NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

School of Physical and Mathematical Sciences
College of Science

CBC SEMINAR ANNOUNCEMENT

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Structure Characterisation of Bioactive Compounds and Their Interactions

Biomolecular interactions with high specificity and a significant degree of affinity play essential roles in all cellular processes such as gene regulation, molecular organisation, protein synthesis and recognition events. Determining the three-dimensional structure of macromolecules, ligands and their complexes is essential for obtaining a deeper insight into molecular mechanisms and dynamics involved in these interactions.[1,2]

The first step to achieve this goal is the synthesis of various compounds, which can act as ligands for biomolecular receptors and thus regulate their function. In order to obtain the compounds with desired properties and optimise product yields, the syntheses can be monitored in real time by employing *in-line* vibrational spectroscopy and statistical methods.[3,4] Further analysis of complex reaction mixtures is carried out *on-line* using a hyphenated system which combines HPLC and SPE with cryo-NMR detection (HPLC-SPE/cryo-NMR).[5] This approach is applied to monitor the reaction progress, explain the side-reaction mechanisms and unambiguously characterize the reaction components.

In the next research stage, specific binding of the prepared ligands to macromolecules is investigated by a combined use of cryo-electron microscopy, surface plasmon resonance (SPR), isothermal titration calorimetry (ITC) and NMR methods based on paramagnetic relaxation enhancements (PREs), saturated transfer difference (STD) and transferred nuclear Overhauser effect (trNOE). The results obtained for free and bound macrolide antibiotics and peptide nucleic acids (PNAs) can provide a wealth of information about the groups responsible for the binding, immersion depth, ligand conformation, binding modes and epitopes. Structural information is further combined with biochemical assays and biological tests to assess the structure-activity relationship and design the molecules with enhanced biological properties.

REFERENCES

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4. P. Novak, A. Kišić, T. Hrenar, T. Jednačak, S. Miljanić, G. Vrbanec, *J. Pharm. Biomed. Anal.* **2011**, *54*, 660.
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Biography

Tomislav Jednačak graduated in 2008 at the University of Zagreb and defended his PhD thesis in 2013 at the same institution. His research is focused on spectroscopic structure characterisation of bioactive compounds, biomolecular interaction studies and process analytical techniques. He was awarded an ÖAD scholarship for the scientific improvement at TU Graz and was a guest scientist at TU Munich. As an EMBO scholar, he is currently studying peptide nucleic acid interactions at Prof. Gang Chen's lab at NTU Singapore.

Date: **21st January 2020 (Tuesday)**
Time: **11.00am to 12.30pm**
Venue: **SPMS Research & Graduate Studies Conference Room**
Host: **Assistant Professor Chen Gang**