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History of dental caries

This is one chapter of the Encyclopedia of History of Dentistry

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Abstract

Dental caries is the single most common chronic childhood disease.

Keywords: *caries, tooth worm, decay, dental pain*

Dental caries is the single most common chronic childhood disease. Nevertheless, throughout history, caries incidence varied with the availability and quality of food. In Western Europe during the Early Medieval period (V-XVth century), caries rates ranged between 3% and 23%. When sugar became abundantly available in the 16th century, excessive use led to teeth blackening. By the early 19th century, caries incidence rates increased parallel with a change in the pattern for a more carbohydrate-rich diet.

As far back as 14,000 calendar years ago, we find the earliest signs of dental **caries manipulation** in Tuscany, Italy. Late Upper Paleolithic men managed to make the carious lesion shallower and less retentive (1). Thirteen thousand calendar years ago, we find evidence of attempts to restore a cavity after its enlargement. The internal wall of dental cavities had bitumen, vegetable fibers, and probably hair adhering to it (2).

Inscriptions on cuneiform tablets found by Henry Layard show that Assyro-Babylonians, as far back as 1800 BCE documented their suffering of toothache caused by the *tooth worm*. A highly poisonous plant root, *Hyoscyamus nigra* (henbane), was employed to fumigate the tooth to lessen the suffering. Even Ambroise Paré, the great surgeon of four French Kings, still believed in "tooth worm" and used acid or hot iron cauterization to remove the damaged area of the tooth in the hope of stopping the progress of caries. Fauchard, the *Father of Dentistry*, suggested gargling with freshly collected urine to reduce the rate of caries (3). The idea of a tooth worm persisted well into the 18th century until Jacob Christian Schaffer disproved them.

The nature of the caries was still elusive at the beginning of the 19th century. In 1837 Joseph Linderer displayed the first histological section on a tooth, revealing how the softer dentin structure, once affected, can undermine the harder and still intact enamel. A breakthrough was accomplished in 1889 when an

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American, Willoughby Miller, proposed the chemo-parasitic nature of dental caries. Miller demonstrated that carbohydrate fermentation products of oral bacteria-produced acid, which dissolved the enamel (4). The question of which specific oral bacteria were the main culprits had to wait until 1924 when J. Kilian Clark of St. Mary's Hospital in London stumbled upon a strain of *Streptococcus* (5). While regular *Streptococci* were round, this strain mutated into a rod shape as the decay advanced, hence the name *Streptococcus mutans*. It took another thirty years before *S. mutans* was unequivocally identified as one of the main culprits (6). In 1954 Frank Orland of Notre Dame showed that when germ-free rats were given *S. mutans* and a cariogenic diet developed caries, while diet alone in germ-free animals did not. This breakthrough led to predictions of developing a vaccine for caries. Those attempts, unfortunately, failed because caries pathogenesis proved more complex. We now realize also that acid production in the dental plaque is not a unique characteristic of *Strep mutans*. The "nonspecific plaque hypothesis" implies that the dissolution of the enamel is a consequence of the total net acid production in the biofilm. Other acid-producing bacteria, like *S. sobrinus, Lactobacillus,* and others, must be accounted for rather than a single pathogen.

A thoroughly mechanical solution to their treatment was well established when specific bacteria were identified. In 1908, Greene Vardiman Black, a preeminent dentist at Northwestern University in Chicago, published cavity preparation guidelines, *extension for prevention*, and principles that dominated 20th-century clinical dentistry (7). So pervasive and unique to dentistry was this *mechanical* solution that, even 100 years later, antimicrobial solutions to caries were primarily adjuncts. Even though oral microbiology/immunology has emerged as the field to find a biological solution to caries through a vaccine or passive immunization, attempts have failed. In the first two decades of the 21st century, we are also seeing the emergence of *minimally invasive* dentistry (2004) using agents that arrest caries and avoid unnecessary dental tissue loss while restoring it. Only when dentin, enamel, or whole tooth regeneration takes hold in dentistry, as it will in the next two decades, will dentistry finally treat carious lesions as an infectious disease and offer a biological solution to it, as all other branches of medicine do.

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