

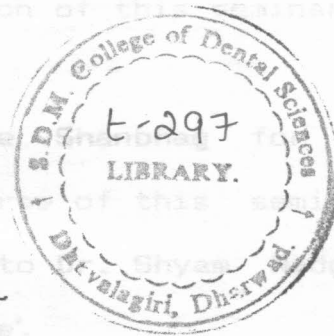
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ETIOLOGY OF DENTAL CARIES

Submitted By:

Shrikant.J.Reddy

Iv B.D.S

Roll No: 65

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***Shree Dharmasthala Manjunatheshwara
College of Dental Sciences***

THE ETIOLOGY OF DENTAL CARIES

THEORIES OF CARIES ETIOLOGY

A number of theories of caries etiology exist, but most of the available evidence supports the Acidogenic Theory of Chemico-parasitic Theory originally proposed by W.D. Miller in 1890. At the time Miller published his text concerning the microorganisms of the mouth, many theories of caries etiology had been considered. Among these were depraved juices accumulated in teeth, disturbances of nutrition, inflammation, worms, sugars, fruit juices, differential electrical potential, putrefaction, inorganic acids, and parasitic agents. Prior to Miller's studies of the etiology of dental caries, which began in about 1880, several groups of workers had observed the occurrence of microorganisms in the carious process and had postulated a causal relationship. The essential nature of acids for demineralization of enamel and dentin in the carious process was accepted, but the production of acids by bacteria in the oral cavity was not recognized.

The Acidogenic Theory

The studies of Miller, an American dental scientist working at the University of Berlin from 1880-1906, had a profound influence on the science of caries etiology. Miller based his ideas on a series of experiments carried out in the laboratories of the famous German microbiologist Robert Koch. He drew heavily on the new knowledge of bacteriology emerging in Europe at that time, principally from the laboratories of Koch and of his great rival, Louis Pasteur in France. Miller made the significant observation that many organisms could produce acid from the fermentation of sugar. He showed that a number of oral microorganisms had this property and that lactic acid was one of the major acids formed. He further showed that extracted human teeth could be demineralized by incubating them in mixtures of bread of sugar with human saliva. Miller wrote the first comprehensive textbook of oral microbiology, *Die Mikroorganismen der Mundhöhle*, published in Germany in 1889 and in the United States in 1890 as *The Micro-Organisms of the Human Mouth*. This original text was republished in 1973. Miller's theory gained further support shortly afterward when Williams in 1897 recognized the fact that bacteria adhered firmly to tooth surfaces, producing a gelatinous film which he considered might localize the acid to the surface of the tooth.

In essence, the acidogenic theory proposes that acids reproduced at or near the tooth surface by bacterial fermentation of dietary carbohydrates. The acids so formed are responsible for the dissolution of the apatite crystals which constitute approximately 95% of the bulk of the enamel. The acids are held in close proximity to the tooth surface by dental plaque, which also serves to protect the acids from the washing and buffering effect of saliva. Similarly, the products of dissolution are also maintained in close proximity to the enamel surface by the presence of the plaque gel.

There is little doubt that acids are involved in the etiology of dental caries. In spite of the existence of other