Research Journal of Engineering Technology and Management (ISSN: 2582-0028), Special Issue 1 (2019)
Available at www.rietm.in/

ORAL MICROBIAL FLORA

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ABSTRACT:

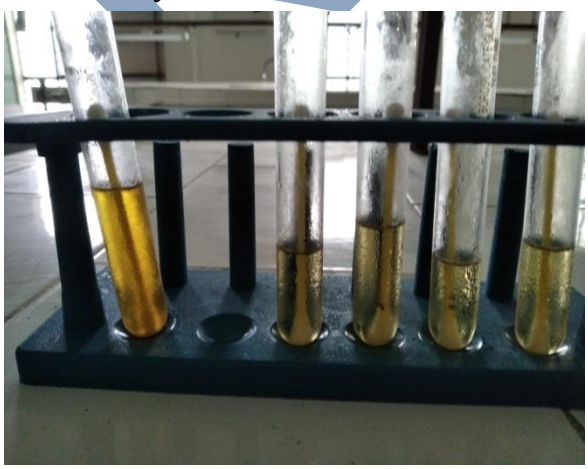
- Dental caries is the disease of civilization is affecting mankind since the dawn of the time. Caries has also been noted in the fossil remains of pithecanthropus erectus and homo rhodesiensis, early ancestors of man. Dental caries is one of the most common chronic infectious diseases in the world. There are three major hypotheses for the etiology of dental caries, the specific plaque hypothesis, the non-specific plaque hypothesis, and the ecological plaque hypothesis. The specific plaque hypothesis has proposed that only a specific species such as streptococcus mutans, on the other hand non-specific plaque hypothesis maintains the caries in the outcome of overall activity of the total plaque microflora.

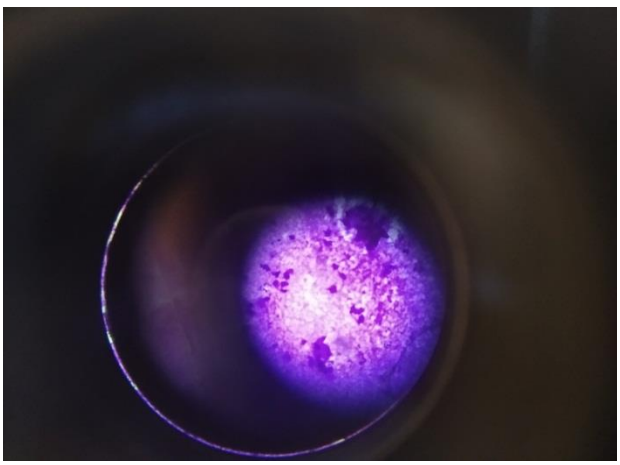
- The ecological plaque hypothesis suggests that caries is a result of Shift in balance of the resident microflora driven by changes in local environmental changes,

Diagnostic microbiology

1) Clinical request and provision of clinical information
2) Collection and transport of appropriate specimen
3) Laboratory analysis
4) Interpretation of the microbiology report and use of the information.

Laboratory work





The following points summarize the evidence obtained by this group of the role of the lactobacilli in the carious process:

1) Lactobacilli were found to be generally present in saliva and tooth scrappings of individuals with beginning or chronic caries; such bacteria were generally absent from individuals with decreased caries incidence.

2) A positive correlation was found between the presence of lactobacilli and caries in rats subsisting on a high glucose diet.

3) Investigators also have concluded that an increase in lactobacilli in the oral cavity preceeded the appearance of observable caries.

4) Lactobacilli could be eliminated from the oral cavity by only the prophylactic agents.

I. INTRODUCTION

- Dental caries is the disease of civilization is affecting mankind since the dawn of the time. Caries has also been noted in the fossil remains of pithecanthropus erectus and homo rhodesiensis, early ancestors of man. Caries seems to have increased considerably in homosapiens during Neolithic period when it was perhaps as high as that seen in many contemporary primitive people.

- Dental caries is an infectious microbial disease of the calcified tissues of the teeth, characterized by demineralization of the inorganic part and destruction of organic substance of the tooth, which often leads to cavitation.

- Evidence for this conclusion has been found in the occurrence of dental caries in the teeth of the fossil record of fish that lived in the occurrence of dental caries in the teeth of the fossil remains of fish that lived in the Permian period of the Paleozoic era, long before man's probable appearance on earth. Caries are also found in the teeth of an herbivorous dinosaur from the cretaceous epoch, and it occurred in the teeth of mammals from the Miocene period.

Fortunately, therefore, the indestructibility of skulls and teeth has given us some insight into the pathology and incidence of dental caries even before it was described in historical writings.

Salient features of carious process

1. Carious process is spread over time .

2. The initial lesion can be arrested and reversed.

3. All ages are susceptible to caries.

4. The interaction between the biofilm and the tooth surface is called carious process and the manifestation of the stage of the process at one point is called carious lesion.

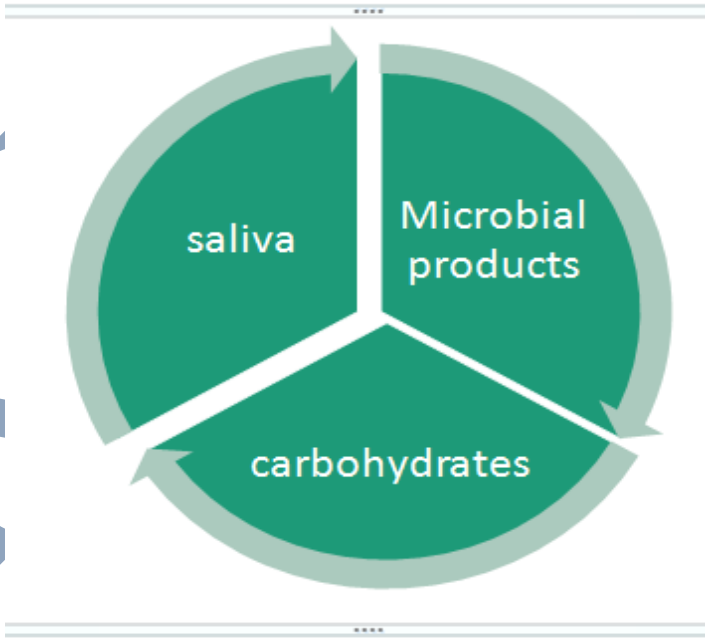
- Dental caries is one of the most common chronic infectious diseases in the world. There are three major hypotheses for the etiology of dental caries, the specific plaque hypothesis, the non-specific plaque hypothesis, and the ecological plaque hypothesis. The specific plaque hypothesis has proposed that only a specific species such as streptococcus mutans, on the other hand non-specific plaque hypothesis maintains the caries in the outcome of overall activity of the total plaque microflora.

- The ecological plaque hypothesis suggests that caries is a result of a Shift in balance of the resident microflora driven by changes in local environmental changes.

Keyes circle

- The interaction of saliva , bacteria , microbial products in the production of biofilms on the tooth surface is an important factor to initiate dental caries . The susceptible host , cariogenic , oral microbial flora and fermentable carbohydrates are important in the development of dental caries and they have been depicted through keyes circle.

Caries



Microbiology of dental caries

- Cariogenic bacteria

Orland and colleagues in 1954 proved by animal bacteria are important for the initiation of dental caries. This experiment demonstrated clearly that germ free rats did not develop caries when fed cariogenic diet. The experiment of key demonstrated the transmissible nature of the disease in humans.

Fitzgeral and keyes in 1960 applied Koch's postulates and showed for the first time the transmissibility of dental caries infection.

Mutans streptococci and caries

- The mutans streptococci (ms) are a group of bacterial species previously considered to be serotype of the species.
- Stertococcus mutans (ms) are considered as a causative agents for dental caries for the following reason :

1) Their ability to stick to tooth surfaces and production of abundant quantity of insoluble extracellular polysaccharide from sucrose.
2) Their ability to produce organic acid such as lactic acid from a number of sugar substrates.
3) Ability to resist acid and acidogenic environment.
4) Production of intracellular polysaccharide, which acts as a reserve substrate of bacteria.

Lactobacilli as the specific etiological agents of dental caries

- Lactobacillus-lactobacillus helps in the progression of dental caries and it's aciduric and acidogenic in nature.it is considered as an essential acidogenic bacteria causing caries. Lactobacillus species are incapable of producing the range of pH values required for caries initiations as they have been shown to be in very low numbers. They have been shown to colonizes white spot lesion before cavitation. They have been associated of carious lesion, in numbers as increase in lactobacillus population. Thus a general rule they have been associated with lesion development and its progression.
- MILLER WHO USED SALIVA (MIXED CULTURE) FOR HIS STUDIES, GOADBY CONCLUDED THAT THREE TYPES OF MICRO ORGANISM FUNCTION IN DENTAL CARIES: THE ACID PRODUCERS, THE LIQUIFIER (PROTEOLYZERS), AND THE PIGMENT PRODUCERS. THE ACID PRODUCING MICRO-ORGANISMS WERE CONSIDERED TO BE THE PRIME MOVERS IN THE CARIOUS PROCESS. STREPTOCOCCI WERE FOUND TO BE THE PREDOMINANT MICROORGANISM IN A NORMAL MOUTH BUT THEY DECREASED IN NUMBER WHEN THE CARIOUS PROCESS BECAME ACTIVE.

- The lactobacilli produced more acid than any other oral microorganism.

- Role of the acidogenic microbial flora and to the lactobacilli in dental caries by the investigations of rodriguez , first published in 1922 , which showed that bacteria of the carious lesion could be divided into three groups, non-acid producers, low acid producers, high acid producers . Three types of organisms were described from the deeper portions of the carious lesion that could be classified as high acid producers, foe they formed a terminal acidity as low as pH 2.9, they were named lactobacillus odontolyticus, types 1, 2, 3 .

- The following points summarize the evidence obtained by this group of the role of the lactobacilli in the carious process:

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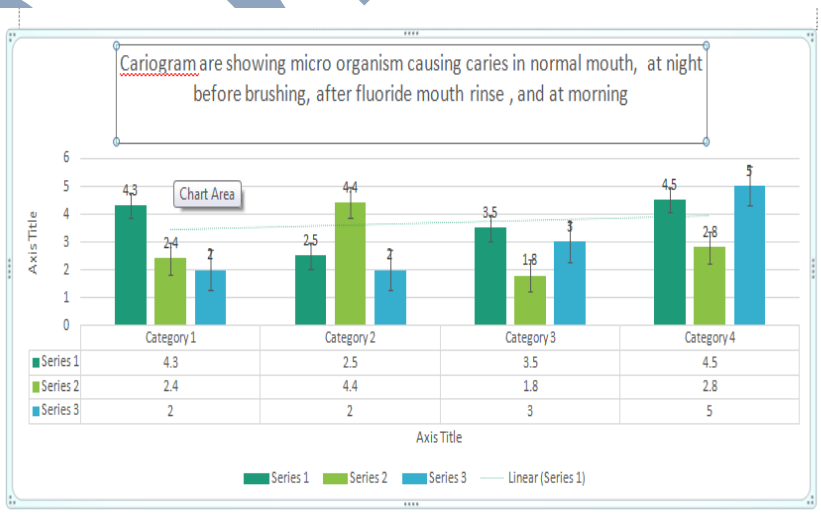
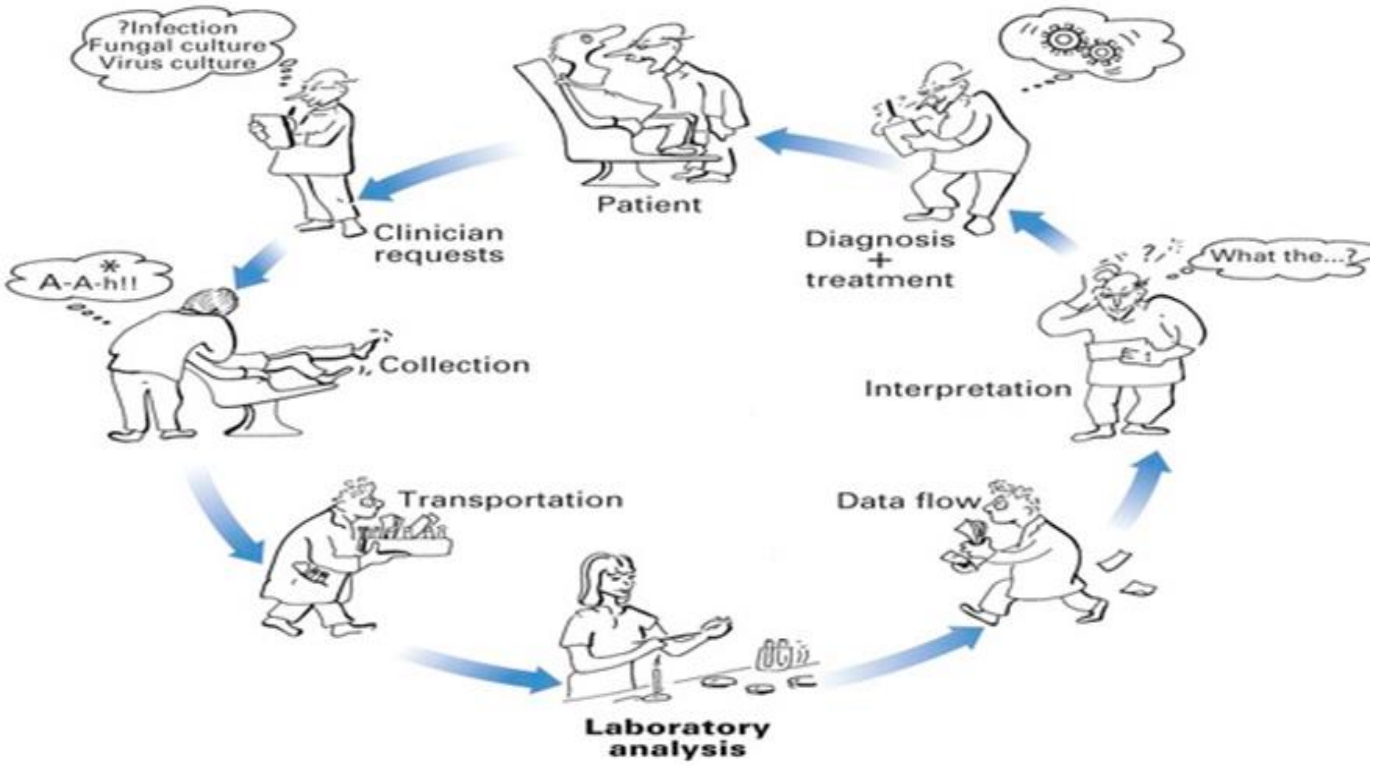
2) A positive correlation was found between the presence of lactobacilli and caries in rats subsisting on a high glucose diet.

3) Investigators also have concluded that an increase in lactobacilli in the oral cavity preceeded the appearance of observable caries.

4) Lactobacilli could be eliminated from the oral cavity by only the prophylactic agents.

Based on these findings bunting and coworkers concluded that dental caries has been truly infective disease that B. acidophilus may be considered to be the specific etiological factor responsible for initial stage of diseases .





- Diagnostic microbiology

1) Clinical request and provision of clinical information
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Material and methods

1) Sterilisation

A simple autoclave

a) Release valve

b) Safety valve

c) Pressure guage

d) Tightening valve

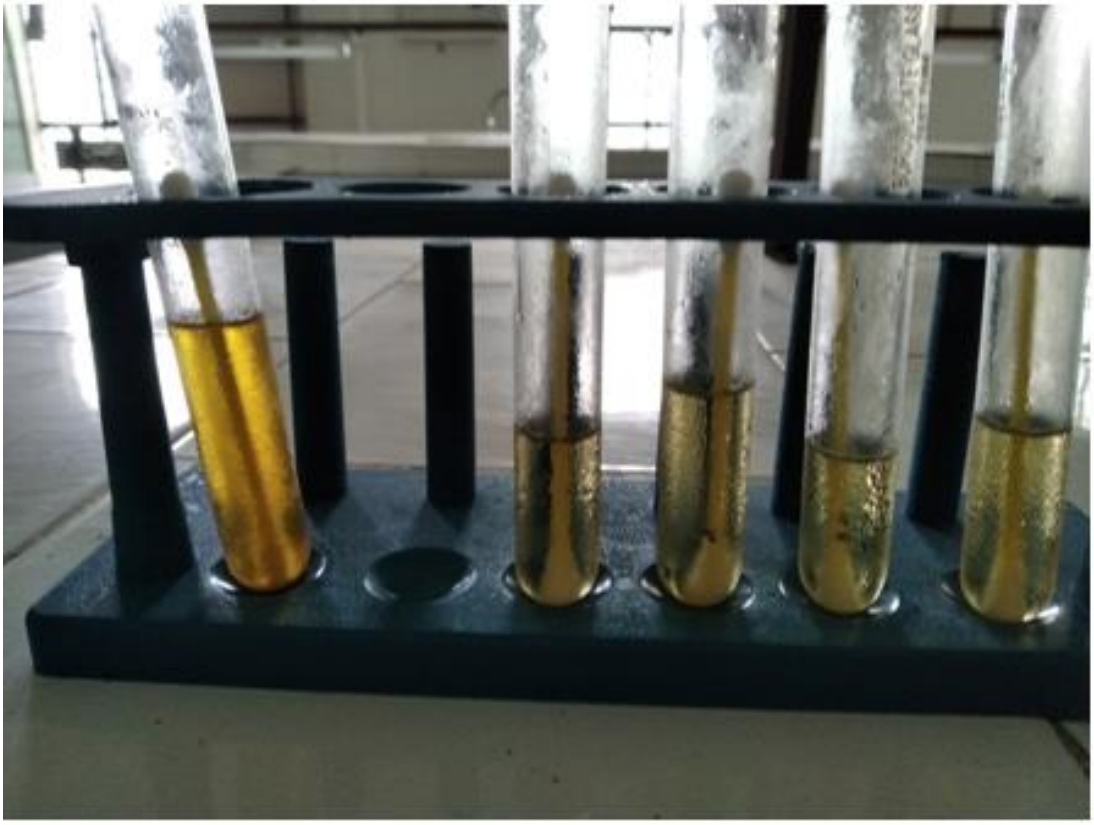
e) Bin containing material

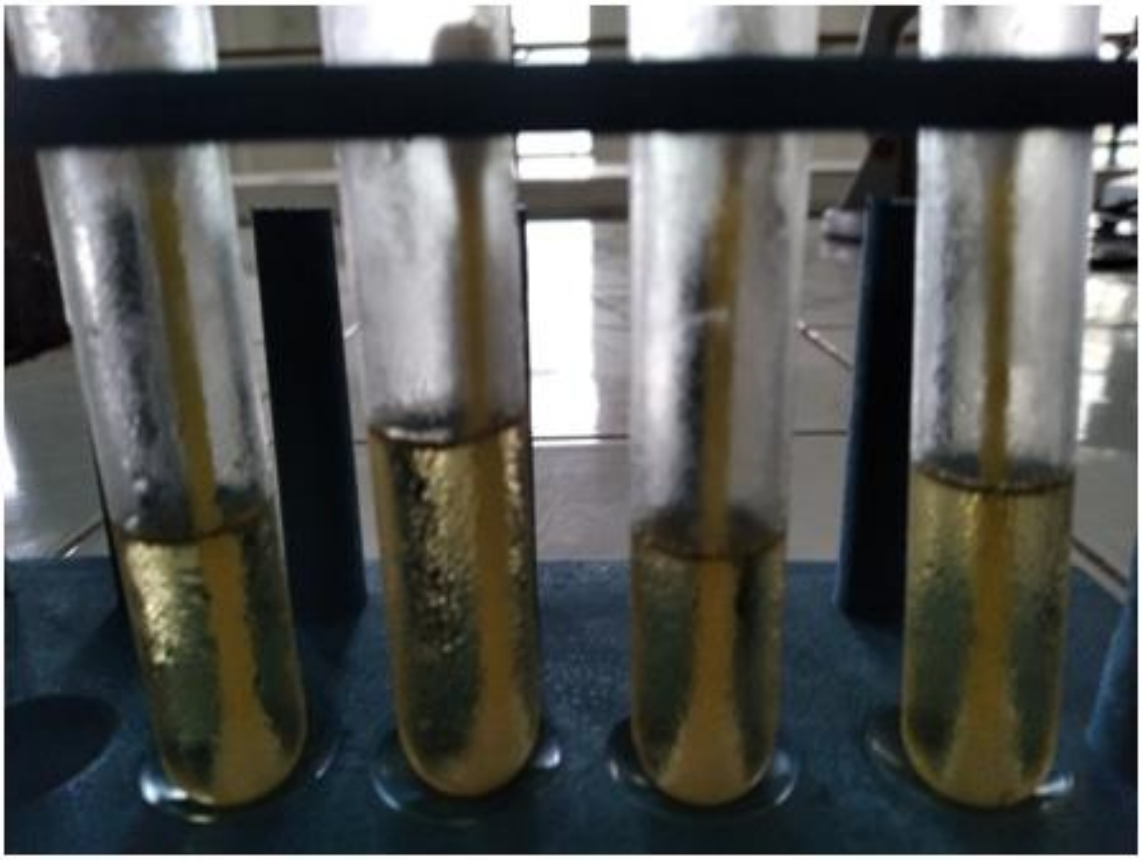
f) Heating element

2) Liquid media

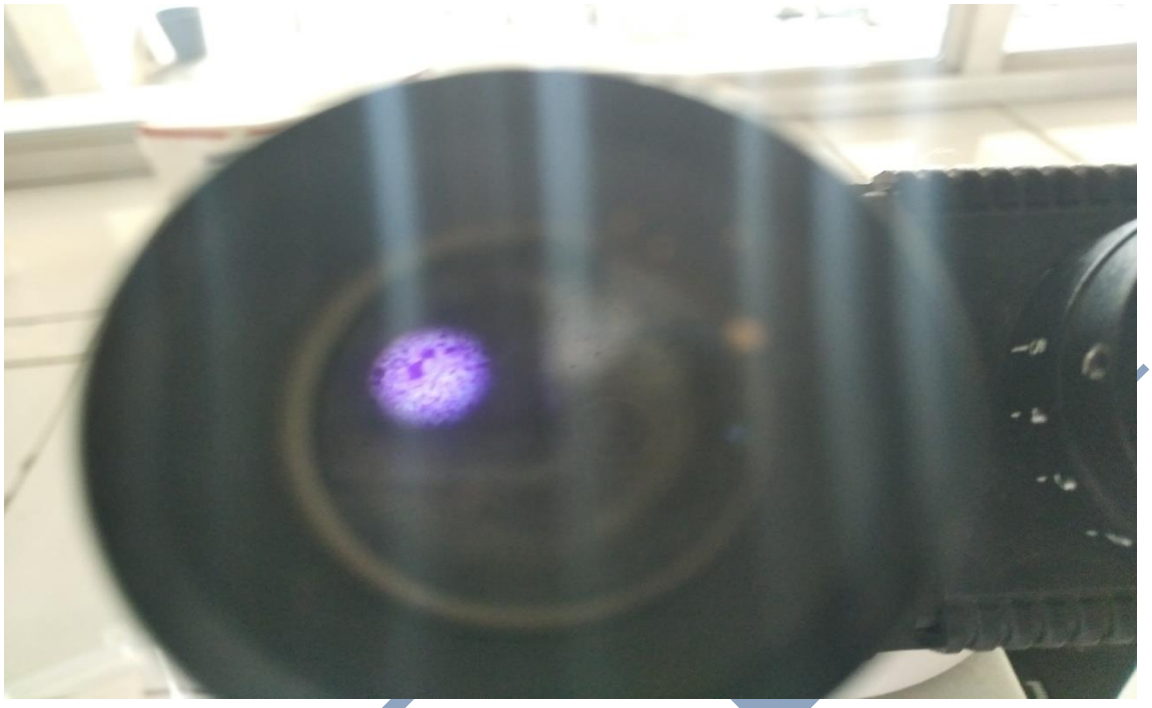
3) Incubator

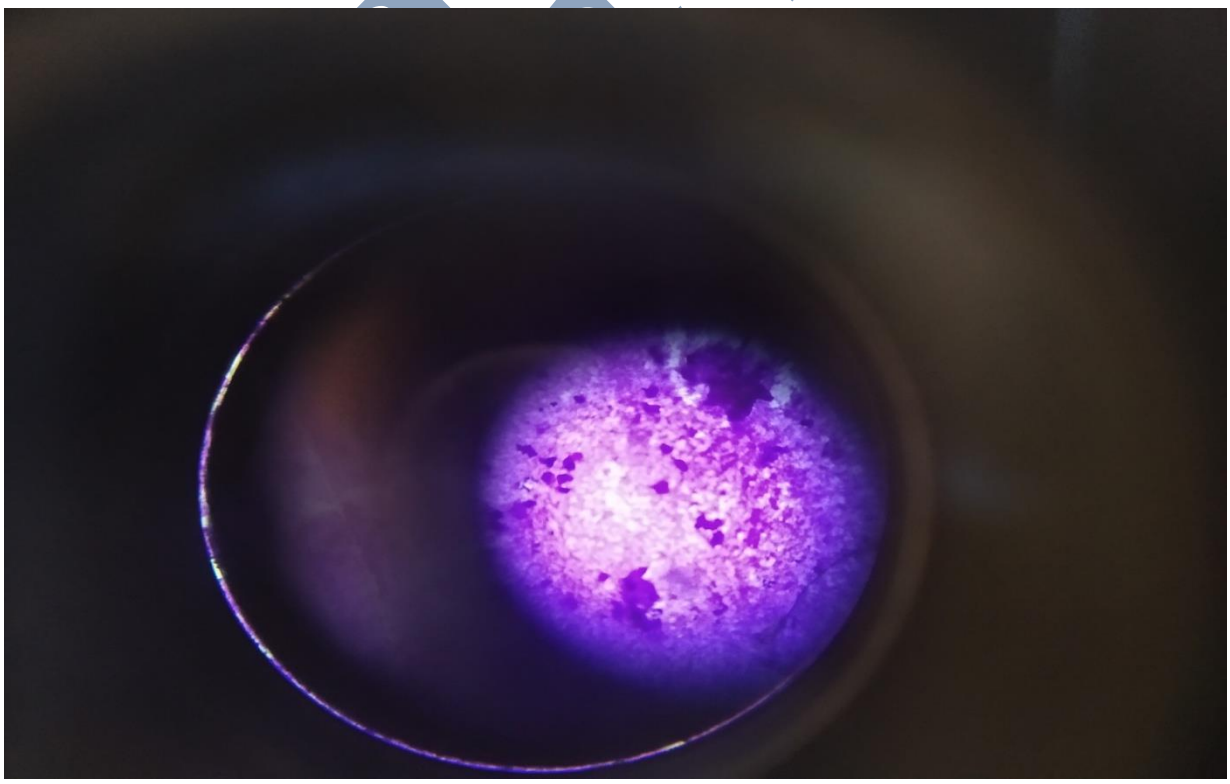
Armamenterium





- **Identification of bacteria**





Streptococci and other acidogenic and aciduric micro organism in dental caries

- In addition to lactobacilli, streptococci have received considerable attention as possible etiological agents of dental caries. Streptococci were first isolated from carious dentin.

Dental caries

Dental caries is the localized demineralization of the tooth surface caused by organic acid metabolites of oral microorganism such as streptococcus mutans. The disease leads to chronic, progressively destruction of the teeth.

The prevalence of dental caries is most often expressed as DMFT (decayed, missing and filled teeth) for primary dentition and DMFT for permanent teeth (Barmes and sardo – infirri, 1977).

Evidence associating dietary factors and dental caries the relationship of diet to dental caries risk was suspected as early as the fourth century B.C, when Aristotle hypothesized that dental caries was caused by consumption of sweet figs , to the tooth (Forsterv,1927)

Current evidence from studies in

- Sucrose in foods is also cariogenic. In a clinical trial at the University of Turku in Finland (Scheinin et al., 1975a, b), three groups consuming diets containing sucrose, fructose, and xylitol, respectively, were followed for 2 years. By the study's end, the average number of decayed, missing, or filled tooth surfaces (DMFS) was twice as high in the group consuming sucrose than in the fructose group. The xylitol group had virtually no DMFS. The lower cariogenicity of fructose relative to sucrose may explain in part the inability of some studies to demonstrate a cariogenic potential of presweetened foods such as cereals (Finn and Jamison, 1980; Glass and Fleisch, 1974), which differ considerably in their content of specific sugars (Glinsmann et al., 1986). The decline in caries prevalence in the United States since the 1970s, despite a continued high consumption of total sugars, may be partially due to the nation's increasing consumption of corn-derived sweeteners such as fructose and the declining use of sucrose (Glinsmann et al., 1986).

- Fluoride is absorbed both systemically and topically (Brown et al., 1977; Ericsson, 1977; Weatherell et al., 1977). During tooth development, systemic fluoride appears to be incorporated into the tooth structure (Sognnaes, 1965; Weatherell et al., 1977). After tooth formation, fluoride is incorporated into the surface crystalline structure of the tooth, primarily through topical agents such as fluoridated water and dentifrices.

- The element fluoride:

- The federal register of United States food and drug administration describes fluoride as an essential nutrient. The who expert committee on trace elements has included fluorine

as one among 14 physiologically essential elements for the normal growth and development of human beings.

- Fluorine is a member of the halogen family with a relative atomic weight of 19 and an atomic number 9.

- The word fluorine is derived from latin term fluore meaning to flow. At room temperature, fluorine is a pale, yellow green gas.

- It is the most electronegative and reactive of all elements and thus in nature is rarely found in its elemental state. Fluorine combines directly at ordinary or elevated temperatures with all elements other than oxygen and nitrogen and therefore reacts vigorously with most organic compounds.

- Combined chemically in the form of fluoride, fluorine is the seventeenth in order of frequency of occurrence of the elements, representing about 0.06% to 0.09% of the earths crust. In rock and soil , fluorine may occur in combined form a wide variety of minerals, such as fluorspar (calcium fluoride, fluorapaptite and cryolite (sodium aluminium fluoride)

- Estimated daily intake of fluorides by man.

- The available data from the different parts of the world indicate that the daily intake of fluoride by individuals vary from country to country. A total intake of between 0.05 and 0.07 mg of fluoride per kilogram body has been found to be the optimum intake for humans.

- Several estimates have been made of the daily intake of fluoride from food and water. The average daily intake of fluoride by adults from dry food substance is in the renge of 0.02 to 1.8 mg and the average daily intake from water containing 1ppm fluoride is about 1.5 mg the total daily intake for adults being in the 1.7 -3.3 mg range. The total fluid intake in children between 1-12 years age ranges from 700-1300ml per day.

- Sodium fluoride mouthrinses

- Sodium fluoride (NaF) mouthrinses are usually formulated at concentration of either 0.02% sodium fluoride (900ppmF) for weekly use or 0.05% sodium fluoride (225ppm F) for daily use. They have been tested in both neutral and acidified forms in a water vehicle. These mouthrinses 10ml of the liquid around the mouth for 60 seconds before expectorating it.

- In light microscopy, bacterial stains are used:

- to visualize bacteria clearly.
- to categorize them according to staining properties.

- The most commonly used stain in diagnostic microbiology is the Gram stain.

II. CONCLUSION

Dental caries is a multifactorial disease. Diet and oral microflora are implicated in caries causation along with such host factors as salivary composition and flow. Genetic susceptibility does not appear to be a major risk factor for caries.

Fermantable carbohydrates appear to be the only component of the diet capable of inducing caries. All fermentable dietary carbohydrates, especially sucrose, are potentially cariogenic, but sucrose is generally accepted as the most cariogenic dietary factor. Sucrose consumption has been associated most strongly by and consistently with the frequency of dental caries in humans and laboratory studies, although they appear to be less cariogenic than sucrose. The cariogenic potential of carbohydrate – containing food depends on their characteristics (eg: stickiness) and the frequency and sequence of their consumption. The addition of certain food and non nutritive sweeteners, such as cheddar cheese, cocoa, and xylitol and to the diet appear to reduce the cariogenic potential of a sucrose containing meal.

Caries will neither form nor progress in the absence of a suitable substrate (oral microflora). Of these oral micro flora that have been implicated in caries causation, S. mutans has been the most consistently and strongly associated.

Consumption of fluoride in optimal amounts reduces caries incidence in people of all ages. Fluoride is strongly anticariogenic if consumed in optimal amounts before eruption of permanent teeth. Widespread fluoridation of water supplies and the use of topical fluorides (eg: fluoridated dentrifices), combined with changing trends in sugar consumption (eg: decreasing sucrose consumption), are probably the two factors most responsible for the recent decline in caries prevalences rates in the United States.

The caries potential of various foods has been investigated almost from the time miller of carbohydrates to acids was a factor in dental decay.

Those studies indicate that an increased consumption of sugar generally causes an increase in the oral lactobacilli and in the incidence of dental caries. Conversely, the exclusion of sugar from the diet reduces the incidence of dental caries, by reducing the incidence of both lactobacilli and caries.

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