

# Peptides at work: from structure to applications

This special issue originates from scientific contributions at the 12th Naples Workshop on Bioactive Peptides, held jointly with the 2nd Italy–Korea Symposium on Antimicrobial Peptides in Naples, Italy, at the congress center of the University of Naples 'Federico II' on June 4–7, 2010.

The workshop has had an extraordinary attendance of over 220 peptide scientists of 23 different countries from all over the world, with numerous participants from the Asia-Pacific area. The meeting has been organized by a joint effort of several scientific institutions, such as the Department of Biological Sciences and the Interuniversity Research Center on Bioactive Peptides (CIRPEB) of the University of Naples 'Federico II', the Second University of Naples, the University of Rome 'Tor Vergata', the Institute of Biostructures and Bioimages of the C.N.R. of Italy, the Regional Competence Center for Molecular Diagnostics and Pharmaceuticals, and the Research Center for Proteineous Materials, Chosun University, Korea. The workshop was held under the auspices of the European Peptide Society, the Korean Peptide Protein Society, the Italian Ministry of Foreign Affairs, the Regional Ministry for Universities and Scientific Research of Campania, and the National Research Council of Italy.

The theme of the workshop 'Peptides at Work: From Structure to Applications' was amply covered by the scientific program of lectures and poster presentations. The two sessions of the first day of the meeting were dedicated to antimicrobial peptides (AMPs). The morning of the second day hosted a very rich program dedicated to the 'Murray Goodman Young Investigator's Session', in which eight short lectures were presented by young scientists competing for a prize represented by a copy of the Houben Weyl workbench edition E22 of 'Synthesis of Peptides and Peptidomimetics', sponsored by G. Thieme Verlag. The session was an important stage for rather talented young scientists, being very much appreciated by the audience for the content of the lectures and the way they were presented. The second day program was completed by two additional sessions dedicated to AMPs. The third and fourth days were instead dedicated to bioactive peptides in general.

A total of 26 invited lectures and 8 additional short oral presentations were given in the 4 days of the workshop. Furthermore, a rather substantial number of poster presentations (85) were also enriching the program, covering the various aspects of peptides as therapeutics, diagnostics, and vaccines.

The scientific content of the invited lectures, short oral, and poster presentations certainly reflected the state of the art in several specific aspects of the topic of the workshop; the investigations presented were indeed representative examples of emerging subjects, which highlighted the field of continuously increasing biologically important and 'man-made' peptide systems. One common feature, which ideally connected the different subjects covered, was the 'molecular approach' used by the various authors in tackling the problem of understanding the structure–activity relationships of bioactive peptides.

A whole section of this special issue is devoted to AMPs. The review by Epanand and Epanand introduces a novel mechanism of AMP toxicity, showing that binding of cationic peptides to the bacterial membrane causes clustering of anionic lipids, thus altering the

structural and dynamical properties of the bilayer. The article by Bechinger reviews structural studies on peptide orientation inside lipid bilayers, illustrating how many AMPs can change their membrane topology as a consequence of subtle variations in parameters such as lipid composition, pH, or peptide concentration. Several research articles are then devoted to the rational design of novel AMPs with improved properties: Mangoni and co-workers performed an alanine scanning on temporin-1Ta, elucidating the sequence determinants of its antimicrobial activity; Gopal *et al.* showed that sequence reversal can lead to an improvement in activity and Bobone *et al.* demonstrated that simple point mutations can change the activity of a peptide from cell penetrating to antimicrobial. Other articles report on the isolation and characterization of natural AMPs with promising activity, such as brevinins from *Hylarana temporalis* (Reshmy *et al.*), a peptide from *Atrina fragilis* (Yoo *et al.*), and jelleins isolated from royal jelly (Romanelli *et al.*). Jose *et al.* studied the structure of a TOAC-labeled alamethicin analog, showing that paramagnetic relaxation enhancement measurements can reliably determine long-range intramolecular distances.

The rest of the issue collects articles delving into different topics related to bioactive peptides, such as bradykinin analogs (Śleszyńska *et al.*), calcitonin gene-related peptide receptor antagonists (Yan *et al.*), peptides targeting the CCK-2 receptors expressed in tumors (Tornesello *et al.*), or binding to proteins of the KTCD family (Pirone *et al.*). Palladino *et al.* used peptides to characterize protein–protein interactions, whereas Kim *et al.* reported on a peptide library-based method to determine the substrate specificity of kinases. De Spiegeleer and co-workers described a chemometric approach to identify the most promising drug candidates in a peptide library. Finally, the review by Longhi *et al.* illustrates the applications of EPR spectroscopy to studies of peptide and protein structure and dynamics.

Overall, these articles provide a glimpse of the exciting interdisciplinary atmosphere experienced by the participants to the Naples meeting, which proved to be once again a highly successful forum for the exchange of ideas on hot subjects and trends in peptide chemistry and an important and decisive stimulus for future work in the area.

The pleasant weather of Naples, particularly warm for late spring, offered to participants, beside science, the occasion of enjoying the city with its museums, monuments, and natural beauty. The social events prepared by the Organizing Committee added the extra Italian flavor to the meeting which we hope will remain in the memories of the participants.

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