JAPAN DENTAL ASSOCIATION

THE FELLOWSHIP OF THE INTERNATIONAL SCIENTIFIC EXCHANGE FUND

RESEARCH ACCOMPLISHMENT REPORT

Name of Recipient: Prodhan MD Rubayet Alam	**Period of Fellowship:** April 2022 – March 2026
Research Subject: Orthodontics and dentofacial orthopedics	
Host Institution in Japan: Kyushu University	**Host Supervisor in Japan:** Professor Ichiro Takahashi

Accomplishments during your stay in Japan:

Research title:

The role of hepatocyte growth factor (HGF) in proliferation of tooth germ mesenchymal cell during tooth germ development.

Tooth development is a complex process that involves reciprocal interactions between epithelial and mesenchymal cells. Hepatocyte growth factor (HGF), a multifunctional cytokine, has been implicated in promoting epithelial-mesenchymal interactions during tooth development. HGF acts by binding to its receptor c-Met, which is expressed in both epithelial and mesenchymal cells. However, the molecular mechanisms underlying the effects of HGF on the proliferation of tooth germ mesenchymal cells during tooth development are poorly understood. The aim of this study is to investigate the molecular control mechanism of the proliferation of tooth germ mesenchymal cells during tooth development by HGF.

Our results revealed that HGF induced the proliferation and increased cell number of mDP cells in a dose-dependent manner. Conversely, PHA-665752 an inhibitor of HGF signaling, inhibited the proliferation rate and cell number in a dose-dependent manner. Organ culture of tooth germ experiment also revealed the inhibitory effect of PHA-665752. Furthermore, time dependent HGF treated mesenchymal cell's mRNA signifies the gene expression in comparison with GAPDH and HPRT primers.

Our results suggest that HGF plays a crucial role in the proliferation of tooth germ mesenchymal cells during tooth development. Our findings provide insights into the molecular control mechanism of tooth development and could potentially lead to the development of novel therapeutic approaches for tooth regeneration. Further investigations are required to fully understand the downstream signaling pathways of HGF in tooth germ mesenchymal cells during tooth development.

Publications:

Nothing contributory

Presentations at Academic Meetings:

Nothing contributory

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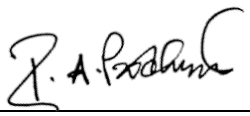
Signature of Applicant:  **Date:** 2023. 04. 07

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THE FELLOWSHIP OF THE INTERNATIONAL SCIENTIFIC EXCHANGE FUND

RESEARCH ACCOMPLISHMENT REPORT

Name of Recipient: Jutharat Manuschai	Period of Fellowship: July 2022 – February 2023
Research Subject: Inhibitory Effect of Silver Diamine Fluoride on Mixed-species Biofilm Formation: An In Vitro Study.	
Host Institution in Japan: Faculty of Dentistry Niigata University	Host Supervisor in Japan: Prof. NOIRI Yuichiro Assoc. Prof. TAKENAKA Shoji
Accomplishments during your stay in Japan: (If this space is not enough, please attach a report) Please find an attached report.	
Publications: -	
Presentations at Academic Meetings: Niraya Kornsombut, Shoji Takenaka, Jutharat Manuschai, Maki Sotozono, Ryoko Nagata, Takako Ida, Yuichiro Noiri Anticariogenic biofilm activity of dental material to reduce and prevent dentin hypersensitivity. 第 36 回日本バイオフィルム学会学術集会，横浜，2022 年 9 月 24 日−25 日	
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Signature of Applicant: Jutharat Manuschai Date: March 18, 2023

Inhibitory Effect of Silver Diamine Fluoride on Mixed-Species Biofilm Formation: An In Vitro Study.

Abstract

Background: Silver diamine fluoride (SDF) has been widely used in Japanese dental clinics for the purpose of arresting root caries in the elderly. Since the fluoride ion exhibits antibacterial activity, SDF may be expected to have antibiofilm effects as well as inhibition of caries progression.

Objective: This study assessed the antibiofilm effect of 38% SDF against cariogenic biofilms formation on human root dentine surface using a modified Robbins device flow-cell system (MRD).

Methods: Forty-eight human root dentine specimens were allocated to SDF and untreated control group (n=24). Specimens in SDF group were applied with 38% SDF for 4 minutes. Mixed-species biofilm consisted of *Streptococcus mutans* (*S. mutans*), *Actinomyces naeslundii* (*A. naeslundii*) and *Lactobacillus rhamnosus* (*L. rhamnosus*) were cultured on root dentine specimens mounted on a MRD. The media were allowed to flow at 2 mL/min for 24 h. Biofilm viability were assessed by colony-forming unit counts and adenosine triphosphate (ATP) assay. Biofilm morphology were observed using a confocal laser scanning microscopy (Live/Dead staining) and scanning electron microscope.

Results: The amount of *S. mutans*, *L. rhamnosus* and *A. naeslundii* in the accumulating biofilm on root dentine surface were significant lower in the SDF group as compared with the control group ($p < 0.05$) (Figure 1). For ATP assay, ATP level in SDF group was significantly lower compared to that in the control group ($p<0.001$) (Figure 2). A Live/Dead staining image showed that biofilm formation on the SDF-treated surface was relatively thinner compared to the control group. Microorganism in the biofilm formed on SDF-treated surface were mostly dead cells. SEM images showed that the number of biofilm clusters in SDF group was less than that in the control group.

Conclusion: According to the results of this study, SDF-treated root dentine surface contributed to inhibit the growth of cariogenic biofilms.

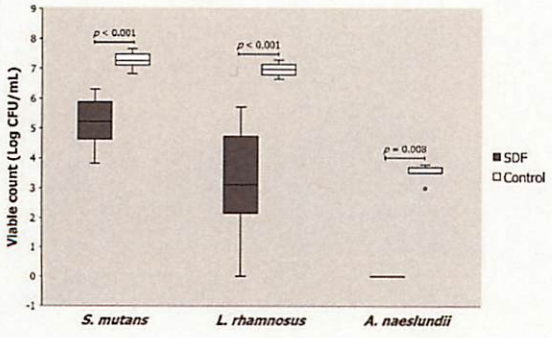

Figure 1 The viable cell number of *S. mutans*, *L. rhamnosus* and *A. naeslundii* (Log CFU/mL) in SDF and control groups (n=10).

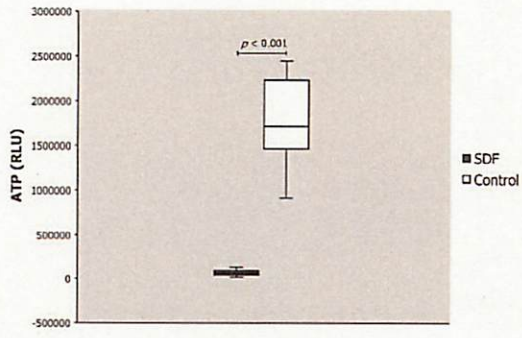

Figure 2 ATP bioluminescence of biofilm formed on root dentine surface in SDF and control groups (n=10).