

Bacterial Pathogenesis

1. Staffs and Students (April 2010)

Professor	Ichiro Nakagawa
Associate Professor	Fumito Maruyama (From July, 2010)
Associate Professor	Takuma Nakajima
Lecturer	Kenji Yamato
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	Takayasu Watanabe
	Bijaya Haobam
	Nayuta Furukawa
	Akiko Endo (Section of Periodontics)
	Noriko Maruyama (Section of Periodontics)

2. Purpose of Education

Research education for postgraduate students

Our major research interests are to elucidate the bacterial evolution to escape from the host immune responses, and cellular defence mechanisms against bacterial infections. Especially, we focus (1) comparative genomics analysis of pathogenic bacterial evolution by acquisition of foreign genes, and the experimental demonstration of the unique hypothesis from bioinformatics information (2) analysis of molecular dynamics of recognition systems and inflammatory induction against bacterial pathogens. To achieve our mission, we are analyzing complete genomic sequences of various bacterial pathogens and comparative genomics, including genus streptococci (*Streptococcus pyogenes* and *S. mutans*), *Porphyromonas gingivalis*, etc., and cellular and molecular biological analyses for host responses.

These studies are collaborated not only with the other section of Tokyo Medical and Dental University, but also with Tokyo University, Tohoku University, Osaka University, and Nihon University.

Education for Undergraduate students

We took part in an education module "Infection and Host Defenses" for 3rd year students in School of Dentistry, and 1st and 2nd year students in School of Oral Health Care Sciences, and teaching pathogenic bacteriology and virology. In the dental field, infectious diseases such as dental caries and periodontitis are still major concerns. In addition, the prevention of iatrogenic infections such as HIV, Hepatitis B and C viruses are also important for dentistry. Therefore, our mission is not simply to give knowledge of microbiology but give talent to apply knowledge to lead appropriate diagnosis and treatment at the clinics. On this point of view, our lectures covered not only oral microbiology but also systemic microbiology and clinical microbiology to understand the variety of infectious diseases.

3. Research Subjects

1. Bacterial whole genome analysis.
2. Analysis of bacterial survival strategy based on bacterial whole genome gene expression.
3. Comparative genomics for bacterial gene acquisition and evolution systems.
4. Molecular analysis of recognition system and inflammation responses against bacterial infection.

4. Publications

Original articles

1. T. Izumo, F. Izumi, I. Nakagawa, Y. Kitagawa, H. Shibata, S. Hamada, Y. Kiso. Influence of *Lactobacillus pentosus* S-PT84 ingestion on the mucosal immunity of healthy or *Salmonella* Typhimurium-infected mice. *Biosci. Microflora*. (2011) 30: 27-35.
2. C. Aikawa, F. Maruyama, I. Nakagawa. The dawning era of comprehensive transcriptome analysis in cellular microbiology. *Front. Microbiol.* (2010) 1:118.
3. A. Sakurai, F. Maruyama, J. Funao, T. Nozawa, C. Aikawa, N. Okahashi, S. Shintani, S. Hamada, T. Ooshima, I. Nakagawa. 2010. The specific behavior of intracellular *Streptococcus pyogenes* undergone the autophagic degradation is associated with bacterial streptolysin O and host small G proteins Rab5 and Rab7. (2010) *J. Biol. Chem.* 285: 22666-22675.

4. C. Aikawa, T. Nozawa, F. Maruyama, K. Tsumoto, S. Hamada, and I. Nakagawa. Reactive oxygen species induced by fibronectin-mediated *Streptococcus pyogenes* invasion trigger apoptotic cell death in infected epithelial cells. *Cell. Microbiol.* (2010) 12: 814-830.
5. H. Mori , F. Maruyama, K. Kurokawa. "VITCOMIC: visualization tool for taxonomic compositions of microbial communities based on 16S rRNA gene sequences." *BMC Bioinformatics*. 11:332 doi:10.1186/1471-2105-11-332 (2010)
6. H. Onishi, Arakawa, S. Nakajima, T. Izumi, Y. Levels of specific immunoglobulin G to the forsythia detaching factor of *Tannerella forsythia* in gingival crevicular fluid are related to the periodontal status. *J. Periodontal Res.* (2010) 45: 672-80.
7. S. Endo, K. Yamato, S. Hirai, T. Morikawa, K. Fukuda, K. Suzuki, H. Suzuki, M. Abei, I. Nakagawa, I. Hyodo. Potent in vitro and in vivo antitumor effects of MDM2 inhibitor nutlin-3 in gastric cancer cells. *Cancer Sci.* (2011) 102(3):605-13.