Division of Microbiology
Department of Oral Biology

Outline
Oral micro-flora play an important role for health maintenance, and causes many oral infections. In these infections, dental caries and periodontal disease are infections of wide prevalence. These infections are caused by oral biofilm formed with many bacterial species. In this Division, we study bacterial role in oral biofilm formation to prevent these infections.

International collaborative projects
This Division is unfurling some international collaborative projects with Department of Oral Biology, School of Dental Medicine, The State University of New York at Buffalo, Department of Oral Biology, Faculty of Dentistry, Mahidol University, Department of Oral Biology, Faculty of Dentistry, Indonesia University.

Faculty members

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Main research in progress

1. The roles of oral *Veillonella* species on biofilm formed by *Streptococcus* species.
   It is reported that oral *Veillonella* species and *Streptococcus* species play important roles in early stage of oral biofilm formation. The focus of our current study is to investigate the influence of each of oral *Veillonella* species on biofilms formed by *Streptococcus* species using a novel method for experimental biofilms formation.
1) The influence of oral *Veillonella* spp. on biofilms formed by *Streptococcus* spp.

Unique partnerships among *Streptococcus-Veillonella* species combinations are examined in the development of oral biofilms in vitro. A high specificity of partnerships is shown among these combinations examined. Also, in this study, the autoinducer (AI)-1 and AI-2 produced by *V. tobetsuensis* are intended to reveal the mechanisms of biofilm formation with *S. gordonii*. This study will contribute to the clarification of the mechanism of the early stages of oral biofilm formation.

2) The distribution and frequency of *Veillonella* species.

The aim of this study is to determine the distribution and frequency of oral *Veillonella* at species level in the saliva of children with species-specific PCR primer sets, in the context of oral hygiene status. Final goal is to demonstrate the specific Veillonella species as bio-indicator showing oral hygiene status of children.

3) Genome project of oral *Veillonella*.

To superstruct genome data base of oral *Veillonella*, we study whole genome sequences of type strains and clinical isolates of oral *Veillonella* species are studied by using Illumina Miseq and Hiseq.

4) Establishment of novel *Veillonella* species.

In our previous studies, many unclassified *Veillonella* strains, which are confirmed by PCR with genus-specific primer as members of genus *Veillonella*, isolated from human oral cavities. Based on the sequence analysis of housekeeping genes, such as *rpoB*, *dank*, *16S rRNA*, some of these strains are establish as novel *Veillonella* species.

2. Metagenome analysis of human saliva from children

In this project, we analyze the salivary microbiome in Thai and Japanese children stratified by oral hygiene status. This cohort of children is notable for having only sporadic access to dental care minimal to oral hygiene practice. The bacterial community structure is assessed using high-throughput gene sequences based on bacterial *16S rRNA*. The goal is to determine differences in the bacterial profile of saliva of children with poor to good oral hygiene status.

3. Investigation of effect of natural essential oil on the oral biofilm formation.

We investigate effect of tea tree oil (TTO) and Rosselle on the oral biofilm formation. As main antibacterial components of TTO, terpinen-4-ol, α-terpineol and 1,8-cineole are known. Recent our investigation has demonstrated that terpinen-4-ol and α-terpineol have remarkable antibacterial activity against bacterial cells in the preformed biofilm. In this study, we examine the effect of another component, 1,8-cineole, against oral bacterial cells in preformed biofilm and biofilm formation.
4. Role of *Slackia exigua* on oral biofilm formation.

*Slackia exigua*, an asaccharolytic anaerobic gram positive rod, is isolated from the oral periodontal biofilm frequently. However, the role of *S. exigua* on oral biofilm formation is not clarified. In this study, we investigate the role of *S. exigua* on biofilm formation of *F. nucleatum*.

**Current publications (2012 – 2017)**


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7. Tamura N, Ochi M, Miyakawa H, Nakazawa F. Analysis of bacterial flora associated with peri-implantitis using obligate anaerobic culture technique and 16S rDNA gene
6. Sato T, Herastuti S, Kamaguchi A, Miyakawa H, Nakazawa F. Hemolysin of 
5. F. NAKAZAWA. Bergey’s Manual of Systematic Bacteriology, Second Edition, 
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3. Izumi MASHIMA and Futoshi NAKAZAWA The wire method for generating experimental 
   biofilms formed by oral *Streptococcus* and *Veillonella* species. The Dental Journal of Health 
   Sciences University of Hokkaido, 31(2), p 11-18(73-80), 2012.
2. Herastuti Sulistyani and Futoshi Nakazawa. Description of Dental Health in Indonesia. The 
   Dental Journal of Health Sciences University of Hokkaido, 31(2). 41-45, 2012.
1. Toshiya Sato, Arihide Kamaguchi, Futoshi Nakazawa. The release of 
   glyceraldehyde-3-phosphate dehydrogenase (GAPDH) from human erythrocyte membranes 