Commentary

Taylor & Francis
healthsciences

Effects of dairy products on oral health

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Dr Johansson has presented an excellent and fascinating review of the effects of milk and dairy products on oral health in Scandinavian Journal of Nutrition, issue 3, 2002 (1). Although milk is one of the more commonly eaten foods it has been the subject of remarkably little clinical research concerning its influence on oral disease. The composition of milk has been compared with that of saliva, and like saliva it harbours a multitude of antibacterial agents, including immunoglobulins, and possesses remarkable physical properties. There is growing evidence that the antimicrobial effects of saliva probably act in concert and that the separation of its constituents may not be the ideal way to investigate their effects; a similar situation may prevail with milk.

There appears to be confusion in the minds of some paediatric dentists on the role of milk in cariogenesis. It is perhaps important to have a clear idea of some definitions. *Cariogenic* applies to any substance that promotes caries; *non-cariogenic* applies to agents that neither promote nor reduce the prevalence or incidence of dental caries. *Cariostatic* refers to substances that prevent or reduce the incidence of dental caries in the presence of a cariogenic challenge. It has been claimed that milk when given in a bottle may contribute to "nursing bottle caries" or early childhood caries. However, reports fail to account for the remainder of the diet that infants ingest, nor do they recognize the physical effect of the nipple, which obstructs the flow of saliva (2–4). All of the available evidence suggests that milk is simply non-cariogenic and may have modest cariostatic properties under well-defined circumstances. Desalivated rats given milk as a sole source of nutrition orally remained essentially caries free (2); these observations are consistent with the results on the pH effects of milk on dental plaque as cited by Johansson. Furthermore, caries induced by 4% lactose (the same concentration found in cow's milk) far exceeded that observed in rats fed whole milk. It is also noteworthy that the number and extent of carious lesions induced by milk containing up to 10% added sucrose were significantly less than observed in rats given 10% sucrose in water (3). Under these circumstances milk exerts a cariostatic effect, i.e. it overcomes to a large extent the harmful effects of sucrose. However, if the animals are fed a normal cariogenic diet separately and offered milk to drink, a reduction in incidence of caries is not observed.

Specific constituents of milk, even in the presence of saliva, can be adsorbed on to hydroxyapatite surfaces and thereby affect pellicle formation. There is some evidence to suggest that the micelles in milk (similar to saliva) are adsorbed to saliva-coated hydroxyapatite (pHA). Several constituents in milk have the capacity to adsorb to pHA, including phosphopeptides and glycosylated proteins; these in turn appear to have the ability to inhibit adsorption of glycosyltransferases. Constituents in milk also appear to have the capacity to bind to surfaces of bacteria, a phenomenon that in turn may affect the ability of microorganisms to bind to surfaces. This area needs to be explored further (5, 6).

The possibility of using milk as a means of delivering antibodies to specific organisms has been explored with mixed success (7, 8). It is critical to choose the most appropriate antigen. This approach has several attractive features; it is simple, safe and does not require active participation; however, convincing clinical evidence of effectiveness remains elusive.

Although the evidence, short of a well-controlled clinical trial, shows that many cheeses have cariostatic effects, their mode of action is not well understood (9–11). Many novel products are generated during the process of making cheese from milk, which include antimicrobial substances and alkali-generating substrate. It is popularly believed that the cariostatic effects of cheese may be attributed to presence of calcium and phosphate, but it is improbable that calcium and phosphate alone can account for the these cariostatic properties (12). The addition of calcium and phosphate to food usually renders that food non-cariogenic, with little or no effect beyond the immediate ingestion.

  ISSN 1102-6480

Cheese, in contrast, displays cariostatic effects even when given as a between-meal snack (11), and its ability to raise the pH value of dental plaque is way in excess of that expected from calcium and phosphate alone.

Cheeses contain significant amounts of tyramine, which could be used by microorganisms to raise the pH value of plaque; in addition, tyramine has weak adrenergic effects. Cheese also contains a diverse range of fatty acids, many of which are potent antimicrobial agents (13). There is also a myriad of microorganisms present in many cheeses; they can be detected in the human mouth for several days following the ingestion of cheese.

Overall, it is abundantly clear that although milk itself may be only non-cariogenic, cheese certainly displays cariostatic properties. Its modes of action are ripe for additional exploration.

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