

Lion Confirms That Oral Bacterial Nitrite Metabolism Leads to the Selective Suppression of the Growth of Periodontal Disease–Associated Bacteria  
—*Neisseria* bacteria may be beneficial to oral health and help prevent periodontal disease—

Lion Corporation (Representative Director, President Executive Officer: Masayuki Takemori) holds that, in addition to conventional plaque control, the key to preventing oral diseases is managing the oral microbiome\*<sup>1</sup> to maintain a healthy bacterial balance—a conviction that drives our ongoing research. Recently, this research has revealed that oral bacteria of the genus *Neisseria* selectively suppress the growth of periodontal disease–associated bacteria through nitrite metabolism. Providing crucial insights supporting a new approach to oral care focused on periodontal disease prevention through the maintenance of a balanced oral microbiome, these findings were presented at the 69th Spring Meeting of the Japanese Society of Periodontology held on Friday, May 22, and Saturday, May 23, 2026, in Shizuoka Prefecture at ACT CITY Hamamatsu.

\*1 Refers to groups of bacteria that live in the oral cavity

Abstract

- ① Among oral bacteria, those of the *Neisseria* genus exhibited high nitrite–metabolization activity.
- ② In environments where *Neisseria* bacteria and nitrite were both present, the growth of periodontal disease–associated bacteria was selectively suppressed.

These findings suggest that, through nitrite metabolism, *Neisseria* bacteria inhibit the growth of periodontal disease–associated bacteria, thereby contributing to the maintenance of a healthy oral microbiota. In other words, *Neisseria* bacteria have potential as beneficial oral bacteria for use in preventing periodontal disease.

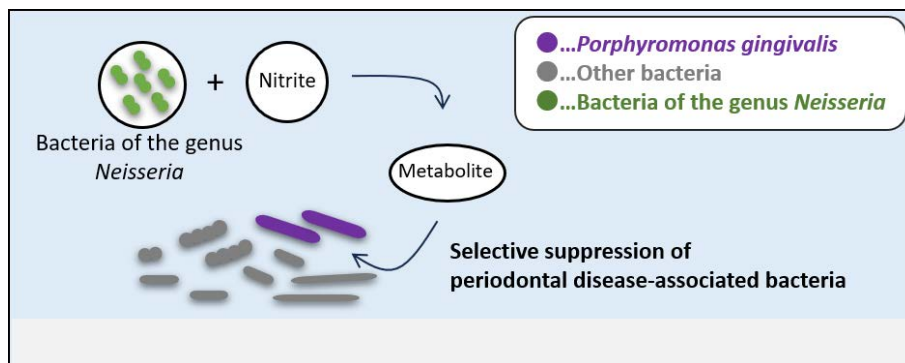


Figure 1. Summary of Research Findings

■ Research Background

The prevention of dental caries and periodontal disease requires not only plaque control—for example, removing plaque through brushing—but also maintaining a healthy balance of oral bacteria to create an oral microbiome that is less susceptible to disease.\*<sup>2,3</sup> The oral cavity is home to hundreds of different types of bacteria, and an imbalance increases the risk of such conditions as periodontal disease.

In recent years, significant attention has been given to certain bacteria commonly found in people with good oral health. Reports indicate that some of these bacteria metabolize nitrite, and the metabolites produced during this process may help suppress the growth of certain other bacteria.\*<sup>4</sup> Therefore, we isolated bacteria capable of metabolizing nitrite from oral bacteria and tested how effectively they suppress the growth of periodontal disease-associated bacteria.

- \*2 Kilian M, et al. The oral microbiome – an update for oral healthcare professionals. Br Dent J. 2016;221(10):657–666.
- \*3 Related Information: [Dipotassium Glycyrrhizate Selectively Inhibits the Periodontal Pathobiont Porphyromonas gingivalis: A New Approach to Periodontal Disease Prevention: Balancing the Oral Microbiome](#), September 26, 2025
- \*4 Rosier BT, et al. The importance of nitrate reduction for oral health. J Dent Res. 2022;101(8):887–897.

## ■ Key Research Results

### 1. Bacteria of the genus *Neisseria* exhibited particularly high nitrite-metabolization activity

Among oral bacteria, 12 candidate species possessing genes related to nitrite metabolism were selected, and their nitrite metabolism rates were compared. The results showed that bacteria of the genus *Neisseria* metabolized nitrite at a particularly high rate and exhibited high nitrite-reducing activity (Figure 2).

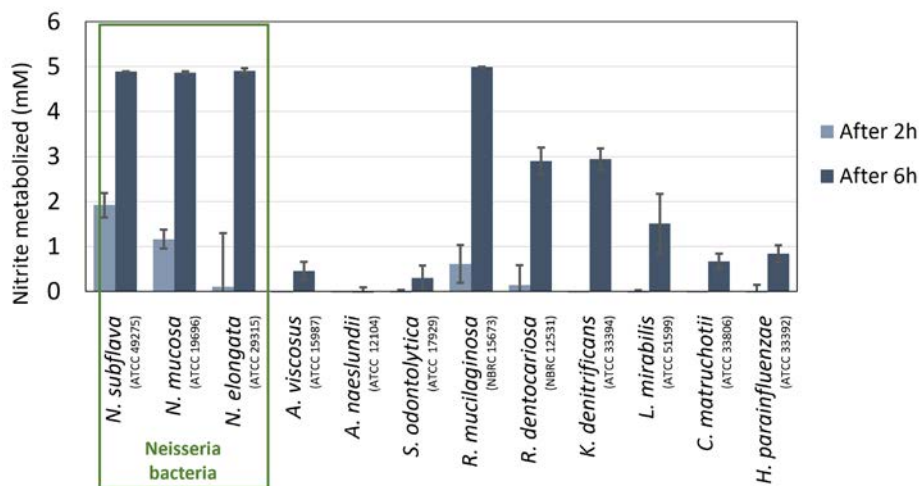


Figure 2. Comparison of Nitrite-Reducing Activity Among 12 Oral Bacterial Species

Test conditions: Cultures of each bacterial species were grown at 37° C in a medium containing 5 mM nitrite. The amount of nitrite metabolized was measured after 2 hours (2h) and after 6 hours (6h), and the results are presented as mean ± standard deviation (n =4).

### 2. Selectively suppressed the growth of periodontal disease-associated bacteria under conditions where *Neisseria subflava* (*N. subflava*) and nitrite coexisted

*N. subflava*, which showed particularly high nitrite-metabolizing activity, was cultured together with *P. gingivalis*\*<sup>5</sup>, and changes in the amount of *P. gingivalis* were examined under different conditions. Results showed that the growth of *P. gingivalis* was suppressed under conditions where *Neisseria* and nitrite were present (Figure 3).

- \*5 *Porphyromonas gingivalis*, a representative bacterial species associated with periodontal disease. This bacterium not only causes inflammation of the gums but has also been reported as a keystone bacterium that disrupts the oral microbiome. (G. Hajishengallis, et al. Low-abundance biofilm species orchestrates inflammatory periodontal disease through the commensal microbiota and complement. Cell Host Microbe. 2011;10(5):497–506., J. Mysak, et al. *Porphyromonas gingivalis*: major periodontopathic pathogen overview. J Immunol Res. 2014;476068.

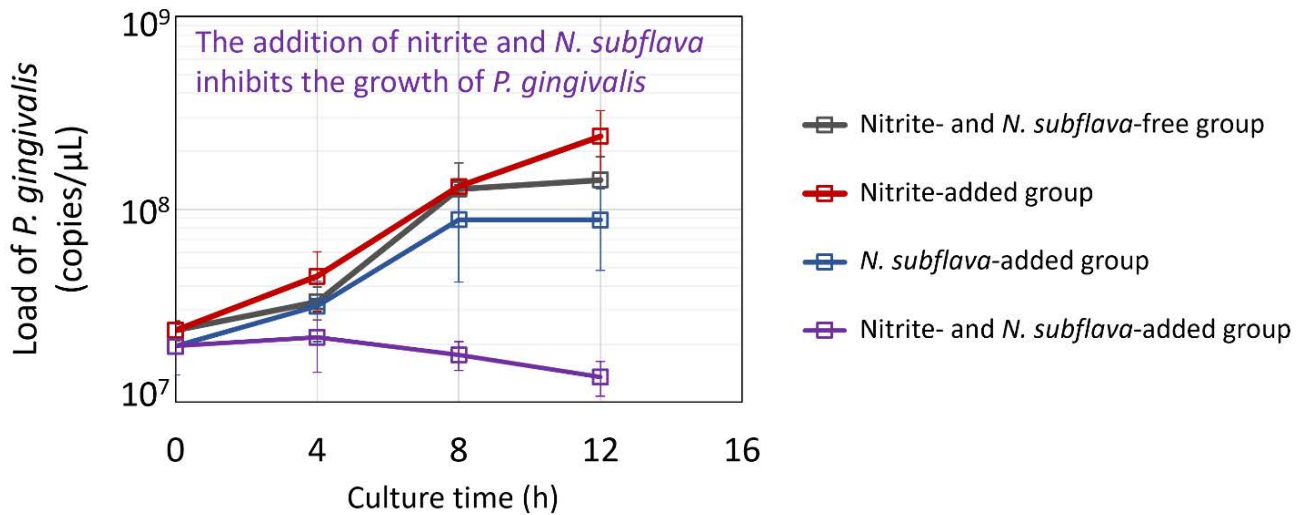


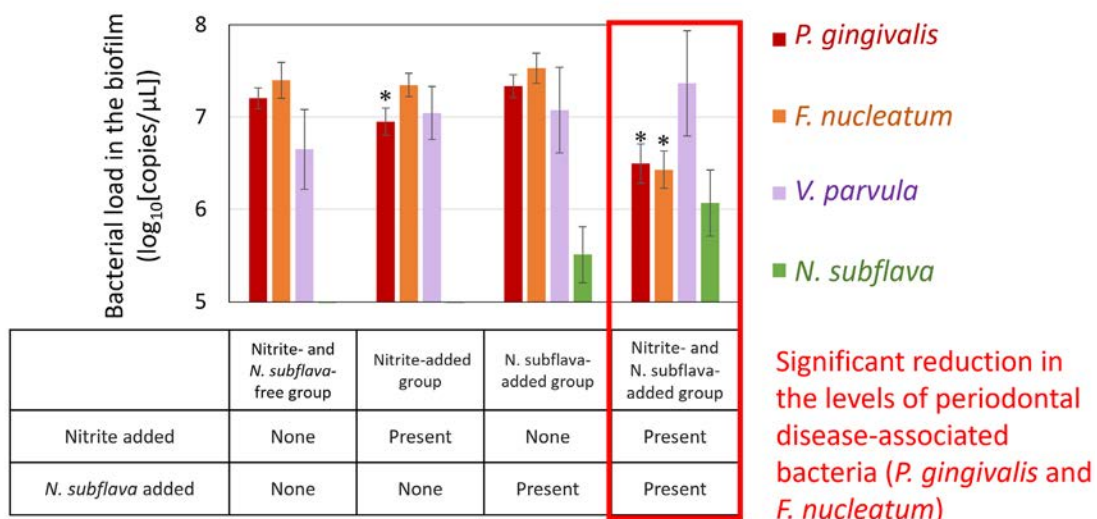
Figure 3. Changes in *P. gingivalis* Load under Different Culture Conditions  
*P. gingivalis* (ATCC 33277) was cultured under four conditions defined by the presence or absence of nitrite and *N.subflava*.

The change in bacterial load of *P. gingivalis* was tracked over time, and the results are presented as mean ± standard deviation (n =6).

Furthermore, experiments were conducted under conditions\*<sup>6</sup> in which multiple bacterial species, including periodontal disease-associated bacteria such as *F. nucleatum*, were cultured to form biofilms (aggregations of bacteria) under four conditions defined by the presence or absence of nitrite and *N. subflava*. The results showed that the load of *P. gingivalis* and *F. nucleatum* decreased in the presence of *N. subflava* and nitrite. Conversely, the load of *V. parvula* showed no decrease (Figure 4). Additionally, an examination of the bacterial balance within the biofilm revealed a significant\*<sup>7</sup> reduction in *P. gingivalis* and *F. nucleatum* (Figure 5). These results suggest that *N. subflava* selectively suppresses periodontal disease-associated bacteria through nitrite metabolism.

\*6 Six bacterial species, *P. gingivalis* (ATCC 33277), *F. nucleatum* (ATCC 23726), *P. intermedia* (ATCC 49046), *Actinomyces* sp. strain MG1 (ATCC 43146), *V. parvula* (ATCC 17745) and *S. oralis* (ATCC 9811) were cultured for one day under anaerobic conditions to form a biofilm.

\*7 The Steel test showed a p-value of <0.05 when compared to the groups without added nitrite or *N. subflava*.



Significant reduction in the levels of periodontal disease-associated bacteria (*P. gingivalis* and *F. nucleatum*)

Figure 4. Bacterial Load of Each Species in the Biofilm  
 Biofilms were cultured under four conditions based on the presence or absence of nitrite and *N. subflava*. The bacterial loads of *P. gingivalis*, *F. nucleatum*, *V. parvula*, and *N. subflava* were compared, and the results are presented as mean  $\pm$  standard deviation (n =6).

\* The Steel test was performed for the groups without added nitrite and *N. subflava* as the control ( $p < 0.05$ )

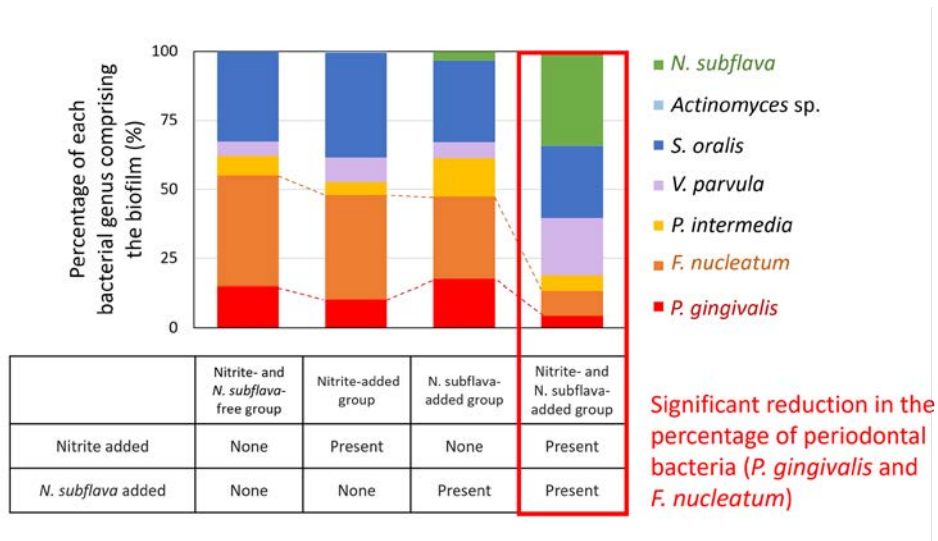


Figure 5. Bacterial Balance in Biofilms (Percentage of Each Bacterial Species)  
 Biofilms were cultured under four conditions based on the presence or absence of nitrite and *N. subflava*. The average percentage of each bacterial species in the biofilms was then compared (n =6).

The above results suggest that oral bacteria, such as those of the *Neisseria* genus, metabolize nitrite to suppress the growth of periodontal disease-associated bacteria and restore the balance of oral microbiomes. These findings indicate that *Neisseria* bacteria may be potentially beneficial oral bacteria that help prevent periodontal disease.

## ■ Future Outlook

Lion believes that oral health requires not only temporarily eliminating the bacteria that cause issues but also the maintenance of a healthy oral bacterial balance\*<sup>8</sup>. We will continue to focus on the importance of preventive approaches based on this new perspective, aiming to contribute to promoting healthy habits.

\*8 Microbiome Control Technology Decoded by Next-Generation Sequencers

<https://www.lion.co.jp/en/rd/basic/analysis/case01.php>

### 【Presentation Information】

Conference: The 69th Spring Meeting of the Japanese Society of Periodontology

Date: Friday, May 22 – Saturday, May 23 2026

Venue: ACT CITY Hamamatsu (Shizuoka, Japan)

Title of paper presented: Suppression of Periodontal Pathobionts through Nitrite Reduction in Oral Bacteria

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### Profile

Dr. Takeshita graduated from Kyushu University's Faculty of Dental Science in 2005 and completed his graduate studies at that institution's Graduate School of Dental Science in 2009. He was appointed professor there in 2023. As a Ph.D.-certified dentist, he has spent many years engaged in clinical and epidemiological research on the influence of oral microbiota on oral or systemic health and is recognized as a leading expert in oral microbiota analysis, advancing research aimed at establishing new health promotion approaches based on microbiota management.

### ■ Comments on the Research

In our previous epidemiological studies, we have reported that *Neisseria*—a genus of commensal oral bacteria that are commonly present in individuals—tends to prevail in individuals with good oral health. This study demonstrates that *Neisseria* selectively suppresses the growth of periodontal disease-associated bacteria through nitrite reduction, representing a significant finding that suggests this bacterium plays a role in promoting oral health. Although tooth brushing and antibacterial agents are extremely effective in reducing bacteria and protecting oral health, they do not completely eliminate oral bacteria. After a while, bacteria—including those associated with disease—will begin to multiply again. That said, effectively making use of commensal bacteria like *Neisseria* may help users maintain a healthy oral microbiome even between brushings. We hope that this approach, which focuses on harnessing the power of commensal bacteria in the oral microbiota, will become a viable new method for managing oral health.

### 【Related Information】

- Lion Integrated Report 2025: Accelerate Growth in Oral Healthcare  
<https://www.lion.co.jp/en/ir/pdf/ar/ir2025.pdf#page=20>
- Lion Integrated Report 2025: R&D Strategy  
<https://www.lion.co.jp/en/ir/pdf/ar/ir2025.pdf#page=38>
- News Release: Oral Care From Infancy Is Crucial! Children Aged 6 to 18 Months Are Going Through a Critical Development Stage in Which Their Oral Microbiome Is Rapidly Maturing Toward That of an Adult [Japanese only] (March 24, 2022)  
[https://doc.lion.co.jp/uploads/tmg\\_block\\_page\\_image/file/8021/20220324.pdf](https://doc.lion.co.jp/uploads/tmg_block_page_image/file/8021/20220324.pdf)
- News Release: Lion Discovers that the Oral Microbiomes of Those with Dental Caries and Periodontal Disease Differ from Those with Healthy Oral Condition, Even After Dental Treatment: Aiming to Propose Preventive Methods That Take into Account the Oral Microbiome

(November 9, 2023)

[https://doc.lion.co.jp/uploads/tmg\\_block\\_page\\_image/file/9595/20231109\\_01.pdf](https://doc.lion.co.jp/uploads/tmg_block_page_image/file/9595/20231109_01.pdf)

- News Release: The Foundation of the Oral Microbiome Is Established by Age 3—Longitudinal Study of Infants and Young Children Clarifies the Period of Accelerated Oral Microbiome Formation [Japanese only] (November 14, 2024)

[https://doc.lion.co.jp/uploads/tmg\\_block\\_page\\_image/file/10319/20241114\\_01.pdf](https://doc.lion.co.jp/uploads/tmg_block_page_image/file/10319/20241114_01.pdf)

- News Release: Dipotassium Glycyrrhizate Selectively Inhibits the Periodontal Pathobiont *Porphyromonas gingivalis*: A New Approach to Periodontal Disease Prevention: Balancing the Oral Microbiome (September 26, 2025)

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- News Release: Lion and Cykinso Uncover New Findings Through Joint Research on Oral and Gut Microbiomes—Suggesting that a Healthy Oral Environment May Contribute to Gut Stability [Japanese only] (November 18, 2025)

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