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*Short Communication*

# A pilot study of cariogenic bacteria and diet associated with root surface caries in Iceland

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The high prevalence of dental caries in Iceland only began to decline in the late 1980s, somewhat later than in neighboring countries. Following experience from other countries, it can be expected that there will be an increase in the number of dentate elderly individuals in Iceland and consequently this will lead to an increase in the prevalence of root-surface caries. Risk factors for caries including counts of cariogenic bacteria and dietary parameters, especially the frequency of consumption of cariogenic 'risk' foods have been shown in several studies conducted in Iceland to be significantly associated with caries (1). Some studies have shown a link between the frequency of sugar consumption and an increased risk of developing root caries (2, 3). There is, however, no information on caries-associated risk factors for root-surface caries in Iceland. The aim of this pilot study was to adapt the methods used in Iceland for assessing the risk of developing coronal caries to the problem of root-surface caries and to observe which factors, if any, could be associated with root caries.

Patients attended a specialist operative dentistry practice in Reykjavik or the Faculty of Odontology of the University of Iceland and were all examined by the same operator (HS). All gave their informed consent to participate in the study and the protocol was approved by the relevant authorities. Patients were excluded if they reported symptoms of dry mouth, were taking antibiotics or chlorhexidine mouthwash, or had done so in the previous 2 weeks. Patients had to have at least two carious lesions on root surfaces. These were scored as: (i) soft, or (ii) hard but discolored root-surface lesions following gentle probing. Samples were removed for microbiological analysis using sterile foam pledgets (approximately 2 mm in diameter) transferred to the laboratory and cultured using standard methods (1).

Patients completed a dietary diary for the following 4 days. This diet diary was structured to enquire about the food and drink consumed as meals and as between-meal snacks.

Table 1. Carriage and counts of cariogenic bacteria from root-surface carious lesions ($n = 67$)

| Microbiological factor | Soft lesions | Hard lesions |
|---|---|---|
| % carriage of *Streptococcus mutans* | 92 | 94 |
| % carriage of lactobacilli | 47 | 24 |
| Mean count of *Streptococcus mutans* (cfu/mL) | $6.0 \times 10^5$ | $4.8 \times 10^5$ |
| Mean count of lactobacilli (cfu/mL) | $1.0 \times 10^4$ | $7.0 \times 10^{2*}$ |

*$P < 0.05$

A total of 22 patients, mean age 52.2 years, were enrolled in the study. They each had 2–4 root-surface lesions and a total of 67 lesions were sampled. Results of the microbiological investigation are given in Table 1 and the relationship between the data obtained from the dietary questionnaires and the clinical findings is given in Table 2. Mutans streptococci were isolated from almost all lesions, but lactobacilli tended to be found more frequently in soft lesions, where their count was significantly higher ($P < 0.05$) than that found in the hard, discolored lesions. Patients with soft lesions or a mixture of soft and hard lesions on their root surfaces reported consuming sugar almost twice as often as patients who only had hard root-surface lesions ($P < 0.02$). Similarly, between-meal, sugar-containing snacks were more frequently consumed by patients who had soft lesions on their root surfaces compared with those who had only hard root-surface lesions ($P < 0.05$).

In order to focus the present study on the influence of diet and cariogenic bacteria, we excluded patients with xerostomia from the study. Increased levels of cariogenic bacteria, especially lactobacilli, in root caries lesions, have

Table 2. Dietary findings from a 4-day dietary diary in patients with root-surface caries ($n = 22$)

| | | |
|---|---|---|
| Mean instances of sugar consumption per 4-d period | | 11.3 |
| Mean no. of between-meal snacks per 4-d period | | 9.2 |
| | Soft lesions ($n = 14$) | Hard lesions ($n = 8$) |
| Mean instances of sugar consumption per 4-d period | 13.0 | 7.8** |
| Mean no. of between-meal snacks per 4-d period | 10.3 | 6.8* |

*$P < 0.05$; **$P < 0.02$

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been previously reported (4–7) and this was confirmed in the present study. Lynch & Beighton (8) found an association between higher counts of *Streptococcus mutans* and perceived treatment need. The color and texture of root-surface lesions is often quite variable, but black, soft lesions harbored more lactobacilli (9) and again the present study confirms this observation. Dietary factors have not been studied as extensively as those of bacteria with respect to root caries. Frequency of sugar consumption was found to be significantly associated with root caries in two studies (2, 3) and the present study found that patients with soft root-surface lesions consumed sugar significantly more often per day and also consumed significantly more between-meal sugar snacks per day than did subjects with discolored root-surface lesions. This pilot study has demonstrated that it should be possible to use dietary and bacteriological data in Iceland in order to assess the risk of developing root caries. Dietary data appear to be relevant in making an assessment of caries risk even in the elderly. In such assessments, however, it would also be necessary to take into account medical history and medication (10) that play a role in the etiology of caries in the age group likely to develop root-surface lesions.

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## References

1. Holbrook WP, de Soet JJ, de Graaff J. Prediction of dental caries. Caries Res 1993;27:424–30.
2. Papas AS, Joshi A, Palmer CA, Giunta JL, Dwyer JT. Relationship of diet to root caries. Am J Clin Nutr 1995;61:423S–9S.
3. Steele JG, Sheiham A, Marcenes W, Fay N, Walls AW. Clinical and behavioural risk indicators for root caries in older people. Gerodontology 2001;18:95–101.
4. Faine MP, Allender D, Baab D, Persson R, Lamont RJ. Dietary and salivary factors associated with root caries. Spec Care Dentist 1992;12:177–82.
5. Beighton D, Lynch E, Heath MR. A microbiological study of primary root-caries lesions with different treatment needs. J Dent Res 1993;72:623–9.
6. Beighton D, Lynch E. Comparison of selected microflora of plaque and underlying carious dentine associated with primary root caries lesions. Caries Res 1995;29:154–8.
7. Powell LV, Leroux BG, Perssson RE, Kayak HA. Factors associated with caries incidence in an elderly population. Community Dent Oral Epidemiol 1998;26:170–6.
8. Lynch E, Beighton D. Relationships between mutans streptococci and perceived treatment need of primary root-caries lesions. Gerodontology 1993;10:98–104.
9. Lynch E, Beighton D. A comparison of primary root caries lesions classified according to colour. Caries Res 1994;28:233–9.
10. Beck JD, Kohout F, Hunt RJ. Identification of high caries risk adults: attitudes, social factors and diseases. Int Dent J 1988;38: 231–8.

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