



## CHAPTER IV

### DISCUSSION AND CONCLUSION

- These experiments based on the hypothesis that lactic acid produced from oral microflora (such as S. mutans and S. sanguis) by fermentation of carbohydrate could be reduced by meticulously selected suitable sugar or by controlling salivary pH in the oral cavity.

The results showed that under anaerobic condition S. mutans and S. sanguis produced less lactic acid from xylitol media than from other sugars. The present accepted dental caries theory referred to the acid decalcification which stated that the bacterial fermentation of dietary carbohydrate retained in the nonself-cleansing regions of the dentition yielded acids which dissolved the underlying tooth enamel to initiate the carious lesion.<sup>(142)</sup> Under anaerobic condition, most of the pyruvic acid from the bacterial fermentation was converted to lactic acid.<sup>(2)</sup> All the present results concurred to indicate advantageous dental effect through the use of xylitol as compared to other sugar. These effects consisted of a diminished fermentation of plaque (low weight of plaque, low plaque index) with decreased potentially pathogenic qualities (low sucrose splitting enzymatic activity, low content of soluble carbohydrate).<sup>(143)</sup> The benefits of xylitol have been reported by Scheinen and Makinin.<sup>(144, 145)</sup> The decrease in plaque formation was noticed

when using a xylitol-containing product might be due to some chemical property affecting the bacterial growth or colonization. A significantly lower incidence of S. mutans,<sup>(146)</sup> and a decrease of acidophilic flora,<sup>(147)</sup> corresponding to a lower plaque formation has been observed when substitution sucrose by xylitol in the diet as reported by Makinen & Scheinin in 1974.<sup>(148)</sup> In the same way decrease of lactic acid from xylitol media also might be due to these chemical properties affecting the bacterial growth.

New knowledge on the development, structure and chemistry of soft dental deposits suggested that they consisted essentially of bacteria and bacterial products and that the microorganisms originated from the oral cavity.<sup>(149)</sup> The Turku sugar studies have shown that even a mild xylitol diet of short duration reduced the amount of dental plaque.<sup>(149)</sup> At the same time chemical changes in the plaque took place, which might indicate a low cariogenicity of material formed on the tooth surface.<sup>(150)</sup> Accordingly, prevention and control of plaque which was essential in the initiation and progression of gingivitis and free smooth surface caries might possibly be achieved by suppressing the oral flora to a degree where colonization on teeth none or less occurred by using xylitol as dietary carbohydrate.

These studies also found that S. mutans cultivated in sucrose media, under aerobic condition, produced less lactic acid. These results might be due to unsuitable condition for

the growth of S. mutans which is nearly a strict anaerobic bacteria. However, the results of these studies were useful while sucrose is necessary to be a source of dietary carbohydrate. It has been suggested that after carbohydrate diet one ought to rinse one's mouth to prevent anaerobic condition in the oral cavity which may reduce the amount of lactic acid produced by S. mutans.

The pH of saliva has been considered to have an important influence on growth and activities of the oral microflora. The pH of freshly collected saliva has been found to vary between 5.7 and 7.0 with the mean near 6.7 and this range was satisfactory for the growth of a wide variety of microorganisms. It might vary as much as one unit in normal circumstances such as chewing, fatigue, change in breathing rate, and general metabolic influences.<sup>(151)</sup> Such changes, if prolonged, would affect the oral microbial flora, since most bacteria grow only within a restricted pH range. If the saliva became too alkaline, acidophilic organisms such as lactobacilli and yeasts would be unable to grow. If it was too acid, such proteolytic bacteria as Staphylococci, Streptococci and Bacillus species could not survive.<sup>(151)</sup>

These experiments revealed a relationship between pH of sugar media and the lactic acid produced by oral microflora. It showed that most sugar media at pH 5 produced less lactic acid, indicating that if salivary pH is too acid the growth of oral streptococci will be inhibited.

In summary, these investigations have confirmed that fermentation of xylitol under anaerobic condition by oral microflora yield less lactic acid and sucrose under aerobic condition. When the pH of sugar media was adjusted to be 5, the amount of lactic acid produce was less.