mechanism.

Finally, owing to the in-depth characterization of the molecular interactions of PACHA 01 and 02, the PhD candidate will join the SyMMES laboratory. His/her results will drive him/her in the design of optimized peptides series (5-20 different peptide sequences) with enhanced antibiotic activity against resistant strains, and expanded utility as broad-spectrum molecular probes for biosensing applications.