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The Relationship of Caries Incidence to Caries Activity in Pre-School Children

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THE RELATIONSHIP OF CARIES INCIDENCE TO CARIES ACTIVITY IN PRE-SCHOOL CHILDREN

By

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DEDICATION

To my beloved husband for his love and understanding throughout these past two years, for without his support this thesis could have not been done.

To my mother for all her love and support throughout all these years.

And, in loving memory of my father, Ezequiel Solis Kitsu.

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VITA

The Author, Maria Virginia Solis Kitsu, is daughter of Ezequiel Solis and Socorro Kitsu de Solis. She was born February 19, 1954, in Mexico City, Mexico.

Her elementary and secondary education was obtained in the American School Foundation of Mexico City where she graduated in 1972.

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CHAPTER I

INTRODUCTION

Many young children show no dental caries, while other children show early extensive caries. It behooves the pedodontist to study carefully the caries activity in young children (younger than are usually brought to the dental office) and possibly encourage parents to bring children to be evaluated by caries activity tests as a preventive measure prior to the development of dental caries.

The following study is unique in that it concentrates on the pre-school child (2-5 years old). A relationship between caries incidence (DMFS) and various caries activity tests (lactobacillus counts, Snyder Test and Streptococcus mutans) will be done and evaluated statistically for dependability.

CHAPTER II

LITERATURE REVIEW

Dental caries is a destructive disease of the teeth, whose etiology is intimately associated with the oral microbial flora[4,63]. This disease of the calcified tissues of the erupted or partially erupted teeth is characterized by the demineralization of the inorganic portion and destruction of the organic substance of the teeth[29,63,79]. Lesions occur often in areas of coronal enamel where saliva stagnates, food debris impacts and the oral microbial flora may find a nutritionally suitable environment for growth[63].

The earliest written references to oral disease were done by the Egyptians, indicating the presence of gingivitis, pulpitis, and toothaches[4]. In the past there was a great controversy as to whether caries arose internally or externally, until Parmly[4], after studying thousands of teeth, came out with the theory that dental decay was produced externally from the accumulation of food around the teeth and gums. Caries was then thought to be involved with the demineralization of the teeth due to the formation of acids, as a result of the putrefaction of proteins. Ammonia produced by this bacterial protein degradation process was presumably oxidized to form nitric acid[4].

Early microscopic observations showed a great variety of microorganisms formulating the concept of caries as primarily "a rotting"

of the organic components of enamel. Others believed the initiation of caries was due to the presence of an undefined acid, as well as microorganisms, in some unexplained interaction. Miller formulated the chemico-parasitic theory based on the concept that caries is primarily a decalcification by acids. The source of such acids in the mouth was the microbial fermentation of dietary carbohydrates[4,13,76]. Dental caries is now known to be a multifactoral disease in which there are three principal factors involved: microbial, host (tissues) and environmental (diet)[4,48].

In the past 40 years, a variety of caries susceptibility tests have been proposed, evaluated, and utilized, both clinically and in research projects. The purpose of these tests has been to assess the degree of caries-activity of an individual or a group of individuals by a laboratory or clinical means[77].

Caries activity tests can be grouped into three categories[4,13,35,76].

1. Tests related to quantity or chemical properties of saliva:
    a. Hydrogen-ion concentration (acidity)
    b. Buffering capacity
    c. Quantity of protein and ammonia
    d. Quantity of calcium and phosphorus
    e. Amylase activity
2. Tests related to number of microorganisms in saliva or plaque:
    a. Lactobacilli in saliva

b. Streptococcus mutans in plaque

3. Tests related to chemical changes in saliva produced by bacterial metabolism:

   a. Acid production measurements (Snyder, Wach, Rickles, Methyl-Red).

   b. Dissolution of enamel from acid production (Fosdick Test).

In the development of tests included in the first category, Miller was able to demonstrate that acidity occurred in caries. However, this was done in a qualitative manner applying litmus paper to a carious lesion[76]. Hanke[35] attempted to correlate the degree of acidity in various regions of the mouth with the incidence of caries, but was unsuccessful. His lowest finding was a pH value of 5.3. There is evidence that shows that the decalcification of the teeth occurs at a pH of 5.0 or lower in the oral cavity[73,74,76].

Stephan devised a microscopic technique[20,42,73,74,76] to measure the hydrogen-ion concentration of plaque. This demonstrated the ability of plaque to reach a pH of 4.6 (low enough to produce enamel decalcification)[73]. Many other investigators[20,42,51,74] agreed that low pH (high hydrogen-ion concentration) was the primary factor causing the enamel dissolution. These findings supported Miller's theory based on the chemicoparasitic etiology of caries. It was also observed that the pH would drop after rinsing the mouth with a glucose or sucrose solution[50,73,76] supporting the belief that eating candy would increase active caries. Other studies[62,76,77,80] found differences in the pH of caries-susceptible and caries-resistant

individuals. It was demonstrated that a correlation existed between lower pH levels and higher concentrations of lactic acid[19,50,77] in caries-active individuals.

Many investigators have attempted to correlate dental caries activity with salivary function and components. Dreizen[16] observed a definite difference between the buffering capacity of saliva in caries-resistant and caries-susceptible individuals, suggesting the usefulness of measuring buffering capacity as a caries activity test. Others, however, believed that the buffer value is a modifying and not a decisive factor in the origin of caries[62].

Ammonia is an incidental product of the bacterial hydrolysis of protein which can influence the pH of plaque. It constitutes 10 to 20% of the salivary buffering capacity. Grove and Grove[32] studied ammonia content of saliva from caries-free and caries-susceptible individuals observing higher concentration of ammonia in the caries free individuals in whom glucose is not transformed to acid as rapidly.

Calcium and phosphate are the principal components of the inorganic portion of teeth[13]. Karshan[43] in his study found differences in the CO_2 capacity and in the percentages of calcium and phosphate removed by shaking the saliva with tricalcium phosphate.

Salivary amylase acts as an enzyme responsible for the conversion of carbohydrates into fermentable sugars, which are the substrates for bacterial acid production. This has been used by some investigators[68, 71,77] to measure caries activity, finding a high correlation between

the levels of salivary amylase activity and dental caries[2].

Many studies on the formation of caries are based on quantitative or qualitative measurements of specific bacterial members of the oral flora. As the microbial flora was studied more thoroughly, streptococci were found to be the predominant microorganisms in a normal mouth and decreased in number as the carious process became active[4]. Lactobacilli were found to be present in both dental caries lesions and caries free mouths.

Both the streptococci like the lactobacilli are saccharolytic bacteria, by converting fermentable sugars to lactic acid[1,66]. Because of this specific characteristic, microbial studies attempting to relate these organisms to caries activity were then conducted. Rodrigues[59,60] studied the bacteria within the carious lesions and designated these bacteria as bacillus odontolyticus type I, II and III. All three microorganism were capable of producing a pH of 3.9 to 2.9 within a five day of cultivation in a beef broth. He developed a quantitative method to determine the incidence of lactobacilli in number using a medium containing 3% standard beef extract and 10% horse serum agar (ph 7.2) under an anaerobic carbon dioxide (10%) environment. Several modified mediums for cultivation were later introduced[36,61]. Hadley's study[33] concluded that caries active individuals had 60,000 lactobacillus colonies while caries free individuals averaged 600. Other investigators[1,20,77] reported similar results as to the presence of these organisms in the caries active

and caries free groups. They observed a reduction in the number of acid producing bacteria with the reduction of the intake of dietary carbohydrates[73]. In studies[37,73] made in children with untreated carious lesions it was demonstrated that there was a direct relationship between the numbers of these lesions and lactobacillus counts. Lower lactobacillus counts were shown in children with fewer untreated carious lesions than in those with greater number of carious lesions.

To study the relationship between the number of lactobacilli and caries activity some researchers compared different caries activity tests[48]. Snyder et al.,[69] evaluated five different caries activity tests (lactobacillus counts, Snyder Test, Rickles test, alpha-amylase and acid buffering capacity) for reliability to predict the caries activity. They found a correlation between lactobacillus counts and Snyder Test, which related to the caries experience. Other investigators also found this same correlation between lactobacillus counts and Snyder test[57,65,66,67,70].

The oral cavity contains many microorganisms but streptococci appears to be the[18,46] most abundant group of microorganisms in saliva and on the various mucous membranes of the oral cavity. They are approximately 1,000 times more numerous than lactobacilli[4]. These microorganisms were studied by Clarke[9] who named one species Streptococcus mutans and found them to grow best in a neutral or alkaline medium. Further studies showed seven sereological groups[4,57] (types a.b,c,d,e,f, and g) of Streptococcus mutans. These were identified

on the basis of cell wall antigens. These organisms are found to be present in the mouth of every human being. Some investigators believe that the exact time of appearance is still unknown[3]. Other studies[7] demonstrate that Streptococcus mutans are absent in the oral cavity prior to the eruption of the teeth, but colonize the oral cavity once the first tooth emerges. They do not seem to colonize on teeth uniformly and are poorly transmittable from one tooth surface to another within the same mouth[28,40]. The organisms then can be isolated from the occlusal pits and fissures with greater frequency than from the buccal and lingual smooth surfaces of the teeth[39,40].

Streptococcus mutans occupies a central role in the etiology of dental caries[5,12,38,45]. A direct relationship between sucrose consumption and dental caries incidence has been shown[33]. Two factors that contribute to this cariogenic potential are the production of high amounts of lactic acid which demineralizes the tooth's surface and the formation of extracellular polysaccharide (dextrans) which facilitate bacterial adherence to the tooth's surface[12,52]. Streptococcus mutans must be considered an important organism in the initiation of carious lesions on enamel surfaces.

Several studies[22,45] were conducted on Streptococcus mutans using animals such as hamsters and rats, which revealed the cariogenicity potential of this organism. Consequently there has been a great interest in determining the relationship between Streptococcus mutans and dental caries activity in humans[28,47,73,78].

CHAPTER III

MATERIALS AND METHODS

Subjects:

One hundred and fifteen pre-school children ranging between two and five years of age were clinically examined for the presence of dental caries and for the degree of caries activity as measured by lactobacillus counts, the Snyder Test and Streptococcus Mutans counts were conducted. About 85% of the children belonged to a Headstart program, while the remaining 15% were routine private office patients. Children were examined once and no follow-ups were conducted. The three different caries activity tests were not carried out for each patient because the amount of saliva collected for the Snyder and Lactobacilli tests was insufficient.

Clinical Examinations:

All children received a clinical oral examination using mirrors and sharp explorers. They were all examined and charted by the same person to prevent variations. The chart used is that provided by the Pedodontic Department of Loyola Dental School. A tooth was considered carious if the tip of the explorer when introduced into a developmental pit or fissure showed resistance upon removal by the examiner. A decayed, missing and filled (DMFS) index was charted for every patient.

Collection of Saliva Samples:

Saliva stimulation was obtained by giving the child a piece of paraffin wax (measuring 2.5 X 0.5 X 0.7 cm) to chew for 3 to 5 minutes. Using a sterile test tube, approximately 2.0 ml. of saliva were collected from each individual. Samples were immediately transferred and kept in a refrigerator at 4°C for 24 hours before being cultured.

Collection of Dental Plaque Samples

Plaque samples were taken from approximal surfaces of the first and second lower deciduous molars using sterile dental floss. Portions of 4-5cm of the floss that were contaminated with the hands were removed with sterile scissors. The portion of dental floss containing the plaque samples was placed into tubes each containing 12 ml of fluid thioglycollate broth (Difco Laboratories, Detroit, Michigan) as a transport medium. The plaque samples were kept in refrigeration (4°C) for 24 hours before the tests were conducted.

Lactobacillus Counts:

Saliva samples were mixed thoroughly using a sterile 1.0 ml pipet by aspirating and expelling the saliva several times before dilution. Exactly 1.0 ml of the saliva was pipetted and transferred into a 9.0 ml sterile water blank tube where it was mixed by repeating the pipetting-rinsing procedure as before. Using the same pipet 0.1 ml of the dilution was transported into a 9.9 ml of sterile water blank and mixed the same manner as above. Then, 0.1 ml of this second dilution

tube was transported to a third dilution tube containing 9.9 ml of sterile water blank. Once the dilution sequence was completed for a saliva sample, the following aliquots were transferred from the dilution tubes to sterile empty petri dishes prior to the addition of the lactobacillus medium: 1.0 ml from tube three (10^{-5} dilution), 0.1 from tube two (10^{-4} dilution), 1.0 ml from tube two (10^{-3} dilution) and 0.1 ml and 1.0 ml from tube one (10^{-2} and 10^{-1} dilutions respectively). The plates were all marked with the respective dilution before pouring the lactobacillus medium or addition of dilution sample.

Using Elliker Agar (Difco Laboratories, Detroit, Michigan) a lactobacilli medium of the following composition: Bacto-Tryptone, 20g., Bacto-yeast extract, 5g; Bacto-gelatin, 2.5g; Bacto-Dextrose, 5gr; Bacto-Lactose, 5g; Bacto-Saccharose, 5g; Sodium Chloride, 4g; Sodium Acetate, 1.5g; Ascorbid Acid, 0.5g, with a pH of 6.8 at 25°C was previously mixed and stored in a refrigerator at 4°C. The medium was melted at 121°C (15 psi.) for 7 minutes and kept equilibrated to 56°C in a water bath until poured. The pouring of the lactobacillus medium was done by opening the petri dishes just enough to allow the pouring of approximately 8-10 ml of melted agar to cover the bottom of the dish. With circular movements the plates were stirred seven times to the right and seven to the left, using the same procedure for all the plates. The medium was allowed to solidify approximately 5-7 minutes. Once it had solidified, the plates were inverted and placed in a candle jar, which served as our anaerobic environment.

After the 48 hours incubation was completed the lactobacilli colonies which had grown were counted by using a Quebec Colony Counter (Dark-field) and an automatic register. The plates which presented more than 300 colonies were recorded as >300 and if less than 30 as <30.

Criteria for Measurement[54,75] of Caries Activity

No. of Lactobacilli (Per ml)	Caries Activity
0 - 1000	Caries Inactive
1000 - 5000	Probably Inactive
5000 - 50,000	Active
more than 50,000	Highly Active

Snyder Test:

A Snyder Test agar (Difco Laboratories, Detroit, Michigan) with the following composition: Bacto-Tryptose 20g; Bacto-Dextrose 20g; Sodium Chloride 5g; Bacto Agar 20g; Bacto-Brom Cresol Green 0.02g, with a final pH of 4.8 at 25°C, was previously measured and separated into 15 ml tubes. This medium was stored at room temperature. The medium was melted at 121°C (15 psi.) for 5 minutes, and equilibrated at 56°C in a water bath before testing.

From the tube of saliva previously mixed for the lactobacillus counts, 0.2 ml of saliva was collected and transported with a sterile 1.0 ml pipet into the previously melted Snyder's agar. It was mixed immediately by rolling the tube between the palms of the hands to distribute the saliva evenly. Once the agar had solidified they were placed in an incubator at 37°C for 72 hours in an aerobic environment.

Color changes were observed every 24, 48, and 72 hours and the results were recorded as caries activity extreme, moderate, slight and negative, as follows:

Snyder Test[77] Caries Activity	24 Hours	48 Hours	72 Hours
Extreme	Positive		
Moderate	Negative	Positive	
Slight	Negative	Negative	Positive
Negative	Negative	Negative	Negative

Streptococcus Mutans Counts:

Plates containing mitis salivarius agar (Difco Laboratories, Detroit, Michigan) and potassium tellurite (Bacto-Chapman Tellurite Solution. 1.0 ml per 1000 ml.) with 0.1% sulfisomidine (Sigma Chemical Company, St. Louis, Missouri. 1 gr. per 1000 ml.) were poured in advance and were allowed to solidify. Storage of these plates was done in a refrigerator at 4°C.

To disperse the dental plaque from the floss in the transport medium, a Vortex mixer was used 1 - 1 1/2 minutes for each sample before culturing. A 1.0 ml sterile pipet was used to transport 0.1 ml of the medium incorporated with bacterial samples into a mitis salivarius-sulfisomidine agar plate. It was spread uniformly with a bent glass rod on the agar surface in order to ensure the cultivation of isolated colonies.

A dilution was made by mixing 1.0 ml of the medium incorporated with bacterial samples into a 9.0 ml sterile water blank and mixed by a pipetting - rinsing procedure. Then 0.1 ml of this dilution was transferred onto another mitis salivarius-sulfisomidine agar and uniformly spread with a glass rod.

Plates were inverted and incubated in an anaerobic environment in the presence of 95%N_2 and 5% Co_2 for 24 hours. After the incubation was completed the plates were allowed to stand at room temperature for another 24 hours before counting the colonies. The colonies present on the surface of this medium were assumed to be Streptococcus mutans and were so reported. Enumeration of these colonies was performed by using a Quebec colony counter (Darkfield Quebec Colony Counter, American Optical Corporation, Buffalo, New York) and an automatic register. (Automatic Register Qr-1, manufactured by Bio-Dynamics, Inc., for American Optical Corporation.)

CHAPTER IV

RESULTS

In order to properly evaluate the DMFS score, lactobacillus count, Snyder test and Streptococcus mutans counts the results were analyzed through a computer. One hundred and fifteen children were evaluated totally. Analysis of variance, regression and correlation, and a two tailed T-test were applied for all tests. Table I represents the results computed for DMFS score, Snyder Test, lactobacillus count and Streptococcus mutans test for the total sample size (Care group). The Care group represents the total combined samples taken from a headstart program and from private practice. Table II and III represent the analysis of variance and regression performed between two tests. Table II uses the DMFS as the dependent variable while the lactobacilli, Snyder test, Streptococcus mutans and the Care group as independent variables respectively. The purpose of the analysis was to evaluate if there was any correlation between each individual caries activity test and the caries incidence (DMFS). In order to use these tests for the prediction of caries, the results showed that there was no correlation between caries activity tests and the caries incidence, with the exception of the Snyder test, where the F value of 23.44 was highly significant at a P of .01, proving 18.25% of the prediction between the Snyder and the DMFS.

Further analyses were made using only the caries activity tests to see if a correlation existed between them (Table III). The lactobacilli and Snyder test are the only two test which showed a significant correlation at a P of .01, where their F value was 7.9158. The other tests showed no significant correlation between each other.

In Table IV the Care group was separated into individual groups representing the source of the patients; headstart (Group 2) or private office (Group 1). A T-test was performed to determine if a correlation existed between the individual group and lactobacillus counts, DMFS scores, Streptococcus mutans and Snyder tests, respectively. According to the T-test results, a correlation did exist between Group 1 and Group 2 lactobacillus counts. The children from the headstart program (Group 2) showed a higher lactobacillus counts than those in private practice (Group 1). The lactobacilli can be determined by the T-value of -3.96 which rejects the Ho with Df. of 78 at a P. of .01 were Ho - $-3.460 > t > 3.46$, and $t = -3.96$. According to the T-test no correlation was found between the source of the samples and the DMFS scores, Streptococcus mutans counts and Snyder tests.

TABLE I

The Mean and Standard Deviations from the DMFS Score, Snyder Test, Lactobacillus Counts and Streptococcus Mutans.

Source	Care Group Private Practice $(N)_1$	Headstart $(N)_2$	Total (ΣN)	Mean (X)	Std. Dev. (δ)
DMFS	17	98	115	5.675	4.481
Snyder	17	98	115	1.546	0.944
Lactobacilli	17	98	115	1.006	1.254
Streptococci Mutans	17	98	115	446.44	594.38

TABLE II

Caries Incidence (DMFS) Related to the Various Caries Activity Tests

Dependent Variable	Independent Variable	% of Explained Variable	DF	F
DMFS	Lactobacillus Counts	0.389%	1/92	0.35937
DMFS	Snyder Test	18.25%	1/105	23.44404
DMFS	Streptococcus Mutans	1.273%	1/98	1.26338
DMFS	Care Group	2.307%	1/112	2.6450

P. = .01

Ho. = 11.97 < F

DF 60 = 7.08

DF 120 = 6.85

TABLE III

Correlation Between Each Individual
Caries Activity Test

Dependent Variable	Independent Variable	% of Explained Variance	DF	F
Snyder Test	Streptococcus Mutans	0.042%	1/92	0.03854
Lactobacillus Counts	Snyder Test	8.003%	1/91	7.91587
Streptococcus Mutans	Lactobacillus Counts	3.845%	1/78	3.11871

Ho. = DF 60 = 7.08

DF 120 = 6.85

Ho = F > 11.97 at P.01

TABLE IV

T-Test for the Correlation Between the Care Group and Each Individual Caries Activity Group

Variable	Cases	Means	T-Values	DF
Lactobacilli	Group 1	0.0042	-3.96	78
	Group 2	1.3336		
DMFS	Group 1	7.8000	1.39	78
	Group 2	6.0154		
Streptococcus Mutans	Group 1	289.0667	-0.91	78
	Group 2	433.9385		
Snyder Test	Group 1	1.5333	-0.75	78
	Group 2	1.7385		

Group 1 = Private Office
Group 2 = Headstart Program

At p.01 Ho = -3.96 > t > 3.96

DF 60 = -2.660 > t > 2.66
D 120 = -2.617 > t > 2.617

CHAPTER V

DISCUSSION

Snyder tests have been correlated to caries incidence[74,75,77,78] and have been used to determine the present caries activity. When the Snyder test was related to caries incidence in this study a significant correlation was found. These results are compatible with those found by Rickles[78] and others[23,75,77] where the acid production of the micro-organism is measured as a caries activity factor to determine the caries incidence.

When lactobacillus counts were related to caries incidence in this study the statistical results showed little or no relationship between the two. These results do not agree with those found by other investigators[5,41,42,78] where lactobacillus counts have been closely associated with the determination of dental caries. Lactobacillus counts have been highly correlated to caries activity as a group[38,47,77,78] and are being used to determine present caries activity.

In the study of Hill and Blanery, which included 2,991 subjects, children with few untreated carious lesions had a much lower lacto-bacillus count than those with a greater number of untreated tooth surfaces. DMF's scores do not consider differences in lactobacillus counts due to treated or untreated lesions and may be the source of difference with previous research. Thus no correlation exists between

caries incidence and caries activity in this study. A correlation did exist in the Snyder test. The experiment is not designed to reveal the source of the discrepancy between the Snyder's test and the lactobacillus counts.

Streptococcus mutans have been shown to be associated with dental caries[51,59,68,69]. When Streptococcus mutans counts were related to caries incidence in this study the statistical results showed no significant correlation between the two. These results are in disagreement with those found by other investigators[5,51,59,68,77] where Streptococcus mutans were found closely associated with caries incidence.

Streptococcus mutans have been associated with smooth surface caries while lactobacilli have been associated with pit and fissure caries[39,40]. The source of discrepancy with other carious researchers may be due to the fact that pit and fissure caries are more prevalent in pre-school children, indicative of our sample, than smooth surface caries. This would account for the correlation between the Snyder's test and caries incidence but not with the Streptococcus mutan test. Also DMF's which was our measure of caries incidence does not differentiate between types of caries, smooth or pit and fissure. Previous studies have shown that lactobacillus counts and the Snyder tests are closely correlated to each other[27,66]. In this experiment our results are in agreement with those persons findings showing such a correlation.

It is not surprising that in studies comparing the two tests, correlations have been found. The Synder test measures the time required for sufficient acid to be produced to change the color of the bromcresol green indicator from green to yellow. Since only lactobacilli grow in the medium, the test measures the time required for the lactobacilli in the inoculated saliva to produce this degree of acidity[5]. Further, because the rate at which bacteria produce acid in a given volume of media is directly proportional to the number of bacteria innoculated, it follows that the lactobacillus count and Snyder test are essentially identical tests.

In Table IV, the total sample was divided into subgroups, headstart and private office. A correlation was found between each individual group and lactobacillus counts. Higher counts were found in the headstart group, while the private practice subgroup presented lower lactobacillus counts. This experiment was not designed to reveal the source of discrepancy. However, the small sample size of the headstart group diminishes the significance of any statistical correlation. Perhaps such subclinical groups should be considered in future studies.

Thus in determining the relationship between caries incidence and caries activity tests some of our results do not correlate with previous studies. One reason is that caries is a process influenced by at least three variables: the nature of bacterial plaque, the form and composition of the diet, and the susceptibility of the tooth.

Any test that measures one of these variables only is not likely to provide a conclusive significant correlation with caries activity. Also, as mentioned, DMF's do not take in consideration treated versus untreated lesions, smooth surface versus pit and fissure caries and the type of microbia involved. Finally the age of the individual used and the caries indicative of that age group must be considered. All these factors must be evaluated in caries incidence and caries activity tests and the discrepancy found between them.

Until the etiology of dental caries is understood precisely, a reliable test is bound to be elusive. However, the use of caries activity tests related to caries incidence in assessing a child's oral status are accurate enough for supervision of patients, in their education, demonstration, and establishing their early treatment planning. However, much future research is needed to add further information to the present study.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The problem of this study was to determine if there was any relationship between caries incidence in children and caries activity tests. Caries incidence was measured by DMFS scores. Caries activity was measured by Lactobacillus counts, Snyder test and Streptococcus mutans counts. These three different caries activity tests were not carried out for each patient because the amount of saliva collected for the Snyder and the Lactobacillus test was insufficient.

There was a strong statistical significant correlation between the DMFS scores and the Snyder test. There was no statistical significant correlation between the DMFS scores and the Streptococcus mutans counts or the lactobacillus counts. Thus, concluding that the Snyder test is a more dependable caries activity test. The only correlation between individually caries activity tests were between lactobacillus counts and Snyder tests, which both measure the amount of lactobacillus in saliva.

There was a statistical significant difference between where the samples were taken and the lactobacillus count. No correlation existed between the other tests.

The use of caries activity tests in young pre-school children may evaluate dental caries prior to its development. However, further

research is needed to assess the child's oral status accurately.

APPENDIX

APPENDIX

Patient	DMFS	Lactobacilli	Snyder	Streptococcus Mutans
Headstart Program:				
1	1	6.4×10^6	Moderate	>567
2	9	2.0×10^7	Negative	>513
3	7	3.0×10^7	Slight	>1400
4	6	2.0×10^7	Negative	> 400
5	0	1.2×10^7	Negative	>1040
6	9	6.3×10^4	Moderate	157
7	11	3.1×10^6	Slight	66
8	2	2.19×10^6	Moderate	>796
9	5	1.47×10^7	Negative	66
10	4	2.4×10^6	Negative	708
11	4	3.0×10^7	Negative	540
12	9	1.19×10^6	Moderate	88
13	4	3.0×10^7	Negative	333
14	6	4.0×10^6	Slight	0
15	4	3.0×10^7	Moderate	606
16	17	2.54×10^6	Moderate	78
17	7	1.87×10^7	Negative	267
18	0	-	Negative	71
19	5	3.0×10^7	Slight	1040
20	5	3.1×10^6	Negative	1
21	0	2.56×10^6	Negative	72
22	0	-	-	773
23	12	3.0×10^7	Moderate	507
24	3	2.6×10^6	Negative	782
25	9	-	Negative	>1376
26	0	-	Negative	884
27	2	2.23×10^7	Negative	>626
28	5	5.1×10^6	Negative	2608
29	7	3.0×10^6	Negative	413
30	3	3.0×10^7	Negative	428
31	13	3.0×10^7	Moderate	354
32	2	1.48×10^7	Negative	257
33	5	3.0×10^7	Negative	289
34	2	-	Negative	720
35	3	-	Moderate	606
36	16	3.0×10^7	Slight	3120

Patient	DMFS	Lactobacilli	Snyder	Streptococcus Mutans
Headstart Program:				
37	10	-	-	2712
38	12	3.0×10^7	Extreme	81
39	5	3.0×10^7	Slight	-
40	10	2.24×10^7	Negative	626
41	0	3.0×10^7	Moderate	212
42	6	1.5×10^6	Moderate	1732
43	1	2.5×10^6	Negative	513
44	5	3.0×10^7	Negative	152
45	5	1.12×10^5	Negative	139
46	1	1.74×10^7	Negative	27
47	6	-	-	1588
48	4	-	Moderate	111
49	2	1.12×10^5	Negative	24
50	0	2.24×10^7	Negative	17
51	6	3.0×10^7	Extremely	711
52	4	-	Negative	336
53	4	-	Negative	266
54	6	-	Negative	0
55	5	1.83×10^5	Negative	2
56	7	2.23×10^7	Slight	9
57	7	2.48×10^7	Negative	1484
58	7	1.83×10^7	Negative	1000
59	6	2.8×10^5	Negative	6
60	8	3.0×10^7	Moderate	89
61	4	3.0×10^7	Moderate	88
62	12	3.0×10^7	Extreme	247
63	16	2.3×10^6	Moderate	5
64	13	3.8×10^5	Negative	17
65	0	8.6×10^5	Negative	261
66	0	-	-	379
67	0	1.44×10^4	Negative	297
68	2	1.71×10^5	Negative	13
69	7	2.96×10^7	Negative	80
70	8	9.9×10^3	Negative	548
71	9	1.33×10^4	Negative	104
72	5	1.06×10^5	Slight	7
73	4	1.0×10^3	Slight	791
74	2	1.18×10^5	Negative	0
75	2	-	Negative	195
76	10	-	-	11
77	1	-	Negative	3
78	5	1.39×10^6	Slight	194
79	5	2.99×10^4	Negative	116

Patient	DMFS	Lactobacilli	Snyder	Streptococcus Mutans
Headstart Program:				
80	12	3.0×10^7	Moderate	58
81	7	2.0×10^1	Negative	394
82	3	-	Negative	7
83	8	9.0×10^4	Moderate	308
84	4	1.98×10^3	Negative	578
85	6	1.68×10^5	Slight	311
86	0	-	Negative	0
87	11	3×10^1	Negative	0
88	6	2.91×10^7	-	-
89	2	1.3×10^4	Negative	-
90	4	7.4×10^6	Negative	-
91	7	4.5×10^4	Negative	-
92	6	3.3×10^4	Slight	-
93	5	4.6×10^5	Negative	-
94	18	2.5×10^6	Moderate	-
95	0	3.7×10^5	Negative	-
96	2	1.74×10^7	Moderate	-
97	2	7.6×10^4	Negative	-
98	11	2.42×10^4	Negative	-
Private Office:				
99	8	9.9×10^3	Negative	548
100	9	1.33×10^4	Negative	104
101	5	1.06×10^5	Slight	7
102	1	-	Moderate	3
103	22	4.0×10^4	Extreme	211
104	2	1.57×10^5	Negative	517
105	3	2.08×10^4	Negative	19
106	4	1.71×10^5	Slight	288
107	12	3.2×10^3	Slight	22
108	6	-	-	1555
109	12	1.5×10^4	Negative	1604
110	5	1.17×10^4	Slight	1
111	16	1.19×10^4	Slight	123
112	6	2.70×10^4	Negative	423
113	4	4.2×10^3	Negative	454
114	0	2.9×10^4	Negative	2
115	9	7.9×10^3	Negative	13

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The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the thesis is now given final approval by the Committee with reference to content and form.

The thesis is therefore accepted in partial fulfillment of the requirements for the degree of Master of Science in Oral Biology.

Oct 10, 1980
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