AIMMS post-graduate course

New paradigms targeting resistance against antimicrobials

Thursday 30 and Friday 31 October 2014

VU University Amsterdam

Motivation

Infective diseases are amongst the illnesses we have lost fear of, thanks to the successes of medicine and biology. Antibiotics are robust, last-if-not-first resorts against most of infectious diseases. However, here the problem begins: as antibiotics are too often used as first resorts, their application became so ubiquitous that resistance develops. Many resistance mechanisms work against multiple antibiotics at the same time and are transferrable between target organisms. Resistance against antimicrobials is now threatening most human societies and requires effective actions.

With genomics, a plethora of potential new drug targets have come up – at least one for each gene. This does however not suffice for battling bacterial diseases: the redundancy and versatility of biological pathways, together with the evolutionary potential of microorganisms compromise novel antimicrobials. Resistance constitutes this challenge and is thus of great interest to multiple sciences: the chemistry of drug-macromolecule interactions, the biology of the adapting and evolving target organism, the medicine of parasite-human interactions and all of those at the same time. In all these aspects, quantitative features and complexity matter, inviting contributions from mathematical modelling and precise experimentation. The integration of these disciplines is a considerable challenge course participants get acquainted with.

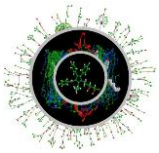
Outline

The two-day course starts with an introduction to the societal impacts of antimicrobial resistance. Spread over seven lectures, several teachers subsequently discuss molecular and network approaches aimed at reducing the occurrence of resistance. Then two hands-on tutorials follow in which participants attempt to design anti-resistance strategies at both molecular target and network levels. The tutorials make use of the JWS-online environment of replica models from real pathways, as well as molecular dynamics software for modelling ligand-macromolecule interactions.

Next keynote lecture on a research portfolio against resistance is provided, followed by an intensive scientific discussion of new ideas on how to prevent resistance against antimicrobials. On the second day, students present a project plan on antimicrobial resistance research. These ideas are subjected to detailed discussions and suggesting new collaborations.

Amsterdam Institute for Molecules, Medicines and Systems

VU UNIVERSITY AMSTERDAM



Target participants

Staff researchers, post-docs, PhD students and excellent Master's students working at universities, research institutes and in industry, studying molecular cell biology, physiology, systems biology, pharmacology, pharmacy, research management and medicine and all other professionals interested in new antimicrobials and resistance who would like to obtain insights in possible new approaches to antimicrobial resistance. Participants bring their own laptop, computation experience is not require.

Organization

The course is organized by Hans V. Westerhoff, professor in Molecular Cell Physiology and Frank Bruggeman who holds a chair in System Bioinformatics both within the Amsterdam Institute for Molecules, Medicines and Systems (AIMMS). The course also part of the AIMMS STAR graduate programme on antimicrobial research. Westerhoff is also the scientific research director of STAR and Bruggeman the programme director.

End terms

After completing the course, participants will be able to decide which aspects of antimicrobials resistance research they want to engage with (i) in their further career, (ii) for the prospects of their work environment (academic group, company), and (iii) in their teaching. Moreover, they will be able to formulate blueprints of research projects, enabling collaboration with AIMMS or other similar research institutes. Slightly extended training programs on antimicrobial research including literature study and discussions are available.

AIMMS

The Amsterdam Institute for Molecules, Medicines and Systems (AIMMS) is a complementary platform to perform molecules and medicines research at an integrated systems level. This approach is facilitated by the vertical integration of multiple scientific disciplines from three departments at VU University. AIMMS actively pursues opportunities towards valorization of its scientific achievements and knowledge, its technology facilities and services, and its intellectual property.

The institute also avails of a number of research capabilities to develop new antimicrobial paradigms contributing to reducing the resistance risk. These range from molecular modelling to systems biology and from pharmacogenomics to molecular microbiology.

STAR graduate programme

Thanks to a subsidy from NWO, AIMMS created the STAR graduate programme, in which excellent Master's students from three affiliated programmes are enrolled in a selection for four PhD positions aimed at designed new paradigms of antimicrobial resistance. The nine remaining students will follow a course in grant proposal writing and also take part in this course. The extensive discussions aims for new insights on what molecular network science can offer to the battle against resistance.

Amsterdam Institute for Molecules, Medicines and Systems

VU UNIVERSITY AMSTERDAM