Short Communication

The Prevalence of the Salivary Mutans Streptococci in a Population of Dental Students Aged 21-29 Years

歯学部学生 (21-29歳) の唾液中ミュータンス
レンサ球菌量について

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Introduction

Dental caries, together with periodontal disease, is the main cause of the loss of human teeth. Due to its prevalence, dental caries is one of the crucial diseases in health. The role of mutans streptococci in the development of human dental caries has been well established¹⁾. As part of any caries prevention program, epidemiologic investigation should be conducted to collectively examine mutans streptococci distribution in humans. However, no simple and standard method for conducting such examinations is currently in use, so comparison of investigations conducted in different parts of the world has been impossible. Given this situation, the Oral Health Unit of the World Health Organization adopted the use of the Dentocult® SM Strip mutans in their pathfinder investigation of mutans streptococci in Beijing²⁾. In this paper, we describe the results of an investigation based on the same method in Japan.

Materials and Methods

In June 1990, we examined mutans streptococci

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1993年1月25日受付

levels in the saliva of 215 students (160 males and 55 females) of Iwate Medical University School of Dentistry. Their ages averaged 24.2 ± 1.9 years (mean $\pm$ S.D.) and ranged from 21 to 29 years. The Dentocult® SM Strip mutans (Orion Diagnostica, Helsinki, Finland), developed by Jensen and Bratthall³⁾, was used for bacterial sampling. The strip indicate one of four levels, 0-3, indicating low to very high levels of saliva mutans, respectively. Classes 0 and 1 correspond to $<100,000$ bacteria/ml, as measured by conventional culture technique. Class 3 corresponds to $>1,000,000$ bacteria/ml. Class 2 corresponds to a count between Class 1 and Class 3.

After chewing on paraffin for one minute to stimulate saliva, subjects had a plastic strip placed in their mouth and rotate it 10 times. The plastic strip was withdrawn through closed lips, leaving a thin layer of the saliva on it. The strip was then placed in the test tube holding 6ml of selective culture broth. Previous addition of one bacteriocin disc is required to make the broth selective for mutans streptococci. Tubes were then incubated for 48h at 37 °C. All tests were conducted in the morning. The presence of dental caries was evaluated by 4 examiners in accordance with WHO's caries diagnosis standard. In statistic analysis, we used The Mann-Whitney U-test for a differences in mean values.

Results

The saliva of 215 students were sampled for the mutans streptococci. 7.4 % had mutans class 0, 21.9 % had class 1, 38.1 % had class 2, and 32.6 % had class 3 (see Fig. 1). Level of caries experience was recorded for each student and the mean number of DMF teeth was 12.1 ± 5.6 (mean $\pm$ S. D.). Fig. 2 shows the relationship between mutans level in the saliva and the prevalence of dental caries. The mean number of DMF teeth for students belonging to class 0, who had a low level of mutans streptococci in saliva, was 9.1, and the number of teeth requiring caries treatment was 0.6 per student. The mean number of

Fig. 1 Frequency distribution of dental students in different groups of the salivary mutans streptococci.

Fig. 2 Mean number of DMFT in different mutans streptococci groups for dental students.

DMF teeth for students belonging to class 3 was 13.0, and the number of teeth requiring caries treatment was 1.9. A statistically significant difference in caries experience between the two groups was observed.

Discussion

A basic goal in dentistry is to prevent the initiation of caries and periodontal diseases and their future development. These diseases are not distributed randomly in the population. For many years, clinical preventive dentists have been developing methods to identify individuals at high risk to dental diseases. There is a clear-cut correlation between the level of mutans streptococci and the incidence of dental caries in all previous studies. For example, the mutans streptococci levels corre-

late with caries severity on approximal surfaces⁴⁾; children colonized with mutans streptococci at an early age run a higher risk of developing caries⁵⁾. Recent efforts have been focused upon the use of mutans streptococci as caries predictor. In this study, we confirmed the evidence of a relationship between salivary levels of mutans streptococci and dental caries experience in a population of dental students. Thus, Strip mutans testing can be of significant clinical value to identify individuals at high risk for caries. Dentists have also been developing methods to diminish the levels of the causative oral bacteria for dental diseases. Since, the process for reducing mutans streptococci counts in the human oral cavity is well understood^{6,7)}, information on the salivary level of mutans streptococci is useful in dental practice.

Another major purpose for Strip mutans testing is to examine local distributions of mutans streptococci for the epidemiological study. It has been impossible thus far to compare studies of mutans streptococci levels in saliva and plaque, since different methods are typically used in each investigation. However, use of the Strip mutans method in each country will allow a global oral health data bank to be constructed. One of the data from Japan will be available as a result of this study.

Conclusion

A positive correlation between different levels of mutans streptococci and caries prevalence was observed in a population of dental students aged 21-29 years using the Dentocult® SM Strip mutans, which will be used as a standard method in the world.

References

- 1) Loesche, W. J.: Role of *Streptococcus mutans* in human dental decay, *Microbiol. Rev.*, **50**; 353-380, 1986.
- 2) Yong Shi, Barmes, D., Bratthall, D. and Leclercq, M-H.: WHO pathfinder caries survey in Beijing extended with mutans data, *J. Dent. Res.*, **69**; 374, 1990.
- 3) Jensen, B. and Bratthall, D.: A new method for estimation of mutans streptococci in human

- saliva, J. Dent. Res., **63** ; 468-471, 1989.
- 4) Kristoffersson, K., Grondahl, H.-G. and Brattahl, D. : The more *Streptococcus mutans*, the more caries on approximal surfaces, J. Dent. Res., **64** ; 58-61, 1985.
 - 5) Köhler, B., Andréén, I. and Jonsson, B. : The earlier the colonization by mutans streptococci, the higher the caries prevalence at 4 years of age, Oral Microbiol. Immunol., **3** ; 14-17, 1988.
 - 6) Emilson, C. G., Axelsson, P. and Kallenberg, L. : Effect of mechanical and chemical plaque control measures on oral microflora in school children, Community Dent. Oral Epidemiol., **10** ; 111-116, 1982.
 - 7) Sandham, H. J., Brown, J., Phillips, H. I. and Chan, K. H. : A preliminary report of

long-term elimination of detectable mutans streptococci in man, J. Dent. Res., **67** ; 9-14, 1988.

Key words: Dental caries experience, mutans streptococci, Caries activity test

索引用語 : 齲蝕経験, ミュータンスレンサ球菌, 齲蝕活動性試験