UNIVERSITÀ DEGLI STUDI FIRENZE
DICUS DIPARTIMENTO DI CHIMICA "UGO SCHIFF"
ECCELLENZA 2023-27

UNIVERSITÀ DEGLI STUDI FIRENZE
PhD Chemical Sciences

Prof. Katsumi Matzusaki

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Kyoto University, Japan
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Friday November 8, 2024

12:00

Aula D4
Plesso aule «Enrica Calabresi»
Via Edoardo Detti, 3, 50019 Sesto Fiorentino (Firenze)

Link for online connection: meet.google.com/ius-xacb-udc

Prof. Katsumi Matzusaki will present the lecture

Antimicrobial Peptides: Their Mechanisms of Action and Applications

Organised in the context of the PhD Programme in Chemical Sciences

You are kindly invited to participate

Prof. Anna Maria Papini, PhD
Coordinator of the PhD

Prof. Anna Maria Papini, PhD
Organiser

Antimicrobial Peptides: Their Mechanisms of Action and Applications

Katsumi Matsuzaki
Graduate School of Pharmaceutical Sciences, Kyoto University, Japan
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Antimicrobial peptides (AMPs), which are responsible for part of the innate immunity of animals and plants, are promising candidates for new therapeutics because their antimicrobial spectra are broad and the development of bacterial resistance against them is difficult. They are typically composed of < 50 amino acid residues, cationic, and amphiphilic. Most AMPs kill bacteria by permeabilizing membranes by such as the Shai-Matsuzaki-Huang model, although intracellular targets have also been suggested for certain peptides. Positively charged AMPs selectively interact with bacterial cells, which are negatively charged, without exerting significant cytotoxicity against host cells. Potent AMPs can be developed by increasing positive charges and introducing Pro residues at he same time or by conjugation with antibiotics. Applications of AMPs as anticancer agents will be also discussed.

CURRICULUM VITAE

Name,_Family name: Matsuzaki
Forenames: Katsumi

Sex: Male

Year of birth: 1959

Place of birth: Osaka, Japan

Nationality: Japanese

Mailing address: Graduate School of Pharmaceutical Sciences, Kyoto University, 46-29 Yoshida-Shimoadachicho, Sakyo-ku, Kyoto, 606-8501, Japan.

Education:

1978–1982	Faculty of Pharmaceutical Sciences, Kyoto University. Awarded the degree of BSc in biophysical chemistry.
1982–1984	Graduate School of Pharmaceutical Sciences, Kyoto University. Awarded the degree of MSc in biophysical chemistry. Work supervised by Prof. M. Nakagaki
1992	Awarded the degree of Dr. Pharm. from Kyoto University in biophysical chemistry for a thesis entitled "Physicochemical Studies on Interactions of Antimicrobial Peptides, Hypelcin A, Trichopolyn I, and Magainins, with Lipid Bilayers". Work supervised by Prof. K. Miyajima

Research and professional experience:

1984–1987	Takeda Chemical Industries Co.
1987–1997	Assistant Professor, Faculty of Pharmaceutical Sciences, Kyoto University
1993–1994	Visiting scientist, Biocenter of the University of Basel, Switzerland (c/o Prof. J. Seelig)
1997–1999	Associate Professor, Graduate School of Pharmaceutical Sciences, Kyoto University
1999–2003	Associate Professor, Graduate School of Biostudies, Kyoto University
2003–present	Full Professor, Graduate School of Pharmaceutical Sciences, Kyoto University

Membership of academic societies:

Biophysical Society (U.S.A) : 1994–
The Pharmaceutical Society Japan : 1984–
The Japanese Peptide Society : 1990–

Editorial board:

Biochimica et Biophysica Acta-Biomembranes : 2005–
Journal of Peptide Science: 2009–2021, Editor 2022–
European Biophysics Journal: 2013–2023

Awards:

1996	The Japanese Peptide Society Award for Young Scientists
1997	The Pharmaceutical Society Japan Award for Young Scientists
2011	Erwin von Bälz Prize
2021	The Pharmaceutical Society Japan Award
2022	The Japanese Peptide Society Award

Review activity for journals

ACS Chem. Biol.
ACS Chem. Neurosci.
Anal. Chem.
Biochemistry
Biochim. Biophys. Acta
Biol. Pharm. Bull.
Biomacromolecules
Bioorg. Med. Chem.
Bioorg. Med. Chem. Lett.
Biophys. Chem.
Biophys. J.
Biopolymers
Cancer Lett.
ChemBioChem
Chem. Pharm. Bull.
Chem. Record
Chem. Sci.
Eur. Biophys. J.
FEBS J.
FEBS Lett.
Glycoconj. J.
Int. J. Alzherimer's Disease
J. Alzherimer's Disease
J. Am. Chem. Soc.
J. Biol. Chem.
J. Control. Rerease
J. Mol. Biol.
J. Neurochem.
J. Pept. Res.
J. Pept. Sci.
Macromolecules
Macromol. Biosci.
Mol. Membr. Biol.
Nat. Chem. Biol.
Nat. Protocols
Nat. Rev. Microbiol.
Neuropeptides
Pharm. Res.
PLosONE
Proc. Natl. Acad. Sci. USA
Sci. Rep.

Relevant publications:

1. Matsuzaki K*, Sugishita K, Fujii N, Miyajima K, Molecular basis for membrane selectivity of an antimicrobial peptide, magainin 2. **Biochemistry** 34, 3423–3429 (1995)

2. Matsuzaki K*, Murase O, Fujii N, Miyajima K, An antimicrobial peptide, magainin 2, induced rapid flip-flop of phospholipids coupled with pore formation and peptide translocation. **Biochemistry** 35, 11361–11368 (1996)

3. Matsuzaki K*, Sugishita K, Ishibe N, Ueha M, Nakata S, Miyajima K, Epand RM, Relationship of membrane curvature to the formation of pores by magainin 2. **Biochemistry** 37, 11856–11863 (1998)

4. Matsuzaki K*, Mitani Y, Akada K, Murase O, Yoneyama S, Zasloff M, Miyajima K, Mechanism of synergism between antimicrobial peptides magainin 2 and PGLa. **Biochemistry** 37, 15144–15153 (1998)

5. Kobayashi S, Chikushi A, Tougu S, Imura Y, Nishida M, Yano Y, Matsuzaki K*. Membrane translocation mechanism of the antimicrobial peptide buforin 2. **Biochemistry** 43, 15610–15616 (2004)

6. Imura Y, Choda N, Matsuzaki K*, Magainin 2 in action: distinct modes of membrane permeabilization in living bacterial and mammalian cells. **Biophys J** 95, 5757–5765 (2008)

7. Miyazaki Y, Aoki M, Yano Y, Matsuzaki K*, Interaction of antimicrobial peptide magainin 2 with gangliosides as a target for human cell binding. **Biochemistry** 51, 10229–10235 (2012)

8. Tanishiki N, Yano Y, Matsuzaki K*, Endowment of pH responsivity to anticancer peptides by introducing 2,3-diaminopropionic acid residues. **ChemBioChem** 20, 2109–2117 (2019)

9. Azuma E, Choda N, Odaki M, Yano Y, Matsuzaki K*, Improvement of therapeutic index by combination of enhanced peptide cationicity and proline introduction. **ACS Infect Dis** 6, 2271–2278 (2020)

10. Yamauchi R, Kawano K, Yamaoka Y, Taniguchi A, Yano Y, Takasu K, Matsuzaki K*, Development of antimicrobial peptide-antibiotic conjugates to improve the outer membrane permeability of antibiotics against Gram-negative bacteria. **ACS Infect Dis** 8, 2339–2347 (2022)