

**Division of Microbiology  
Department of Oral Biology**

**Outline**

We engage in educations on microbiology and immunology regarding with a general medicine and dentistry, and in researches on microbiology.

**Faculty members**

Professor

Keiji NAGANO, Ph D. (Left)

Senior Assistant Professor

Hiroshi MIYAKAWA, Ph D. (Center)

Assistant professor

Mari FUJITA, D.D.S., Ph D. (Right)



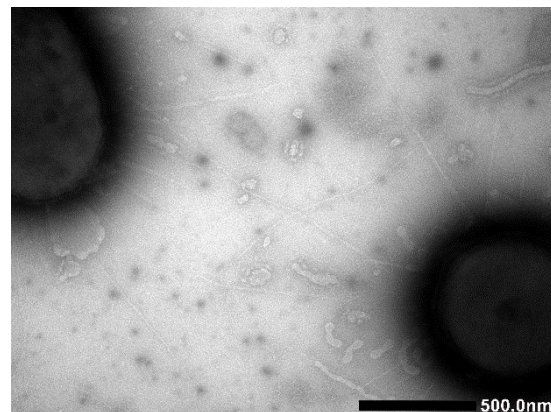
**Research Interests**

We are interested in the biochemical and molecular genetic analyses of bacterial virulent factors. Topics currently pursued include mechanisms of biofilm formation of oral bacteria, especially periodontopathic bacteria such as *Porphyromonas gingivalis*, *Tannerella forsythia*, *Treponema denticola* and *Prevotella* spp. We are also interested in the exploitation of antimicrobial regents and bacteriophage.

**Current Projects**

**(1) Structural and functional analyses of fimbriae in *Porphyromonas gingivalis***

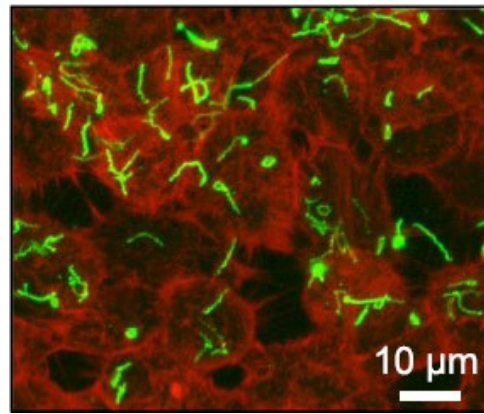
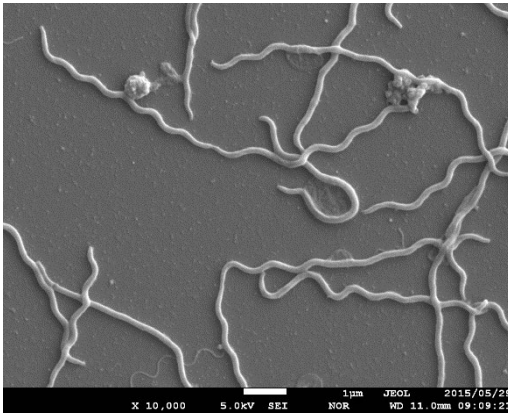
*P. gingivalis* expresses thin filamentous structures, fimbriae, on the surface. They adhere to the gingival tissues and form a biofilm largely through the fimbriae. We are studying to elucidate the structure and function of the fimbriae with the ultimate goal of inhibiting the bacterial colonization.



**(2) Study on the regulation mechanism between colonization and motility in *Treponema denticola***

Oral spirochete *T. denticola* settles (colonizes) in gingival tissues with multi-species biofilm. On the other hand, the bacteria show an active movement.

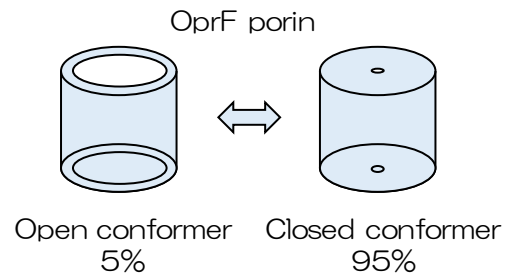
We aim to elucidate the regulation mechanism between their colonization and motility.



*T. denticola* is an oral spirochete (left, and green in right), and adheres to the gingival epithelial cells (red in right).

**(3) Analysis of conformational change of OprF porin in *Pseudomonas aeruginosa***

*P. aeruginosa* shows a highly intrinsic resistance to antibiotics largely due to the low outer membrane permeability. The low permeability is caused by the folding of the major porin OprF; a majority (~95%) forms a closed-channel conformer. We are studying the regulation mechanism between open and close conformers of the OprF porin.



**Selected Publications**

Fujita M, Chiu CH, Nagano K. Transcriptional analysis of the *mfa*-cluster genes in *Porphyromonas gingivalis* strains with one and two *mfa5* genes. *Mol Oral Microbiol.* **38**: 41-47 (2023).

Yokogawa T, Nagano K, Fujita M, Miyakawa H, Iijima M. Characterization of a *Treponema denticola* ATCC 35405 mutant strain with mutation accumulation, including a lack of phage-derived genes. *PLoS One* **17**:e0270198 (2022).

Sakae K, Nagano K, Furuhashi M, Hasegawa Y. Diversity analysis of genes encoding Mfa1 fimbrial components in *Porphyromonas gingivalis* strains. *PLoS One* **16**:e0255111 (2021).

Nagano K, Hasegawa Y, Yoshida Y, Yoshimura F. A major fimbrilin variant of Mfa1 fimbriae in *Porphyromonas gingivalis*. *J Dent Res* **94**:1143-1148 (2015).

Nagano K, Hasegawa Y, Murakami Y, Nishiyama S, Yoshimura F. FimB regulates FimA fimbriation in *Porphyromonas gingivalis*. *J Dent Res* **89**:903-908 (2010).

Nagano K, Nikaido H. Kinetic behavior of the major multidrug efflux pump AcrB of *Escherichia coli*. *Proc Natl Acad Sci U S A* **106**:5854-5858 (2009).

Nagano K, Read EK, Murakami Y, Masuda T, Noguchi T, Yoshimura F. Trimeric structure of major outer membrane proteins homologous to OmpA in *Porphyromonas gingivalis*. *J Bacteriol* **187**:902-911 (2005).