INTERACTIONS OF STARCH HYDROLYSIS PRODUCTS WITH ORAL BACTERIA

by

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ABSTRACT

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with Oral Bacteria

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Evidence suggests that sucrose and starch diets are more cariogenic than sucrose-only diets. The purpose of this study was to determine the ability of selected oral bacteria to enzymatically degrade starch and some of its degradation products, and also to investigate the interactions of these amylolytic products with sucrose (or sucrose hydrolytic products) in relation to bacterial growth and sucrose-dependent polysaccharide synthesis.

S. sanguis IUOM-11M and JC804, S. mutans 6715, S. salivarius IUOM-8, A. viscosus IUOM-62, and A. naeslundii ATCC 12104 degraded starch, maltose, maltotriose and maltoheptaose. S. mutans NCTC 10449 degraded starch, maltose and maltotriose, while A. viscosus ACTCC 15987 degraded starch and maltose and S. sanguis SS34 degraded only maltose. L. casei IUOM-14 did not degrade any of the substrates. Analysis of starch degradation products from S. sanguis IUOM-11M demonstrated oligosaccharides, maltose and trace amounts of glucose. S. sanguis IUOM-11M, S. mutans 6715, A. naeslundii ATCC 12104 and A. viscosus IUOM-62 were all able to utilize hydrolyzed starch as a carbohydrate source for growth. The starch hydrolysis product, maltoheptaose, effected the growth of S. sanguis IUOM-11M in glucose and maltose cultures. An increased lag phase and reduced growth rate was observed in both maltoheptaose-supplemented cultures. The presence of maltoheptaose in a standard in vitro glucose utilizaton assay, partially inhibited the ability of washed S. sanguis

IUOM-11M cells to utilize glucose. The inhibition of glucose utilization was maltoheptaose concentration-dependent.

S. sanguis IUOM-11M α-glucosidase activity (EC 3.2.1.20) demonstrated a pH optimum of 6.5 and greatly enhanced activity from maltose-cultured cells as compared to cells cultured in glucose, fructose or amylase-hydrolyzed starch. The presence of fructose in the growth medium prevented the enhanced activity by maltose.

Maltose inhibited sucrose-dependent synthesis of S. sanguis IUOM-11M insoluble polysaccharide and both primer-dependent and primer-independent synthesis of soluble polysaccharides. Maltoheptaose inhibited primer-dependent, but not primer-independent, soluble polysaccharide synthesis.

Several oral bacterial strains have the ability to degrade starch and to further degrade the products to acidogenic substrates. The interactions between starch hydrolysis products and sucrose metabolism suggest means by which acid production might be stimulated within plaque.

TABLE OF CONTENTS