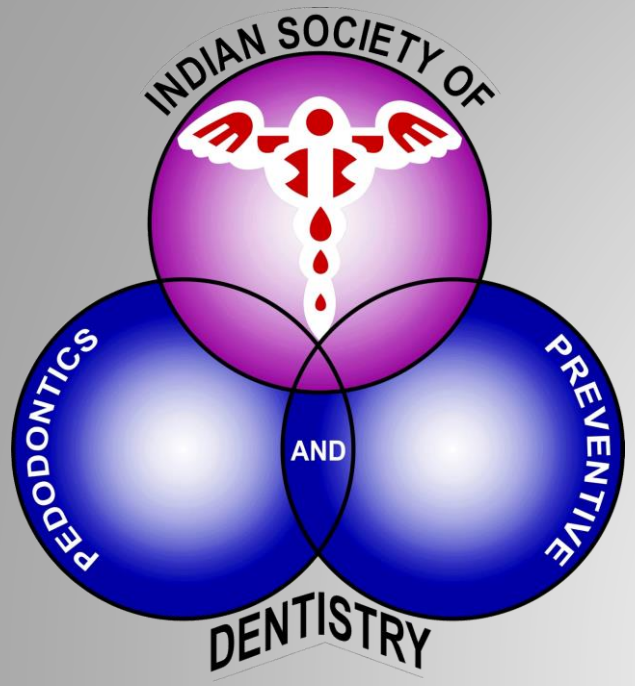
Dr. Arun M. Xavier

Completed his Bachelors and Masters in Pediatric Dentistry from A.B. Shetty Dental College, Mangalore .

He was awarded '**The Best Outgoing Post Graduate Student by overall performance**" from A.B. Shetty Dental college in 2010.

He has widely presented research papers and lectured both in Dentistry & Medical conferences in National/International platforms and has received several Best Research Paper awards in National Pediatric Dentistry Conferences.

- He has also won several accolades both nationally and internationally including **The Classified Winner** to the Bright Smiles Bright Futures award (Glasgow, Scotland in 2015).
- **Special Recognition Award** for Outstanding services in Pediatric Dentistry in 2016 by IDA, Nedumbaserry branch.
- The **Young Pedodontist Research award 2017** by ISPPD.
- **Young Researcher award 2018** (from the International Award of Excellence, London, UK, 2018)
- **Academician of the Year 2018** (Dentistry 2018 Conference, IDRR, Bangalore)
- The Highly Commended '**Specialist Dentist of the Year 2018 – Pedodontist**' by Famdent India.
- He has more than 35 Scientific publications in international/national indexed journals to his credit.
- His areas of special interest include Medically compromising conditions in children, Cariology and Post-natal oral care and counselling.
- Currently, he is serving as Reader in the Department of Pediatric Dentistry at Amrita Hospital, Cochin.

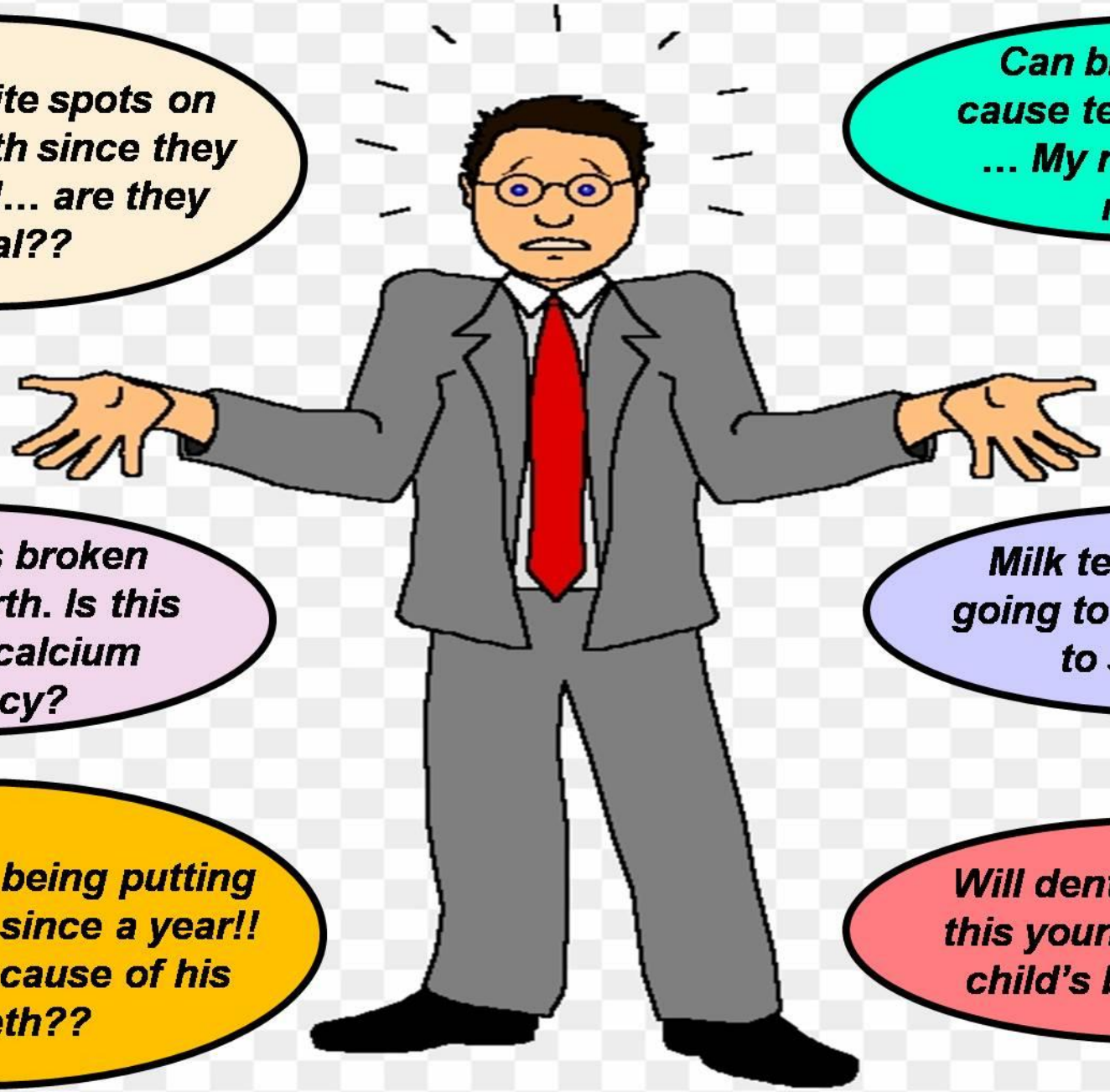


ECC: Etio-Pathogenesis, Epidemiology, Implications and Caries Risk Assessment

DR. ARUN M XAVIER
Reader
Amrita School of Dentistry
Kochi

CONTENTS

- Definitions & Terminology
- Classification, Stages & Patterns
- Etiology
- Hydroxyapatite crystal and the Pathogenesis process
- Prevalence studies – Global and Indian
- Caries Risk Assessment
- Caries Detection Tools
- Implications of ECC
- Suggested further Reading


There are white spots on my baby's teeth since they have erupted… are they normal??
Can breast feeding cause teeth to decay?? … My neighbour told me so…
My child has broken teeth since birth. Is this because of calcium deficiency?
Milk teeth are anyway going to fall.. Do we need to save them?
My son has not being putting on body weight since a year!! Can that be because of his bad teeth??
Will dental extraction at this young age affect my child's brain activity!?

WHAT ?

HOW ?

EARLY CHILDHOOD CARIES (ECC)

WHO ?

WHEN ?

WHY ?

INTRODUCTION

- **Dr. Abraham Jacobi (1862)** - **Clinical appearance of ECC**
  Dentition. Its derangements. A course of lectures delivered in the New York Medical College. New York: Balliere Brothers.

- **Eric HR, Harries MD.** *Comforter Caries. Lancet 1911;Nov 11:1327.*

- **Fass EN.** *Is bottle feeding of milk a factor in dental caries? J Dent Child 1962; 29: 245-51.*

- **Winter GB, Hamilton MC, James PM.** *Role of the comforter as an etiological factor in rampant caries of the deciduous dentition. Arch Dis Child 1966; 41:207-12.*

DEFINITIONS

"The presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries) or filled tooth surfaces in any primary tooth in a child 71 months of age or younger" - ECC

Policy on Early Childhood Caries (ECC): Classifications, Consequences, and Preventive Strategies. AAPD Reference Manual 2016; 71-73

"The presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries) or filled tooth surfaces in any primary tooth in a child under the age six" - ECC

Bangkok Declaration Nov 2018 [reaffirmed Drury *et al.* (1999) definition]

DEFINITIONS

Any sign of smooth-surface caries in a child younger than three years of age, and from ages three through five, one or more cavitated, missing (due to caries), or filled smooth surfaces in primary maxillary anterior teeth.

OR

A decayed, missing, or filled score of greater than or equal to four (age 3), greater than or equal to five (age 4), or greater than or equal to six (age 5) - S-ECC

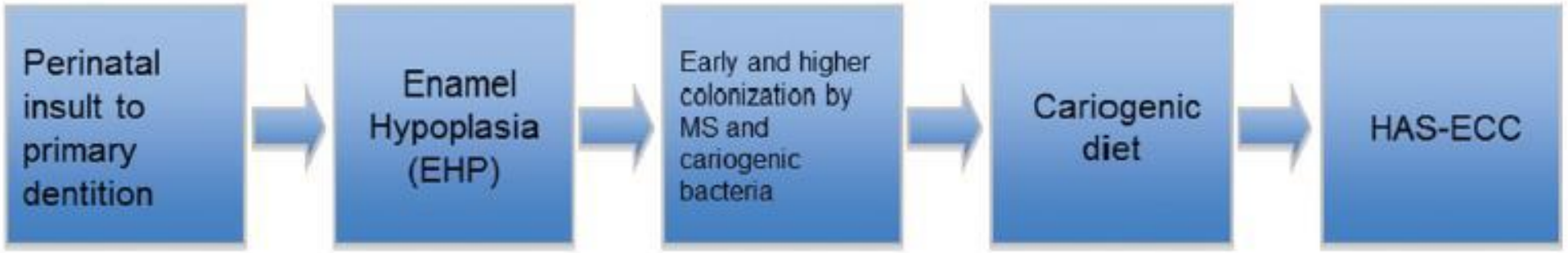
Policy on Early Childhood Caries (ECC): Classifications, Consequences, and Preventive Strategies. AAPD Reference Manual 2016; 71-73

Suddenly appearing, rapidly burrowing type of caries, resulting in early involvement of pulp and affecting those teeth usually regarded as immune to ordinary decay - RAMPANT CARIES

- Massler (1945)
- Definitions, Oral Health Policies, and Clinical Guidelines

HYPOPLASIA ASSOCIATED SEVERE EARLY CHILDHOOD CARIES

HAS-ECC



Caufield PW, Li Y, Bromage TG. Hypoplasia-associated severe early childhood caries – a proposed definition. J Dent Res. 2012 Jun; 91(6): 544-50.

EARLY CHILDHOOD CARIES

TERMINOLOGIES	AUTHOR & YEAR	DEFINITION
Nursing caries	Winter *et al*, 1966	A unique pattern of dental caries in young children due to prolonged nursing habit.
Nursing bottle mouth	Kroll *et al*, 1967	A syndrome characterized by a severe caries pattern beginning with the maxillary anterior teeth in a healthy bottle fed infant or toddler.
▪ **Nursing bottle syndrome** ▪ **Bottle prop caries** ▪ **Labile caries** ▪ **Comforter caries**	Shelton *et al*, 1977	A devastating condition that may render young children dentally crippled.
▪ **Night bottle syndrome** ▪ **Baby bottle caries**	Dilley *et al*, 1980	A unique pattern of dental caries in young children.
▪ **Baby bottle mouth** ▪ **Nursing mouth decay**	Croll 1984	A very destructive caries process which can affect infant and toddlers.

EARLY CHILDHOOD CARIES

TERMINOLOGIES	AUTHOR & YEAR	DEFINITION
Nursing bottle caries	Tsamtsouris 1986	Caries caused by a prolonged use of a bottle filled with any liquid other than water.
Baby bottle tooth decay	Mim Kelly et al ,1987	A caries caused by bottle feeding only not by breast feeding.
▪ **Milk bottle syndrome** ▪ **Infancy caries** ▪ **Soother caries** ▪ **Circular caries**	Ripa 1988	A specific form of rampant caries of infants.
Tooth cleaning neglect	Moss, 1996	Baby bottle decay is renamed to shift the emphasis away from the bottle to the need of cleaning
RIECDD (rampant infant and early childhood dental decay)	Horowitz 1998	It does define the age group affected by the disease and the usual rapidity of its development.

EARLY CHILDHOOD CARIES

TERMINOLOGIES	AUTHOR & YEAR	DEFINITION
Early childhood caries	Davies 1998	A complex disease involving maxillary primary incisors within a month after eruption and spread rapidly to involve other primary teeth.
Maternally Derived Strep. Mutans Disease [MDSMD]	Li, Y., & Caufield, P. W. (1995). *The Fidelity of Initial Acquisition of Mutans Streptococci by Infants from Their Mothers. Journal of Dental Research, 74(2), 681–685.*	Mothers with high titers of the bacteria or who have suffered from many dental caries themselves are likely to pass the same virulence and associated problems on to their children.

DIFFERENCES
ECC & RAMPANT CARIES

	EARLY CHILDHOOD CARIES	RAMPANT CARIES
Type of caries	Specific form of Rampant caries	Acute widespread caries with early pulp involvement affecting teeth immune to decay
Age of occurrence	In infants and toddlers (primary dentition)	In both primary and permanent dentition
Characteristic features	Mandibular incisors not involved	Mandibular incisors are involved
Aetiology	• Bottle feeding before sleep • Honey dipped pacifiers • Prolonged, at will breastfeeding	• Bottle factors before sleep • Frequent snacks, excessive sticky refined food • Decreased salivary flow • Genetic background • Poor oral hygiene

CLASSIFICATION OF ECC

WYNE. H (1999)

- **Type I (mild to moderate) ECC**

- **Type II (moderate to severe) ECC**

- **Type III (Severe) ECC**

HARRIS & GARCIA GODOY (1999)

STAGE	CLINICAL PRESENTATION
VERY MILD	Clinically, light demineralization usually at the gingival crest & no cavitation
MILD	Demineralization at the gingival 3rd of the tooth & moderate cavitation
MODERATE	Frank cavitation on multiple tooth surfaces
SEVERE	Widespread destruction of tooth; partial to complete loss of clinical crown

PATTERN OF CARIES PROGRESSION

Maxillary Central Incisors

↓

Maxillary Lateral Incisors

↓

Maxillary first molars

↓

Maxillary canines / second molar

↓

Mandibular molars – **LAST AFFECTED**

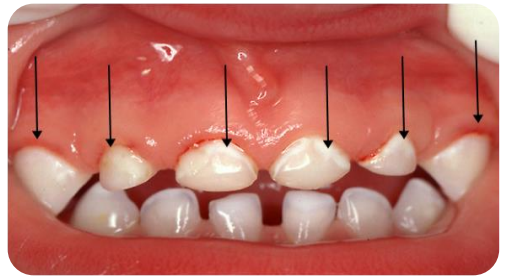
Psoter WJ *et al.* (2003)

DEVELOPMENTAL STAGES OF ECC

VEED KAMP & WEERHEJIM, 1995

- Stage 1 – Initial Reversible [10-18 months]

[NON- CAVITATED]



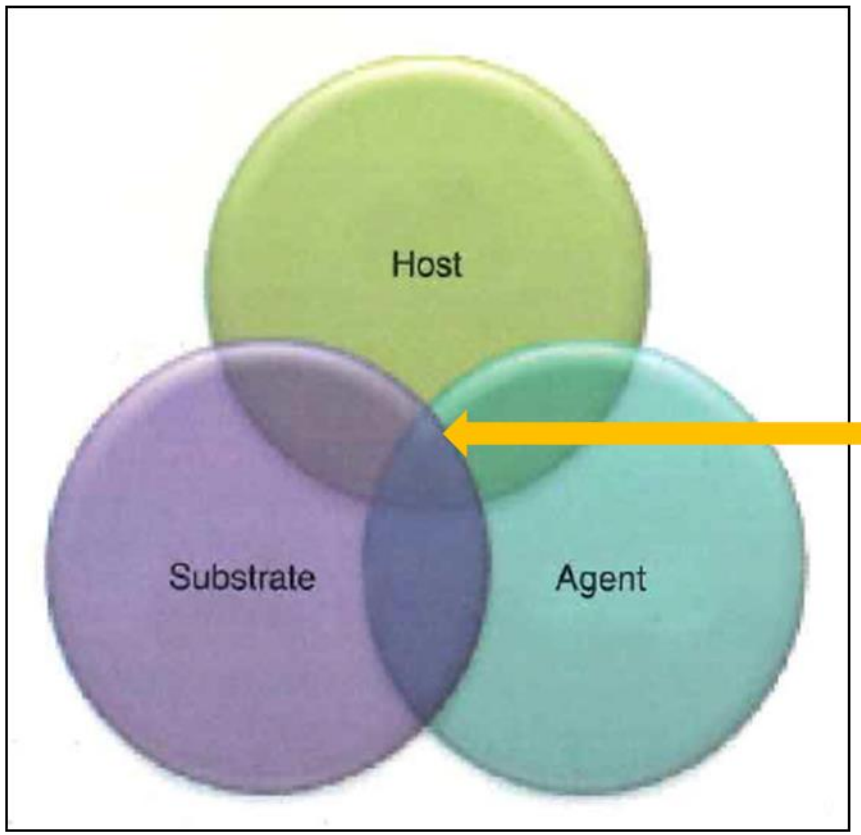
- Stage 2 – Damaged Carious stage [18-24 months]

- Stage 3 – Deep Lesion [24-36 months]

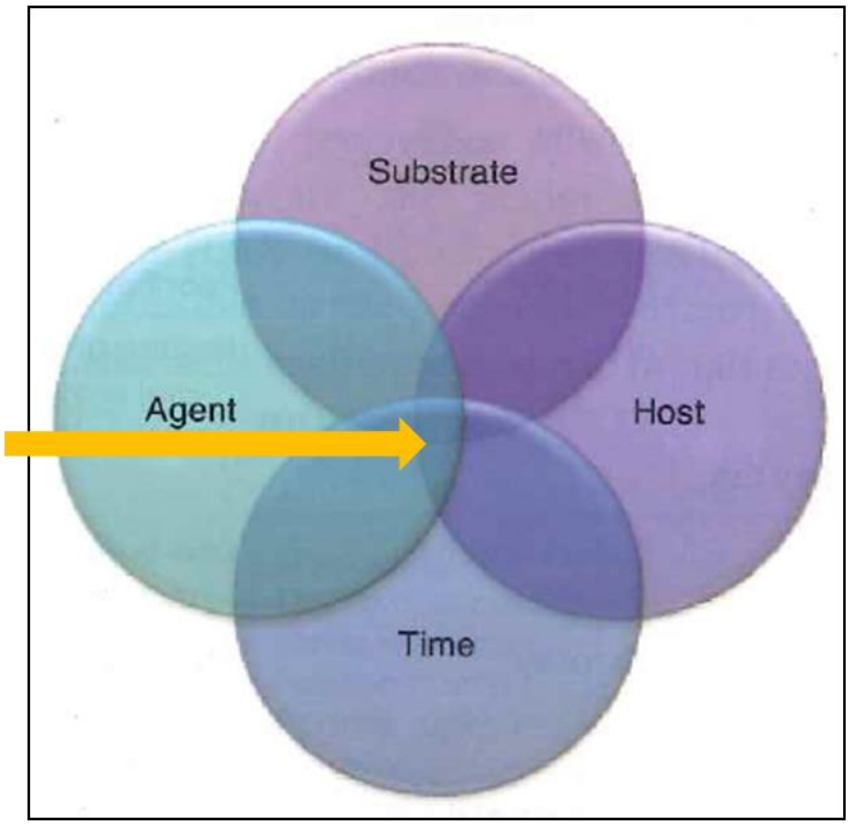
- Stage 4 – Traumatic stage [36-48 months]

[CAVITATED]

ETIOLOGY OF DENTAL CARIES



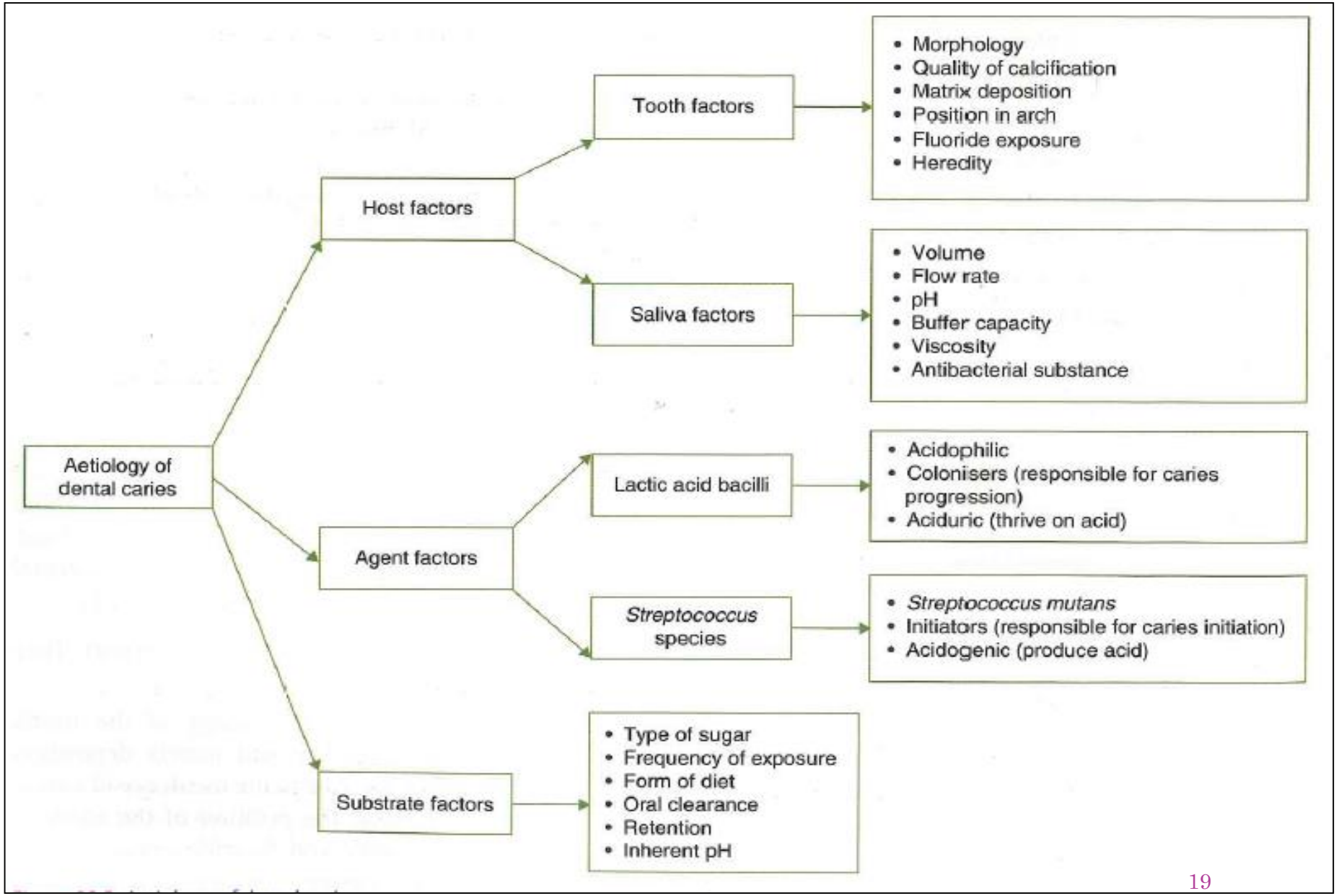
DENTAL CARIES



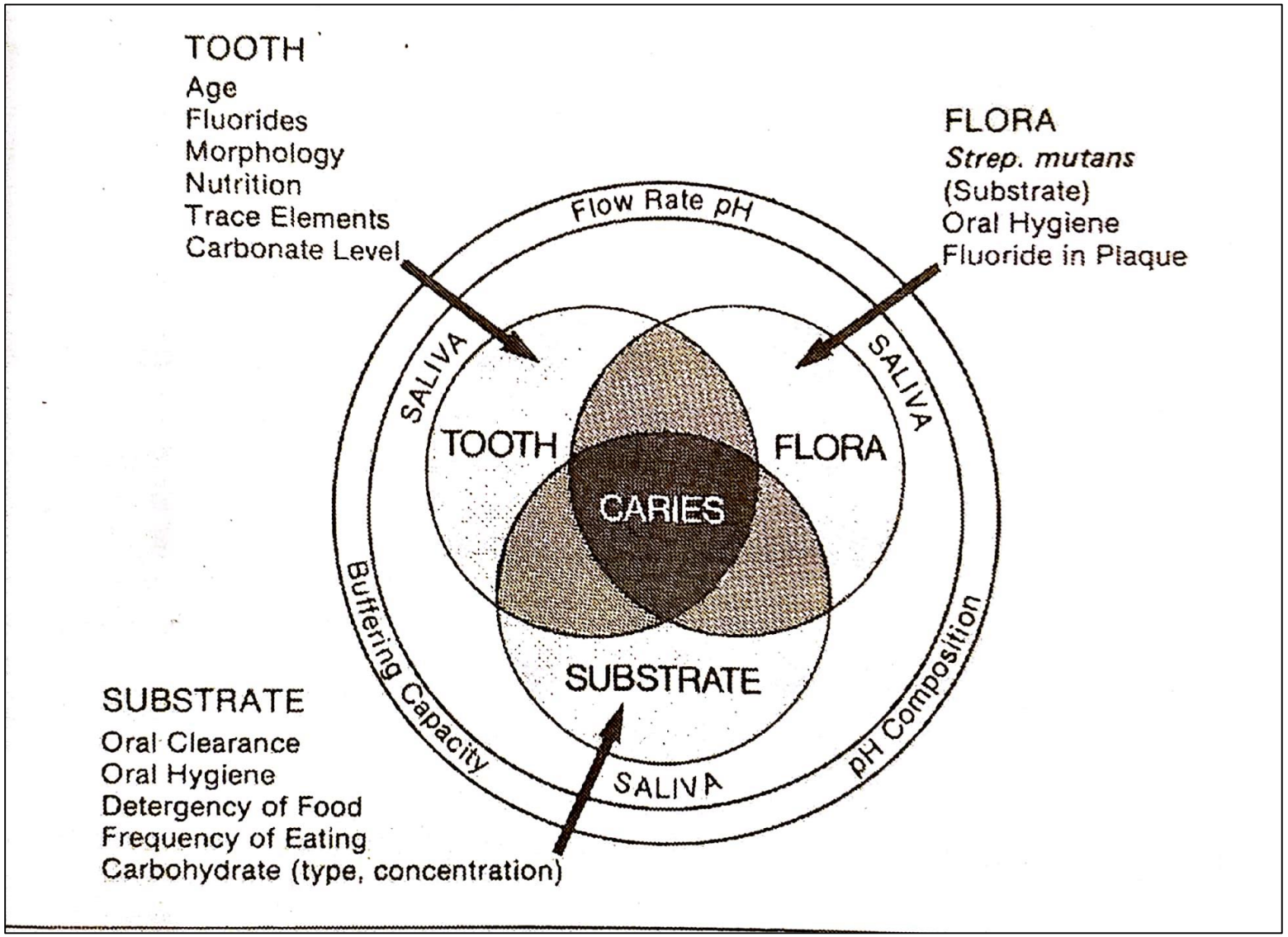
Keyes Triad (1960)

Newbrun Tetrad (1982)

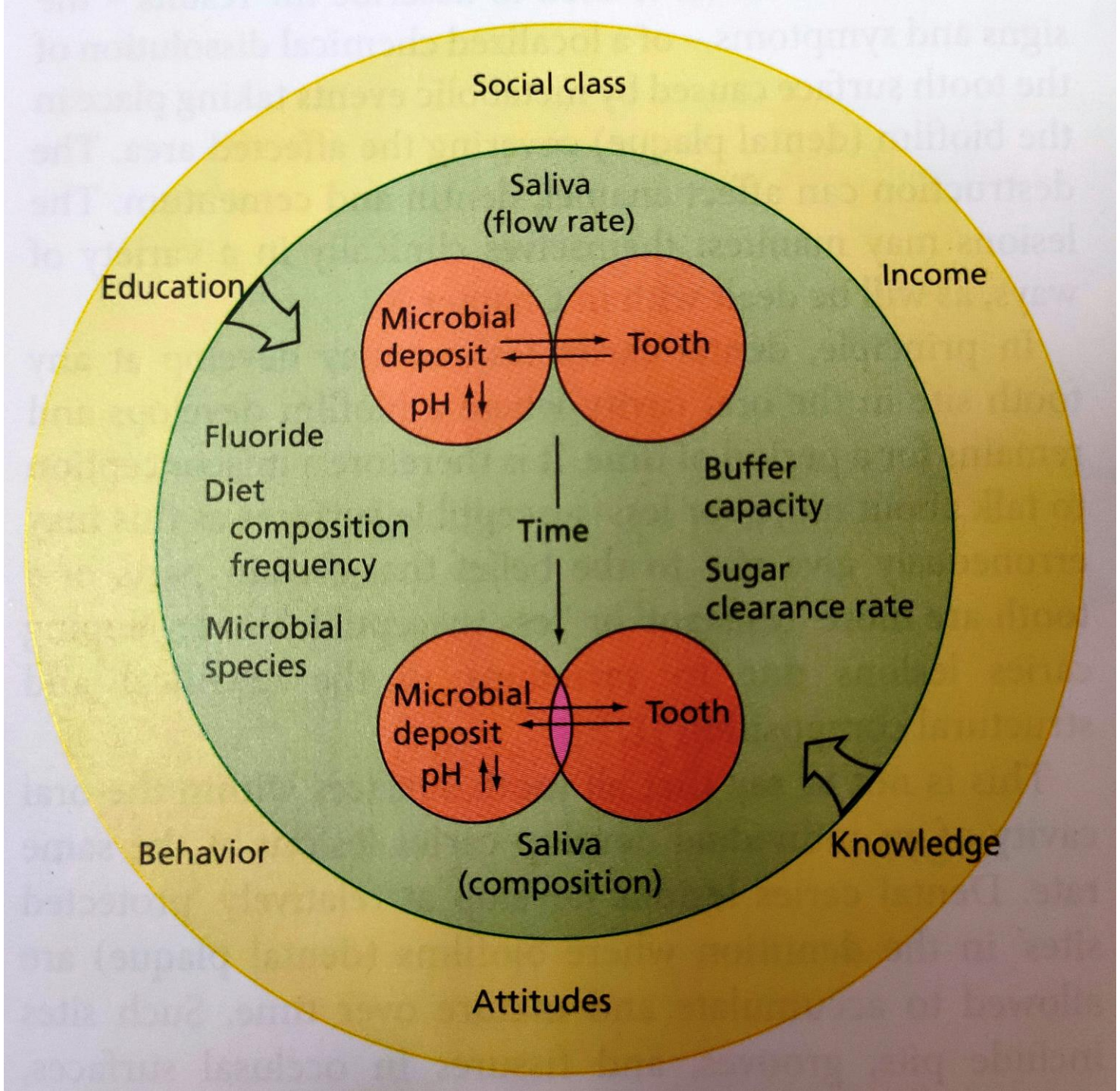
ETIOLOGY OF DENTAL CARIES



ETIOLOGY OF DENTAL CARIES

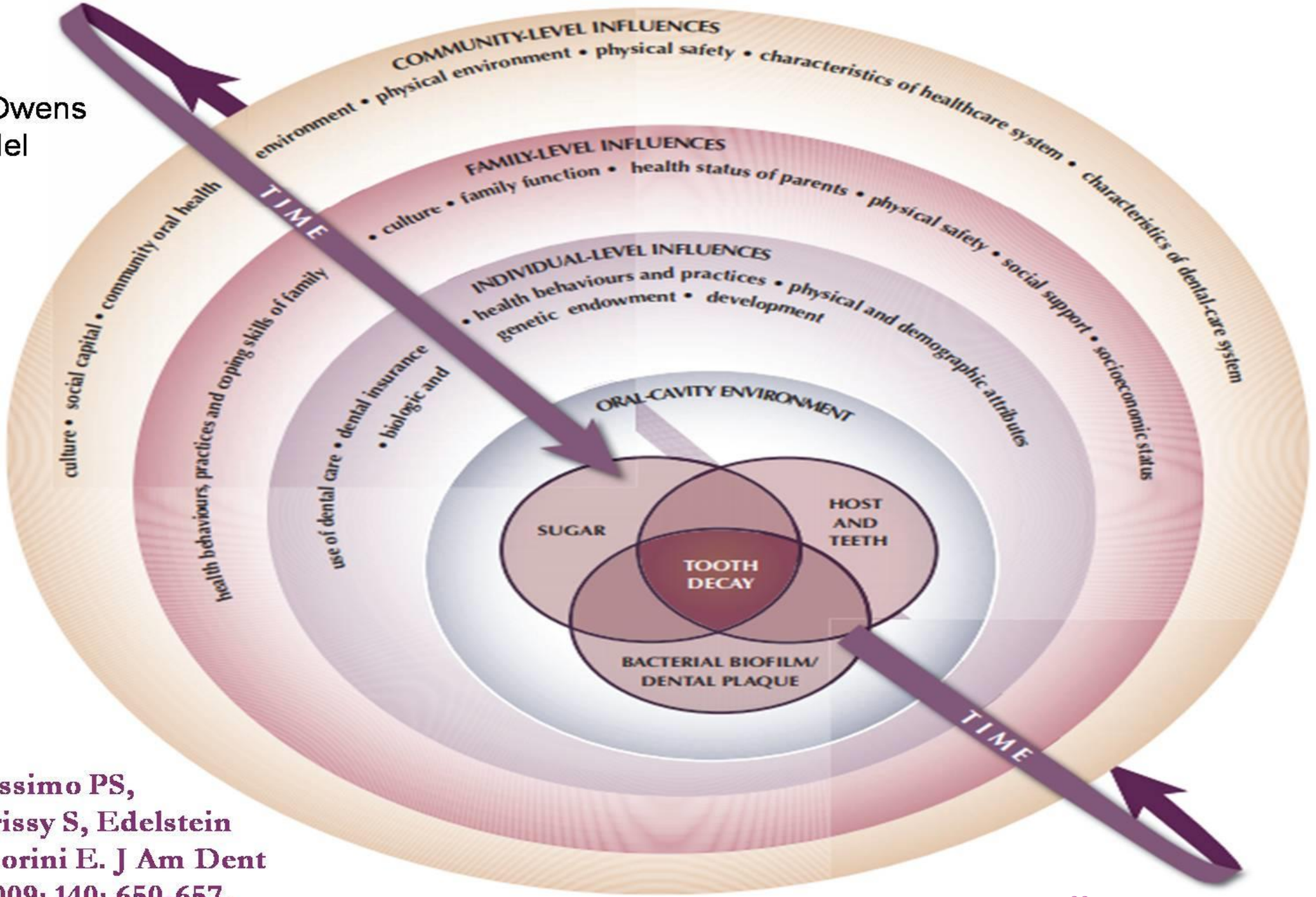


Gordon Nikiforuk. Understanding Dental Caries. Etiology and Mechanisms 1st Edn

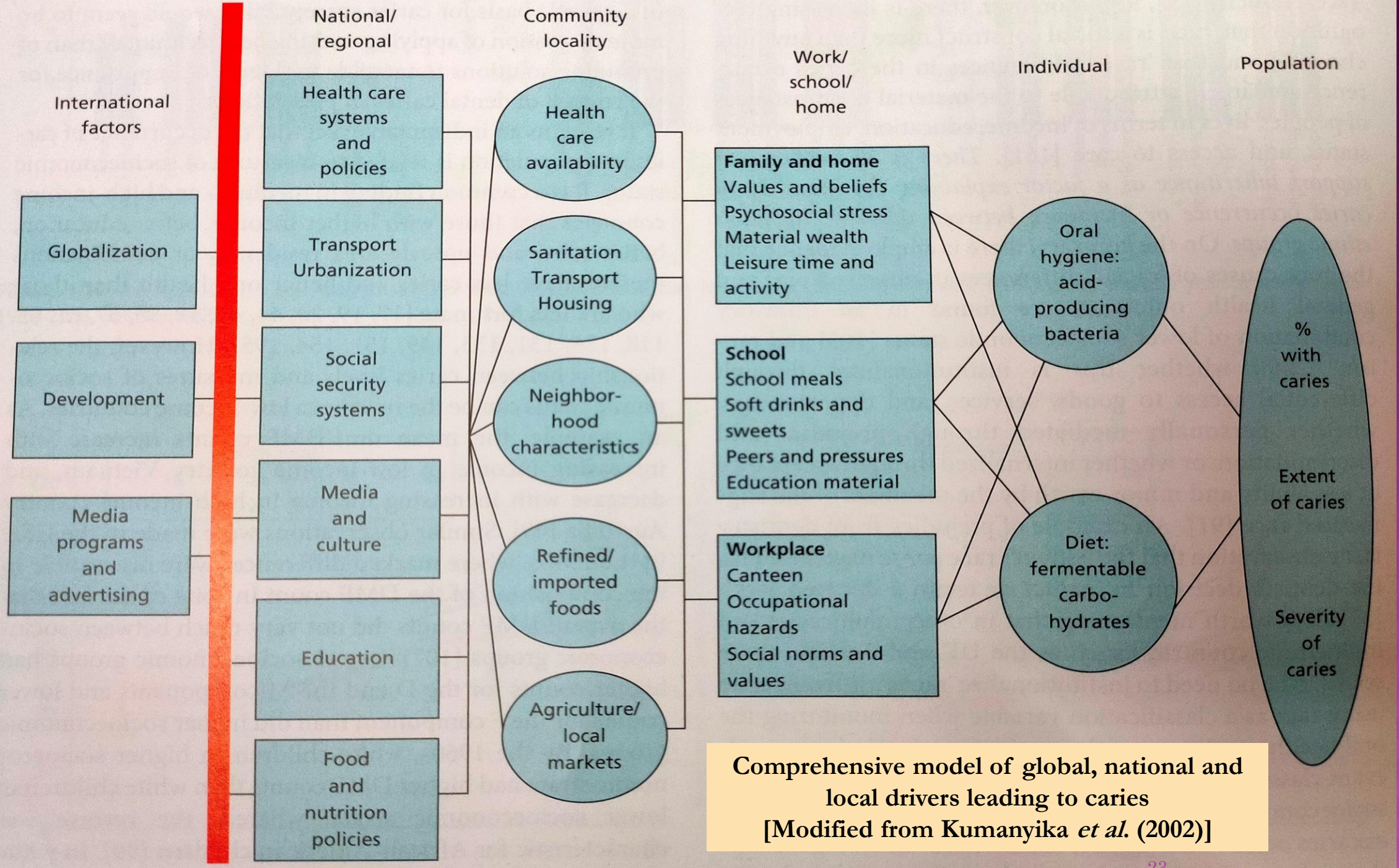


Fejerskov, Manji Model (1990)

Fisher-Owens Model



Casamassimo PS, Thikkurissy S, Edelstein BL, Maiorini E. J Am Dent Assoc 2009; 140: 650-657.



Comprehensive model of global, national and local drivers leading to caries [Modified from Kumanyika *et al.* (2002)]

RISK FACTORS OF ECC

A SYSTEMATIC REVIEW

FACTORS	NUMBER OF RISK FACTORS
Socio-demographic factors	20
Dietary factors	29
Oral hygiene	09
Breast/bottle feeding	15
Oral bacterial flora	04
Other factors	29
TOTAL	106

Harris R, Nicoll AD, Adair PM, Pine CM. Risk factors for dental caries in young children: A systematic review of the literature. Community Dent Health,2004; 21(1 Suppl): 71-85

RISK FACTORS OF ECC

A SYSTEMATIC REVIEW & META-ANALYSIS

FACTORS	NUMBER OF RISK FACTORS [Odds Ratio*]
Socio-demographic factors	19
Dietary factors	29 (Frequent consumption of sweetened foods **3.14***)
Oral hygiene	10 (Poor oral hygiene **3.12***, Visible plaque present **3.1***)
Breast feeding	10
Bottle feeding	15
Oral bacterial flora	3 (Increased baseline salivary values of streptococcus mutans - upper middle income countries **9.21***, High income countries **3.83***)
Other factors	37 (Presence of enamel defects **14.62***, Dentinal caries-dmft>0 **4.21***)
TOTAL	**123**

Kirthiga M, Muthu M, Saikia A, Kirubakaran R. Risk factors for Early Childhood Caries: A Systematic Review and Meta-analysis of Case Control and Cohort studies. Pediatr Dent 2019; 41(2): 95-112

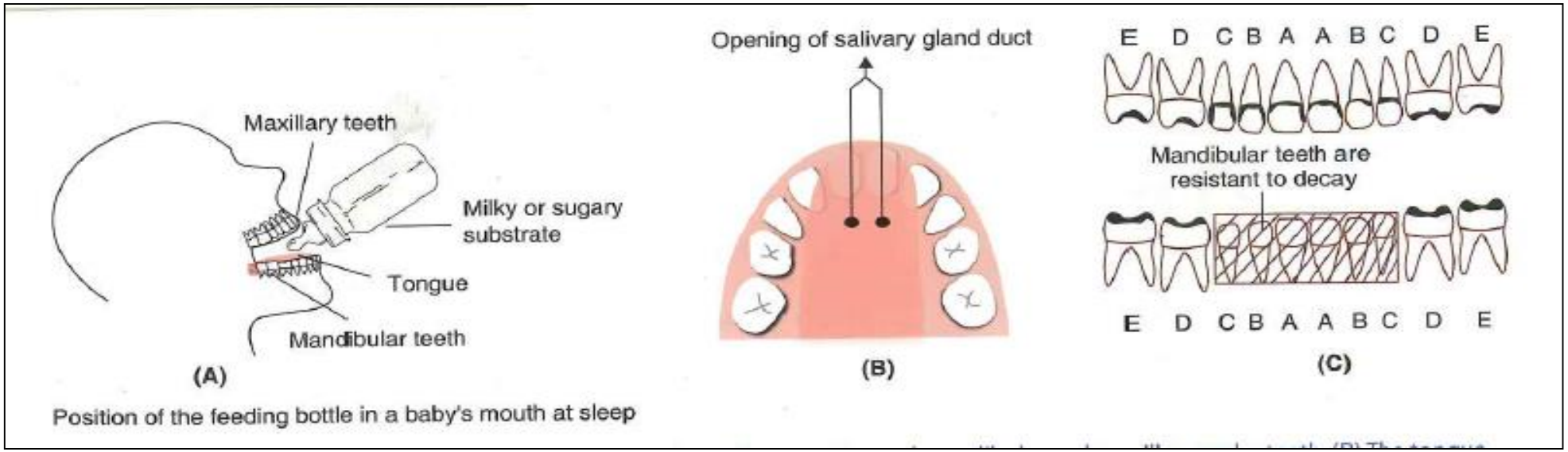
POTENTIAL ETIOLOGICAL FACTORS

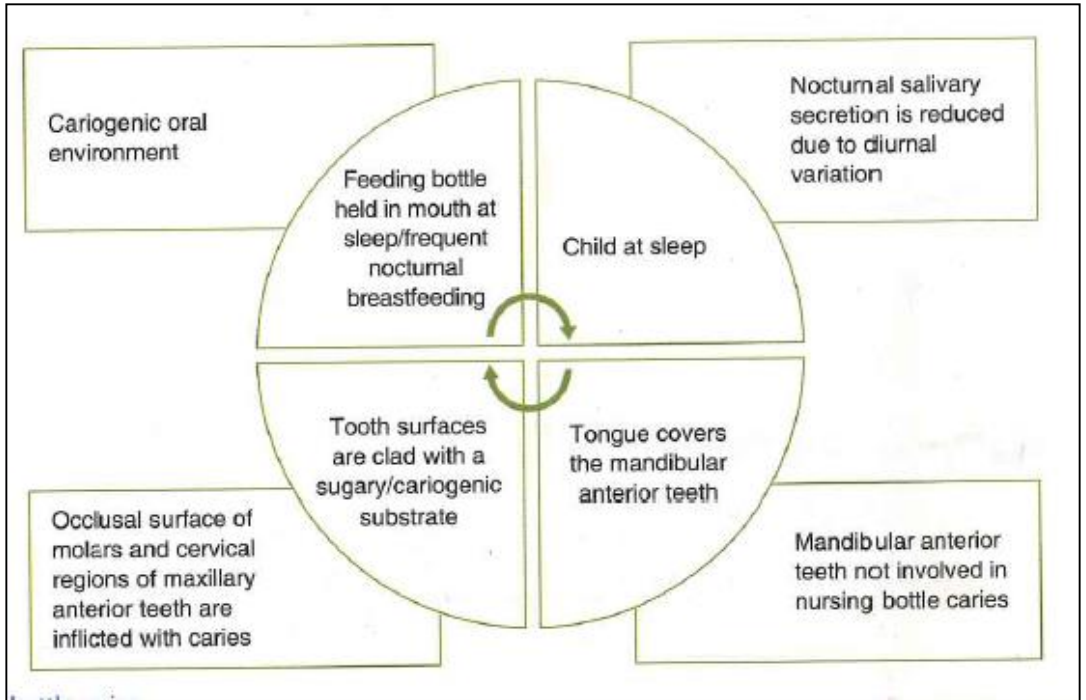
- ✓ **Night time** feeding practices / **Sleep time feeding practices**
- ✓ **Prolonged bottle feeding / "on demand" or "at will" breast feeding <u>after first primary tooth erupts</u>** or **<u>beyond</u>** the age of **<u>12-18 months</u>** [*Should be weaned from bottle at 12-14 months*]
- ✓ Improper **oral hygiene practices** in infants and children
- ✓ Inappropriate **dietary** practices

The Reference Manual of Pediatric Dentistry 2019-2020: 71-73

AMERICA'S PEDIATRIC DENTISTS
THE BIG AUTHORITY on little teeth

FEEDING PRACTICES





AETIOLOGICAL PATTERNS IN ECC

- Pattern A – Infants being fed with a nursing bottle containing a high amount of fermentable carbohydrates during sleep

- Pattern B – Unrestricted nocturnal breastfeeding (At will) after eruption of primary incisors and poor oral hygiene

- Pattern C – Deficient salivary quantity/flow
  Deficient antibacterial properties
  Poor salivary buffering capacity & pH
  High Cariogenic potential

Henry JA *et al.* Int J Ped Dent 2016; 27(3)

MICROBIOTA OF DENTAL CARIES

VIRULENCE OF A BACTERIA

- Ability to pump protons at very low pH
- Having an enzyme system that can maintain low pH
- Ability to produce acid stress response proteins

ENAMEL CARIES

- Streptococcus Mutans (SM Serotype) – Initiation of caries
- Streptococcus Sorbinus (SM Serotype) – Initiation of caries
- Lactobacilli Spp. – Progression of caries

MICROBIOTA OF DENTAL CARIES

STREPTOCOCCUS MUTANS

- Chief sugar transport system: P.E.P – P.T.S system (Ferment sugar at very low concentration)

- Produce **Extracellular and Intracellular Polysaccharides**

- **Extracellular Polysaccharides:** Glucans – Help plaque matrix formation; Fructans – Are liable and can easily meatabloize under carbohydrate restriced conditions.
- **Intracellular Polysaccharides**: Glycogen like storage compounds (used for energy production and converted to when free sugars are not available)

MATERNAL S. MUTANS – A CONTROVERSY!!

- MDSMD – Vertical transmission of MS from mothers to their children, especially when mothers have high MS levels.

Li Y, Caufield PW. J Dent Res 1995; 74: 681-85.
Douglass JM, Li Y, Tinanoff N. Pediatr Dent 2008; 30: 375-87.

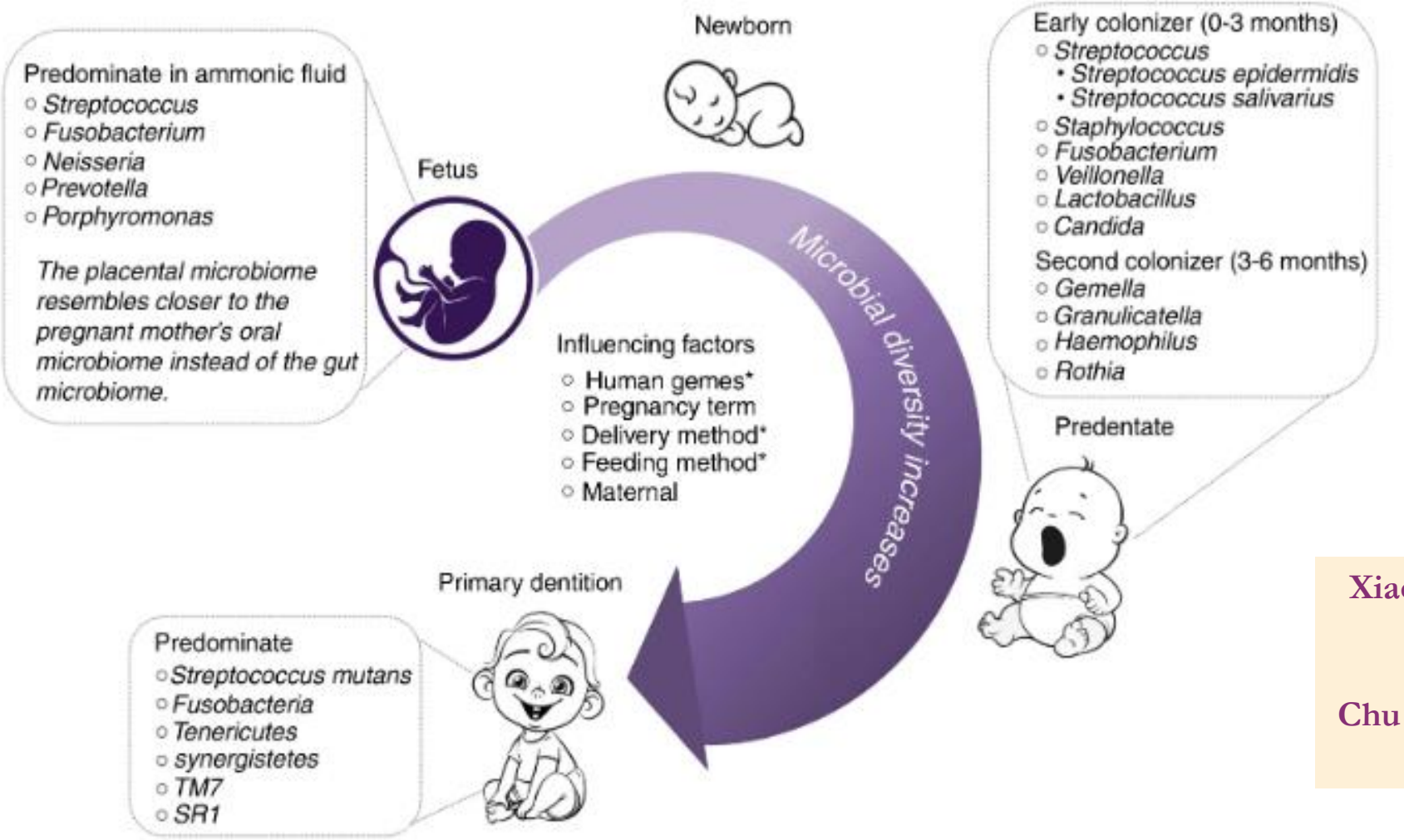
- MS genotypes that did not match their maternal strains were identified in the majority of S-ECC population

Mitchell *et al.* Pediatr Dent 2009; 31: 193-201.

- Horizontal transmission

Berkowitz RJ. Pediatr Dent 2006; 28(2): 106-9
Parisotto TM *et al.* Oral Health & Prev Dent 2010; 8(1): 59-70

Oral microbiome development in early childhood and influencing factors



Xiao Jin *et al.* Int J Oral Sci 2020; 12: Article 12.

Chu *et al. Nat. Med.* 2017; 23, 314–326.

* Human genes (influencing factor)

- One locus on chromosome 7 near gene IMMPL2
- One locus on chromosome 12 near gene INHBA-AS1
- Gene STAT3

* Delivery mode (influencing factor)

- Vaginal birth: predominantly *Lactobacillus, Prevotella, Bacteroids, TM7, and Sneathia spp*
- C-section: predominantly *Staphylococcus, Corynebacterium, Slackia, Veillonella* and *Propionibacterium, spp*

ORAL CANDIDA ALBICANS COLONIZATION

- Children with C. albicans in saliva have **FIVE** times higher chances of ECC occurrence

Xiao J, Huang X, Alkhers N *et al.* Caries Res 2018; 52(1-2): 102-112

- C. albicans in saliva have an increased risk of severe ECC

Beena MS, Faizal CP, GufranAfmed MB *et al.* J Ind Soc Ped Prev Dent 2017; 35(4): 296-300.
Thomas A, Mhambrey S, Chokshi K *et al.* J Clin Diagn Res 2016; 10(8): ZC109-ZC112.

SCARDOVIA WIGGSIAE – A NEW CARIES PATHOGEN

J Oral Biosci. 2017 Aug;59(3):135-141. doi: 10.1016/j.job.2017.05.002. Epub 2017 May 24.

Scardovia wiggsiae and its potential role as a caries pathogen.

Kressirer CA[1,2], Smith DJ[1,2], King WF[1], Dobeck JM[1], Starr JR[1,2], Tanner ACR[1,2].

Author information

Abstract

BACKGROUND: *Streptococcus mutans* has been strongly associated with dental caries but caries also occurs in its absence. Association of a new species, *Scardovia wiggsiae* with childhood caries suggests this could be a new caries pathogen.

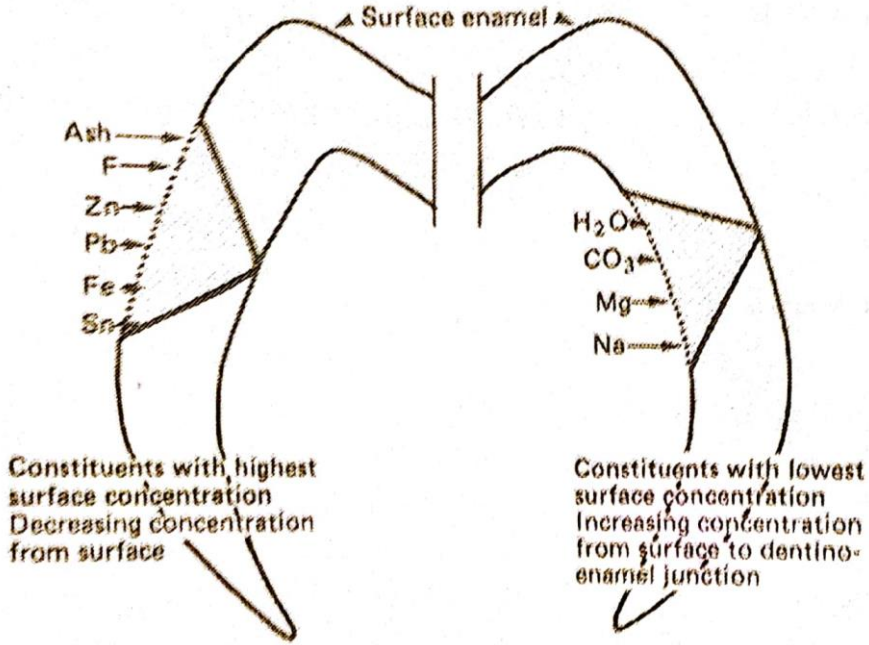
HIGHLIGHT: *S. mutans* is considered a caries pathogen based on its association with caries, and on its ability to produce acid, to survive low pH environments, and to induce caries in experimental animals. *S. wiggsiae* was significantly associated with severe-early childhood caries in the presence and absence of *S. mutans*. Further *S. wiggsiae* was elevated in initial carious lesions in adolescents with fixed orthodontic appliances. *S. wiggsiae* detection was enriched on a low pH agar suggesting acid-tolerance. *S. wiggsiae* isolates were acid tolerant and produced acid from several sugars at low initial pH values, and were not arginine deiminase positive, characteristics consistent with potential cariogenicity. Cariogenicity of *S. wiggsiae* was tested in a rat animal model in parallel with *S. mutans*. While *S. wiggsiae* by itself showed minimal caries induction, when co-inoculated with *S. mutans*, there was significant cavity production.

CONCLUSION: *S. wiggsiae* was associated with advanced and initial caries, is acid tolerant and produces acid to low pH at initial neutral and low pH conditions. In combination with *S. mutans*, *S. wiggsiae* was detected in caries in an animal model. Together, these data suggest that *S. wiggsiae* has many of the characteristics consistent with its being a caries-associated species.

MINERALS IN ENAMEL

Effect	Mineral
Cariostatic	F, P
Mildly cariostatic	Mo, V, Cu, Sr, B, Li, Au, Fe
Doubtful	Be, Co, Mn, Sn, Zn, Br, I, Y
Caries inert	Ba, Al, Ni, Pd, Ti
Caries-promoting	Se, Mg, Cd, Pt, Pb, Si

Cariology (Newbrun)



Gordon Nikiforuk. Understanding Dental Caries. Etiology and Mechanisms

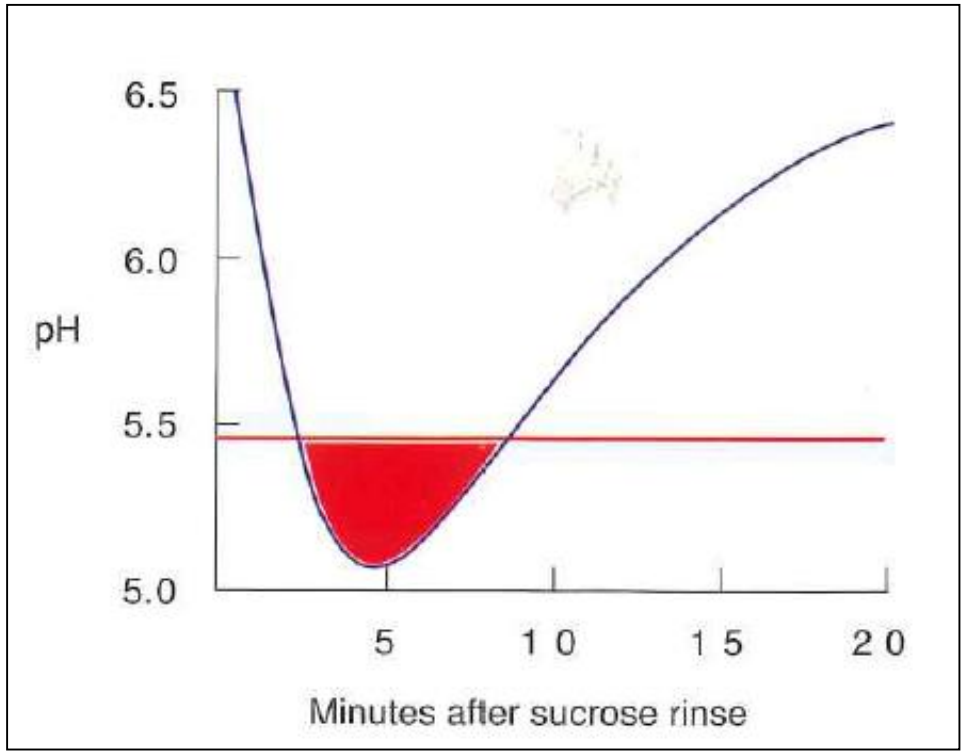
THEORIES IN THE CARIOUS PROCESS

NAME	AUTHOR	CONCEPT
Legend of the worm	Guy de Chauliac	Worms caused tooth decay
Endogenous theories: **1. Humoral theory**	Galen	Internal action of acids and corroding humors
2. Vital theory	End of 18th century	Originated, like bone gangrene, from within the tooth itself
Exogenous theories: **1. Acidogenic theory**	W. D. Miller (1890)	Acid demineralization produced by fermentation of sugars
2. Proteolysis theory	Gottlieb (1944)	Proteolytic enzymes of oral bacteria causing destruction of organic material of tooth
3. Sulfatase theory	Pincus (1950)	Hyrolysis by sulfatase enzyme - sulphuric acid
4. Proteolysis chelation theory	Schatz and Martin (1955)	Chelates cause destruction without acid formation
5. Sucrose chelation theory	Lura (1967)	Loss of inorganic phosphate from enamel (phosphorylating theory)
6. Burke and Jackson hypothesis	Burke and Jackson (1970)	High/low risk sites on tooth determined by genes (autoimmune theory)

CRITICAL PH

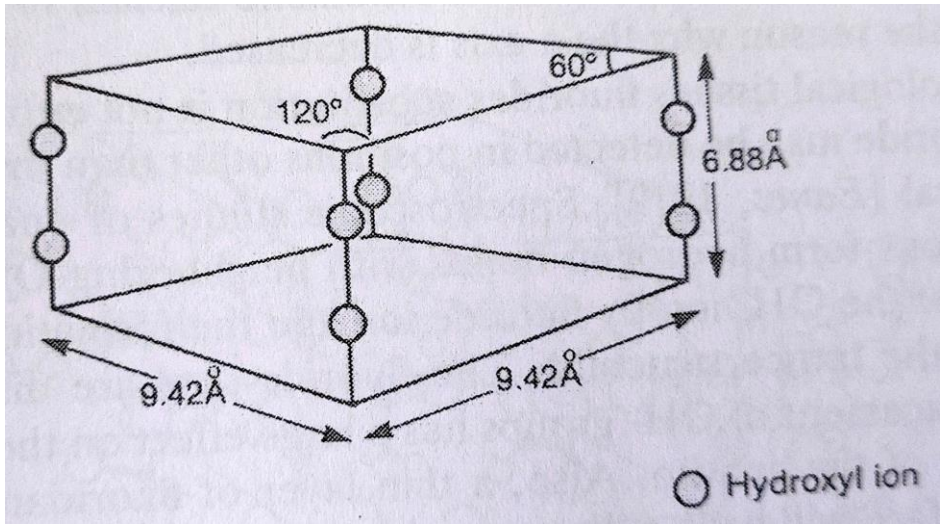
It is the pH below which a tooth is subjected to DEMINERALIZATION

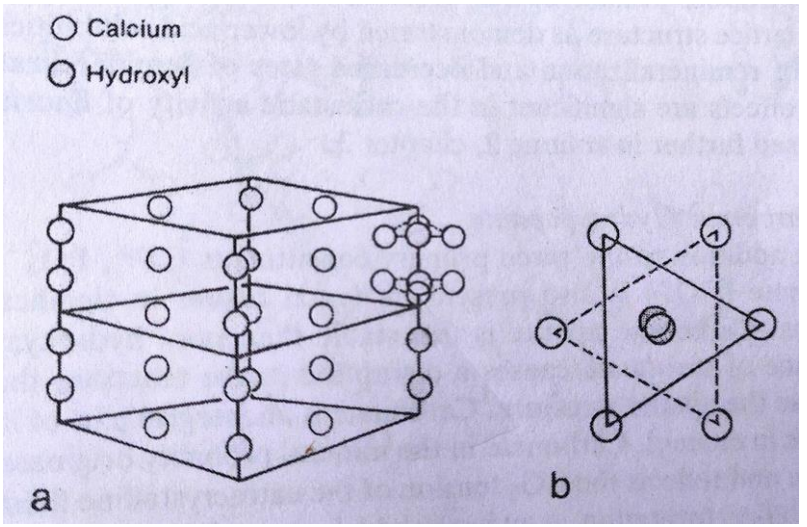
Mean Value is 5.5

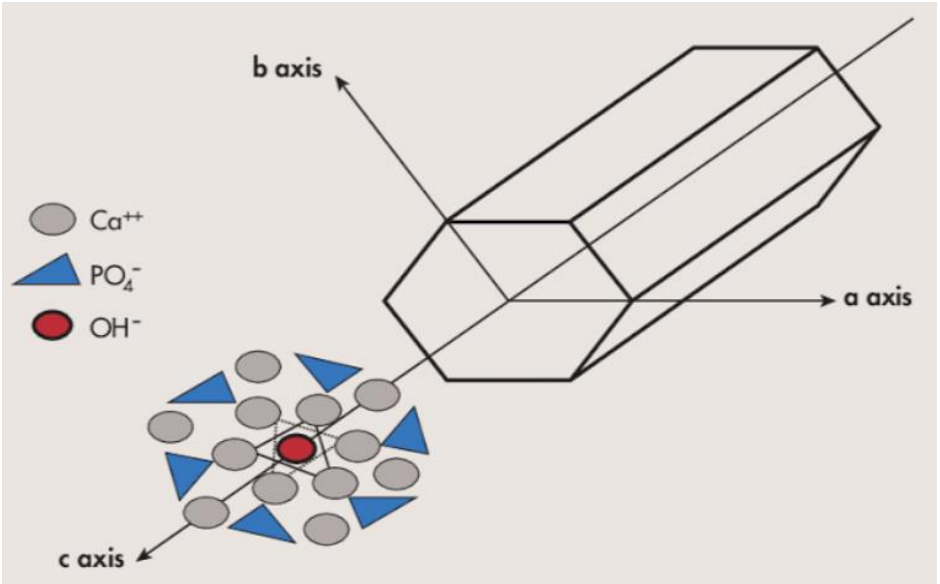


STEPHAN's curve

HYDROXYAPATITE CRYSTAL

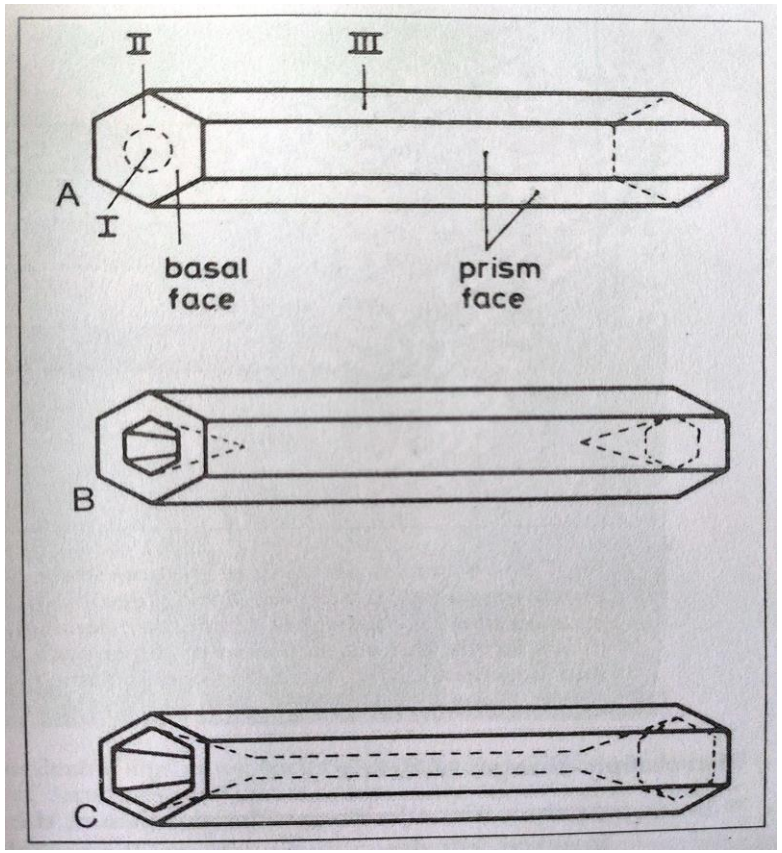


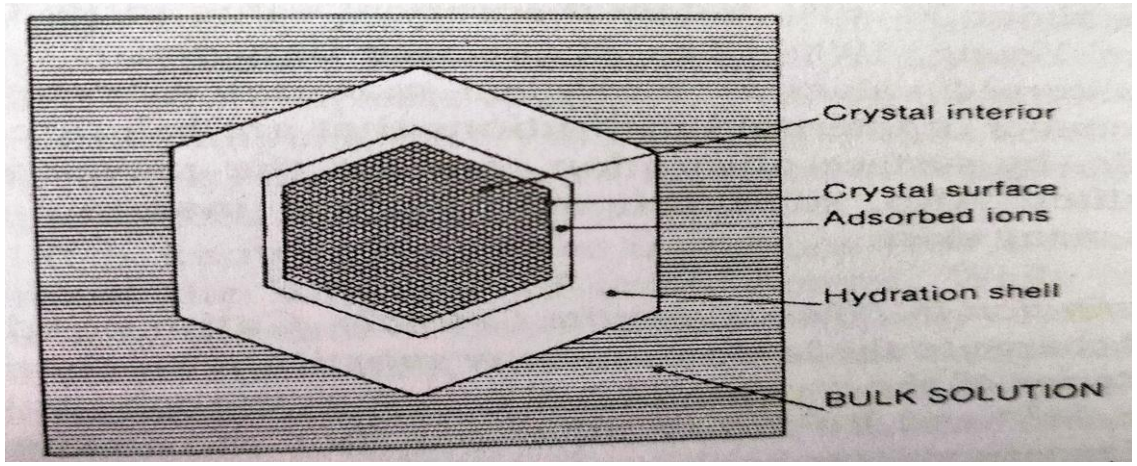


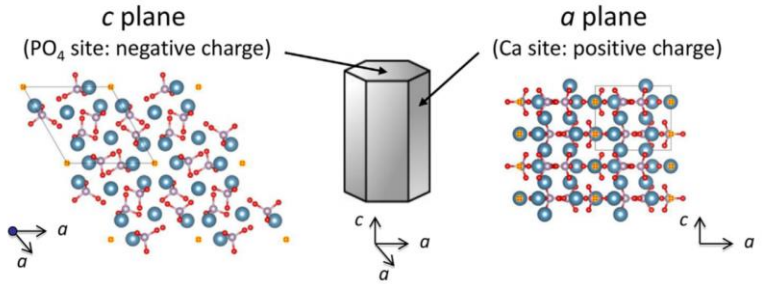


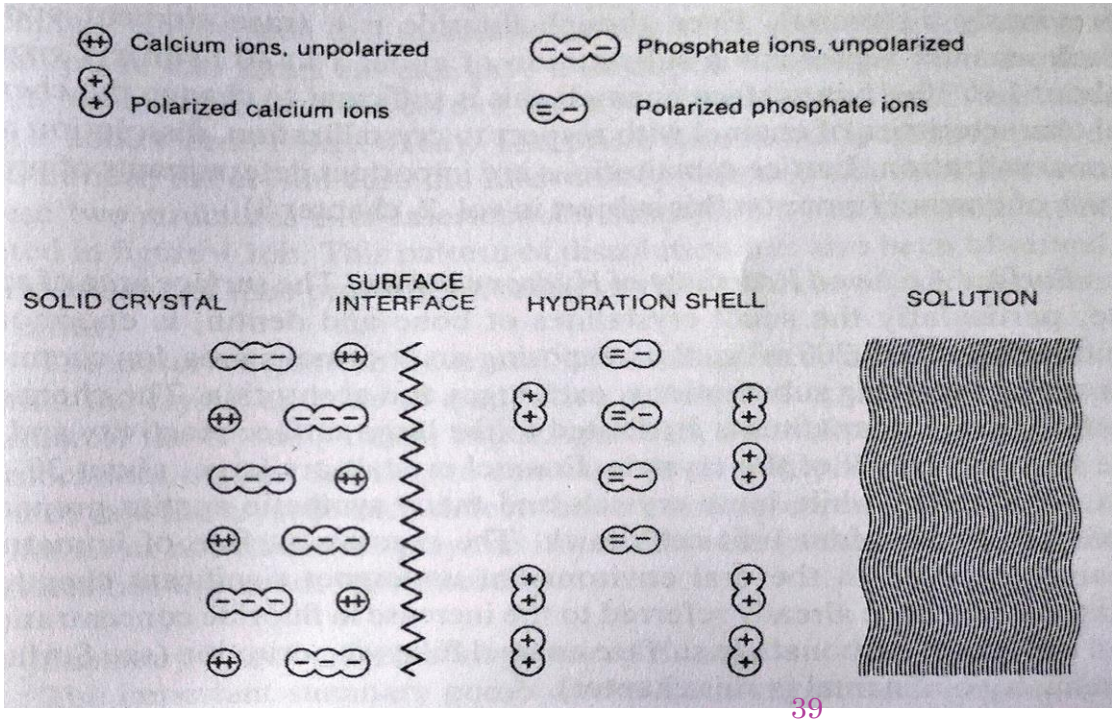
CARIOUS PROCESS

HYDROXYAPATITE CRYSTAL









CURRENT CONCEPT IN THE PATHOGENESIS OF DENTAL CARIES

DEMINERALIZATION – REMINERALIZATION CYCLE

- **At pH below 5.5** – DEMINERALIZATION occurs,

$$Ca_{10}(PO_4)_6(OH)_2 + 10\ H^+ \longrightarrow 10\ Ca_2 + 6H(PO_4)^{3-} + 2H_2O$$

[Lactic acid/ Acetic acid]

[Instable hypoposhate ion]

- Voids are formed in enamel and the surrounding saliva becomes supersaturated with Ca^{2+} and instable phosphate ions.

- When **pH rises back to neutral pH** and the **buffering action of saliva**,

$$H_2O + CO_2 \longrightarrow \mathbf{H_2CO_3}$$ [Carbonic acid – WEAK ACID]

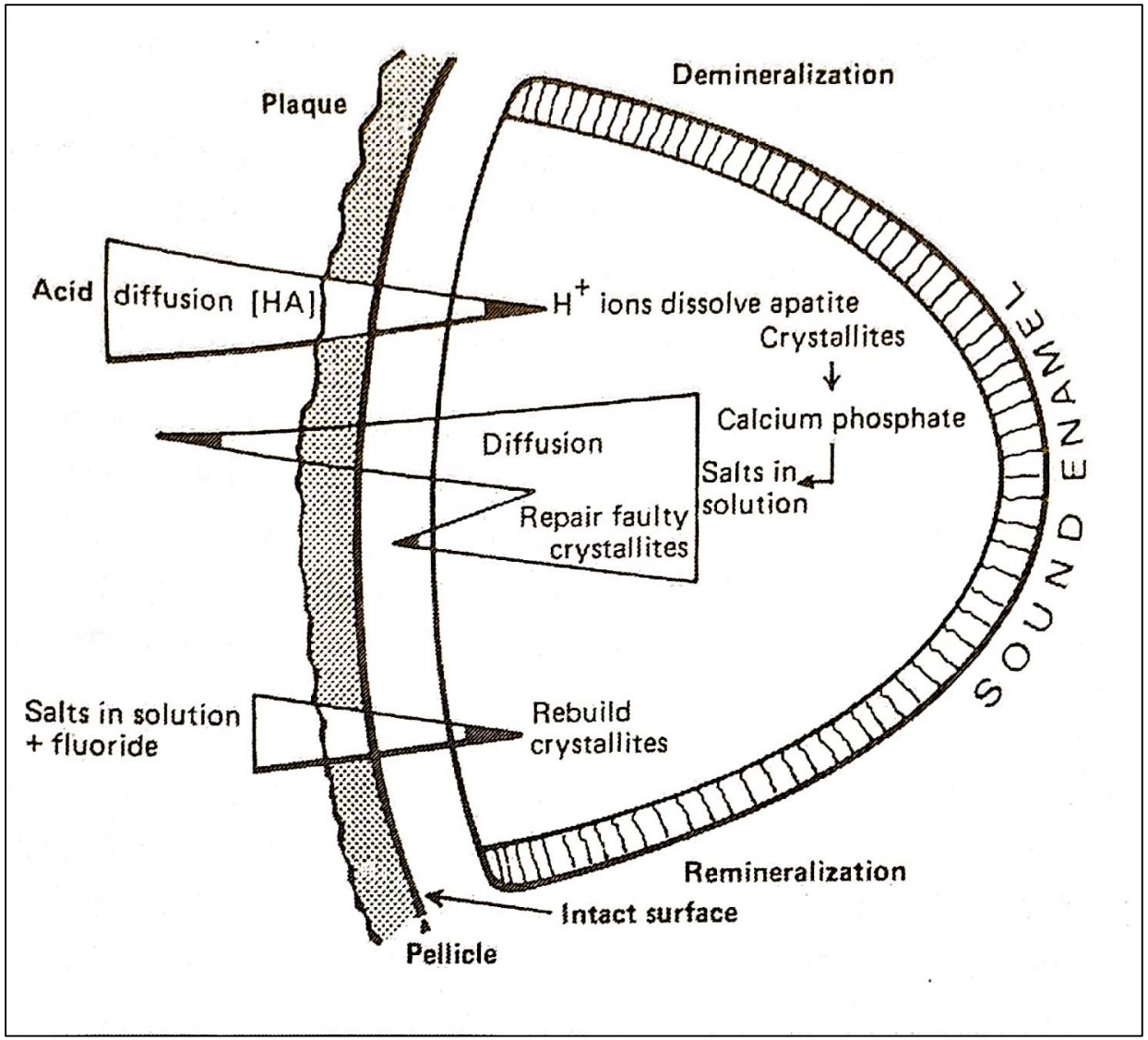
- To re-establish equilibrium pressure of CO_2, decomposition of H_2CO_3 occurs

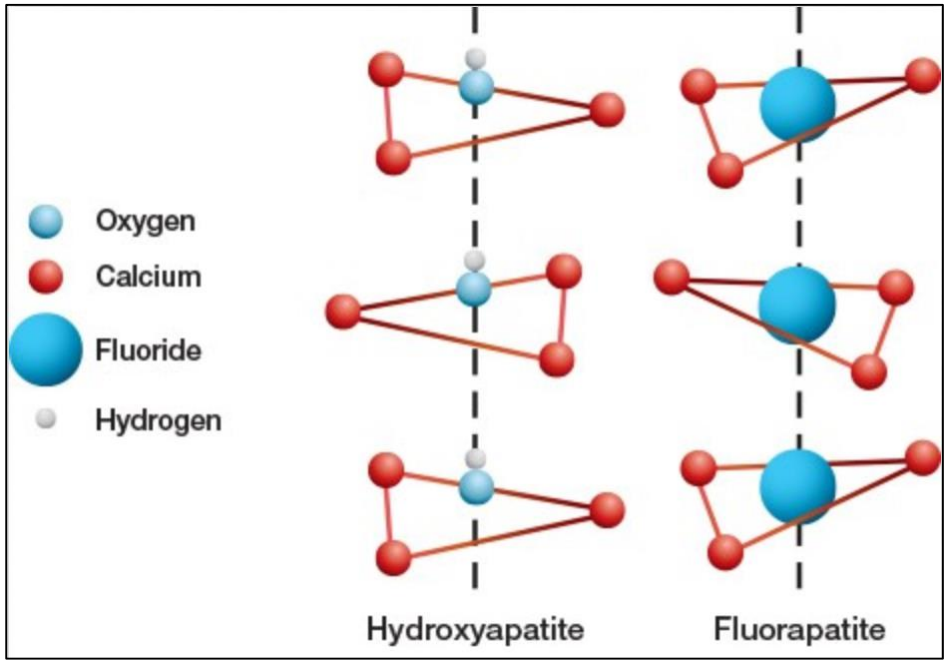
$$H_2CO_3 \longrightarrow HCO_3^-\ (+\ CO_3^{2-}\ +\ \text{Bubbling of } CO_2)$$

[Bicarbonate ion] [Carbonate ion] [More release than blood plasma]

- **REMINERALIZATION** occurs

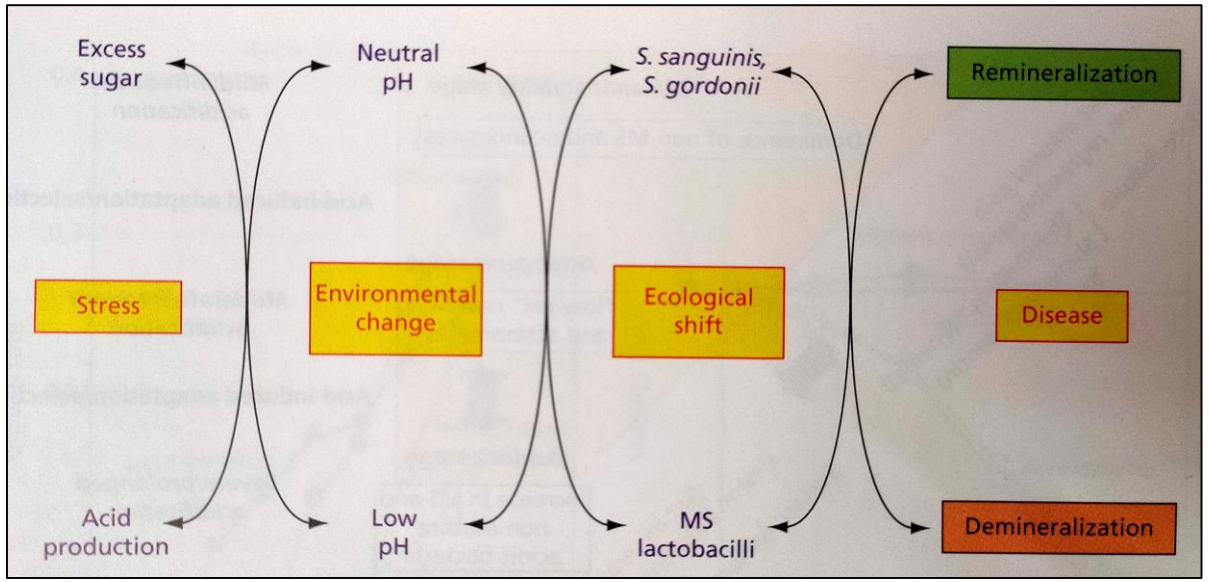
DEMINERALIZATION – REMINERALIZATION CYCLE

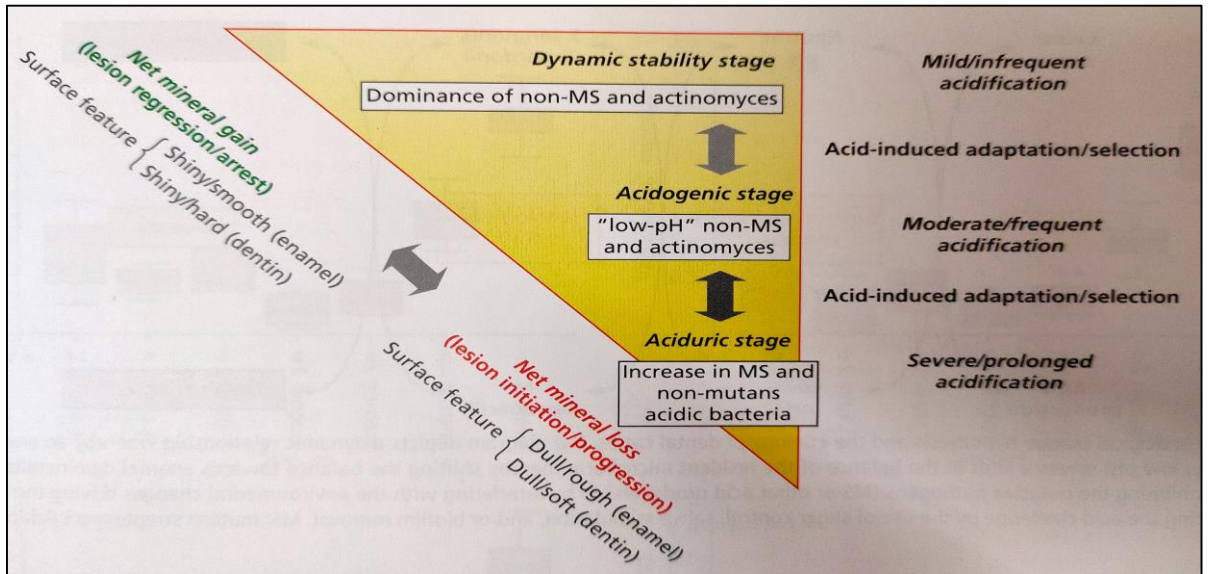




Gordon Nikiforuk. Understanding Dental Caries. Etiology and Mechanisms

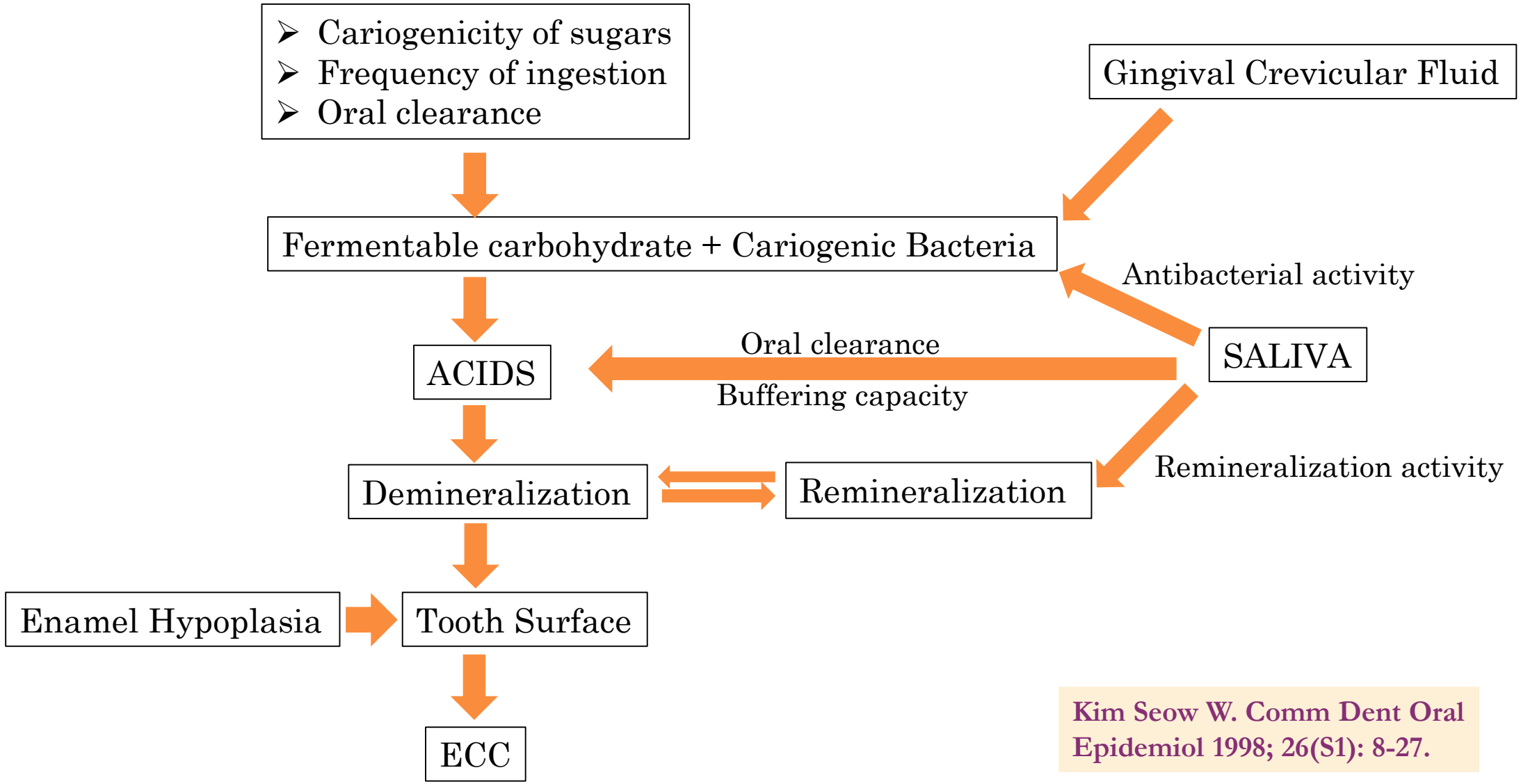
ECOLOGICAL PLAQUE HYPOTHESIS - EXTENDED





Ole Fejerskov, Bente Nyvad, Edwina Kidd. Dental Caries: The Disease and its clinical Management. 3rd Edn., Pg 127-128

BIOLOGICAL MECHANISMS OF ECC



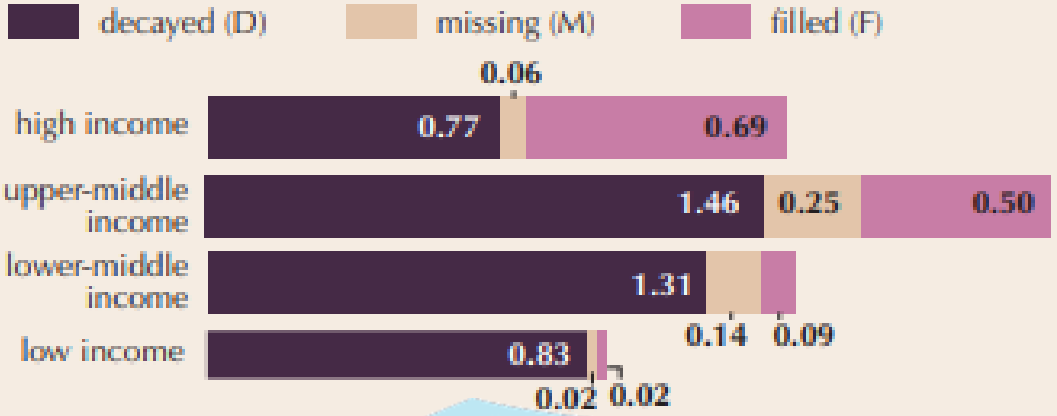
Kim Seow W. Comm Dent Oral Epidemiol 1998; 26(S1): 8-27.

GLOBAL PREVALENCE OF DENTAL CARIES

FDI ATLAS 2015

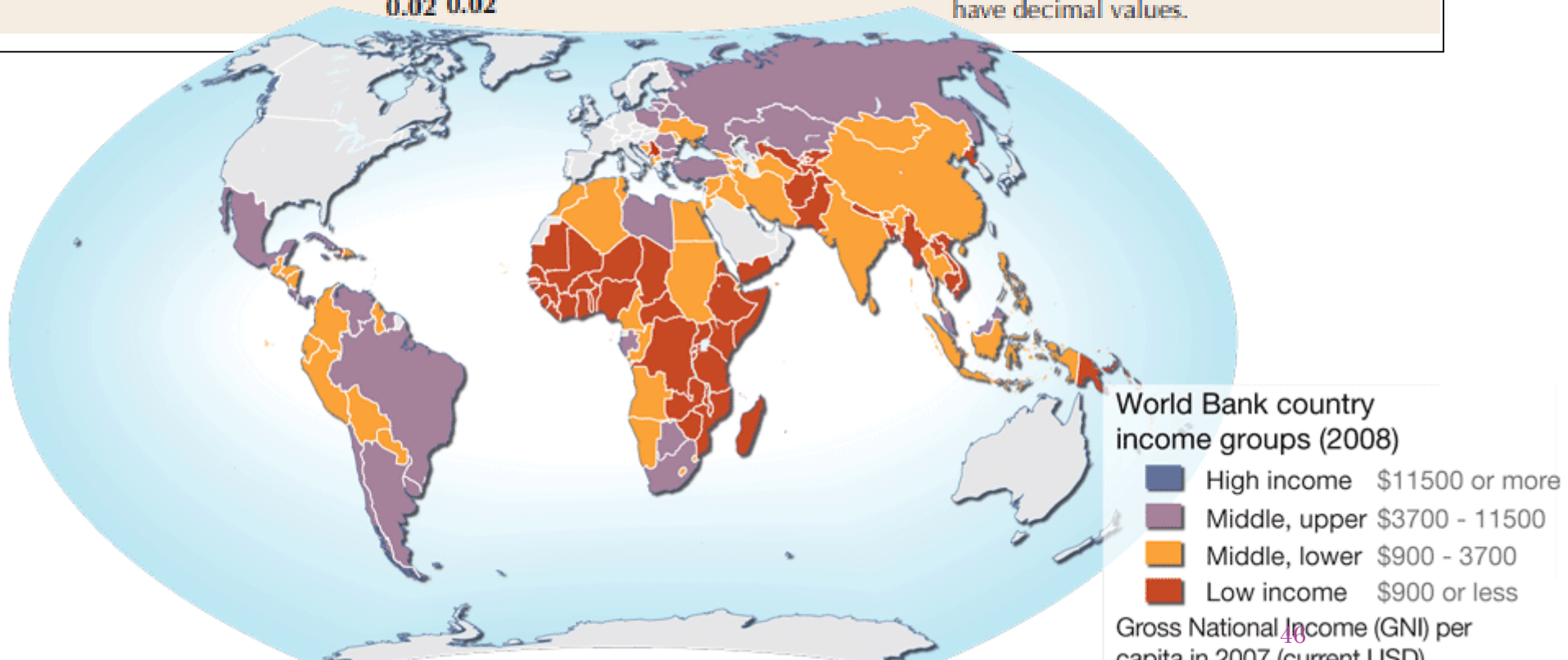
GLOBAL DISTRIBUTION OF TOOTH DECAY

Average number of affected teeth for 12-year-olds
by country income group
2000 or latest available data



The DMFT Index

The DMFT index is generally used to report tooth decay in epidemiological studies. It records the number of decayed (D), missing (M) and filled (F) teeth (T). While DMFT is not the only measure and has limitations, the oral health status of populations is often summarized as a DMFT score (usually of 12-year-olds). A DMFT score of 1.0 means that 1 of the 32 adult teeth is either decayed, missing or filled. Scores for individuals are full numbers, for populations they can have decimal values.



PREVALENCE STUDIES IN INDIA (TILL 1999)

Prevalence rates of caries in Indian children at various ages

Children below the age of 5 years

Investigators	Year	Place	Prevalence
Sarkar and Chaudhary	1992	West Bengal	20.2
Sethi and Tandon	1996	Karnataka	65.5
Goyal et al.	1997	Punjab	28.5

Children of 5–6 years of age

Investigators	Year	Place	Prevalence
Shourie	1941	Delhi	50.8
Chaudhary	1967	Lucknow	52.3
Tiwari and Chawla	1977	Chandigarh	70.6
Damle et al.	1982	Haryana	74.0
Chopra	1985	Delhi	34.1
Gupta et al.	1987	Karnataka	50.8
Sharma et al.	1988	Shillong	88.33
Norboo et al.	1998	Leh	74.6
Menon and Indushekhar	1999	Karnataka	2.56

Children at the age of 12 years

Investigators	Year	Place	Prevalence
Shourie	1941	Delhi	54.8
Gill	1968	Lucknow	43.8
Damle et al.	1982	Haryana	89.5
Tiwari et al.	1985	Crissa (Odisha)	63.8
Sahoo et al.	1986	Orissa (Odisha)	67.9
Chawla et al.	1993	Chandigarh	31.4
Damle and Patel	1994	Bombay (Mumbai)	80.1
Norboo et al.	1998	Leh	47.7
Rodriguez and Damle	1998	Bombay (Mumbai)	63.4
Menon and Indushekhar	1999	Karnataka	31.0
Singh et al.	1999	Haryana	33.1

PREVALENCE OF DENTAL CARIES IN INDIA (2010 -2018)

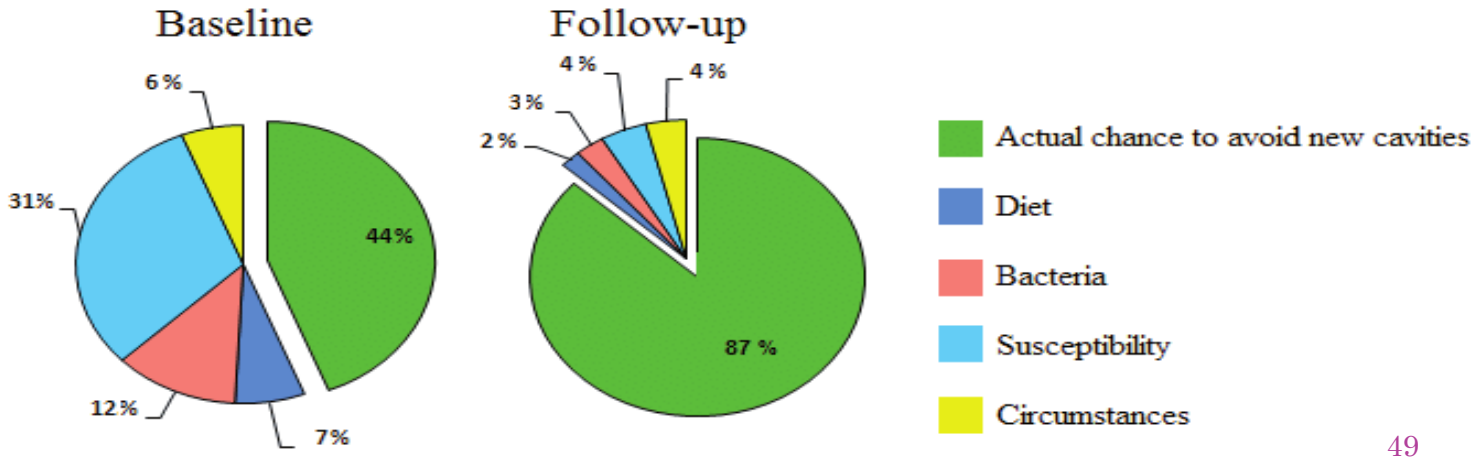
WHO INDEX AGE GROUPS	MEAN DMFT	PREVALENCE (%)
5 years	2.36	49
12 years	1.95	49
15 years	3.31	60
35-44 years	--	78
65-74 years	7.01	84

Janakiram C et al. Prevalence of Dental Caries in India among the WHO Index Age Groups: A Meta-Analysis. J Clin Diag Res 2018; Aug, Vol-12(8): ZE08-ZE13

CARIES RISK ASSESSMENT

CARIOGRAM

- Brathal 1996
- Graphical picture – interactive tool
- Calculates individuals risk of developing new caries in the future and the extent of an etiological factor
- Colours: **Green** – Chance to avoid new cavities
  Dark Blue – Diet contents, frequency, lactobacillus count
  Red – Bacteria – Amount of plaque, S.Mutans count test
  Light Blue – Suceptibility – Fluoride program, saliva secretion, Buffering capacity
  Yellow – Circumstances – Past caries experience, Related diseases
- INCREASED **GREEN** – GOOD (Decreased caries Risk)



CARIES RISK ASSESSMENT

CARIES ASSESSMENT TOOL (CAT)

- Introduced by AAPD

- Part 1: History (Interviewing parent/Caregiver)
  Child with special Needs, Dry mouth, Routine dental visit, has decay, time elapsed since last cavity, appliances, Parent or sibling has decay, socio-economic status, exposure to fluoride etc

- Part 2: Clinical Evaluation (Examination of Child's mouth)
  Visible plaque, gingivitis, areas of demineralization, enamel defects, deep pit and fissures

- Part 3: Supplemental Professional Assessment (Optional)
  R/F Enamel caries, Levels of MS, LB

Interpretation:

a. Child's ultimate risk is based on the highest risk category: Presence of a single risk indicator in any area of high risk classifies child as high risk
b. Classifies caries risk at a given point of time

McDonald and Avery's. Dentistry For The Child And Adoloscent. 9th Edn

Caries-Risk Assessment Form from Birth to 5 Years Old (For Dental Providers)

Factors	High Risk	Moderate Risk	Protective
Biological			
Mother/primary caregiver has active caries	Yes		
Parent/caregiver has low socioeconomic status	Yes		
Child has >3 between meal sugar-containing snacks or beverages per day	Yes		
Child is put to bed with a bottle containing natural or added sugar	Yes		
Child has special health care needs		Yes	
Child is a recent immigrant		Yes	
Protective			
Child receives optimally fluoridated drinking water or fluoride supplements			Yes
Child has teeth brushed daily with fluoridated toothpaste			Yes
Child receives topical fluoride from health professional			Yes
Child has dental home/regular dental care			Yes
Clinical Findings			
Child has >1 decayed/missing/filled surfaces	Yes		
Child has active white spot lesions or enamel defects	Yes		
Child has elevated mutans streptococci levels	Yes		
Child has plaque on teeth		Yes	

Circling those conditions that apply to a specific patient helps the practitioner and parent understand the factors that contribute to or protect from caries. Risk assessment categorization of low, moderate, or high is based on preponderance of factors for the individual. However, clinical judgment may justify the use of one factor (e.g., frequent exposure to sugar-containing snacks or beverages, more than one decayed/missing/filled surface [dmfs]) in determining overall risk.

Overall assessment of the child's dental caries risk: High ☐ Moderate ☐ Low ☐

From American Academy of Pediatric Dentistry: Clinical guideline on caries-risk assessment and management for infants, children, and adolescents, *Pediatr Dent* 33(special issue):110–117, 2011.

Table 2. Caries-risk Assessment Form for ≥6 Years Old

(For Dental Providers)

Factors	High risk	Moderate risk	Low risk
Risk factors, social/biological			
Patient has life-time of poverty, low health literacy	Yes		
Patient has frequent exposure (>3 times/day) between-meal sugar-containing snacks or beverages per day	Yes		
Child is a recent immigrant		Yes	
Patient has special health care needs		Yes	
Protective factors			
Patient receives optimally			
Patient brushes teeth dail			
Patient receives topical fl			
Patient has dental home/			
Clinical findings			
Patient has ≥1 interproxi			
Patient has active non-ca			
Patient has low salivary f			
Patient has defective rest			
Patient wears an intraora			

Circling those conditions
or protect from caries. R
However, clinical judgme

Overal

Table 1. Caries-risk Assessment Form for 0-5 Years Old

Factors	High risk	Moderate risk	Low risk
Risk factors, social/biological			
Mother/primary caregiver has active dental caries	Yes		
Parent/caregiver has life-time of poverty, low health literacy	Yes		
Child has frequent exposure (>3 times/day) between-meal sugar-containing snacks or beverages per day	Yes		
Child uses bottle or non-spill cup containing natural or added sugar frequently, between meals and/or at bedtime	Yes		
Child is a recent immigrant		Yes	
Child has special health care needs		Yes	
Protective factors			
Child receives optimally-fluoridated drinking water or fluoride supplements			Yes
Child has teeth brushed daily with fluoridated toothpaste			Yes
Child receives topical fluoride from health professional			Yes
Child has dental home/regular dental care			Yes
Clinical findings			
Child has non-cavitated (incipient/white spot) caries or enamel defects	Yes		
Child has visible cavities or fillings or missing teeth due to caries	Yes		
Child has visible plaque on teeth	Yes		

Circling those conditions that apply to a specific patient helps the practitioner and parent understand the factors that contribute to or protect from caries. Risk assessment categorization of low, moderate, or high is based on preponderance of factors for the individual. However, clinical judgment may justify the use of one factor (e.g., frequent exposure to sugar-containing snacks or beverages, more than one decayed missing filled surfaces [dmfs]) in determining overall risk.

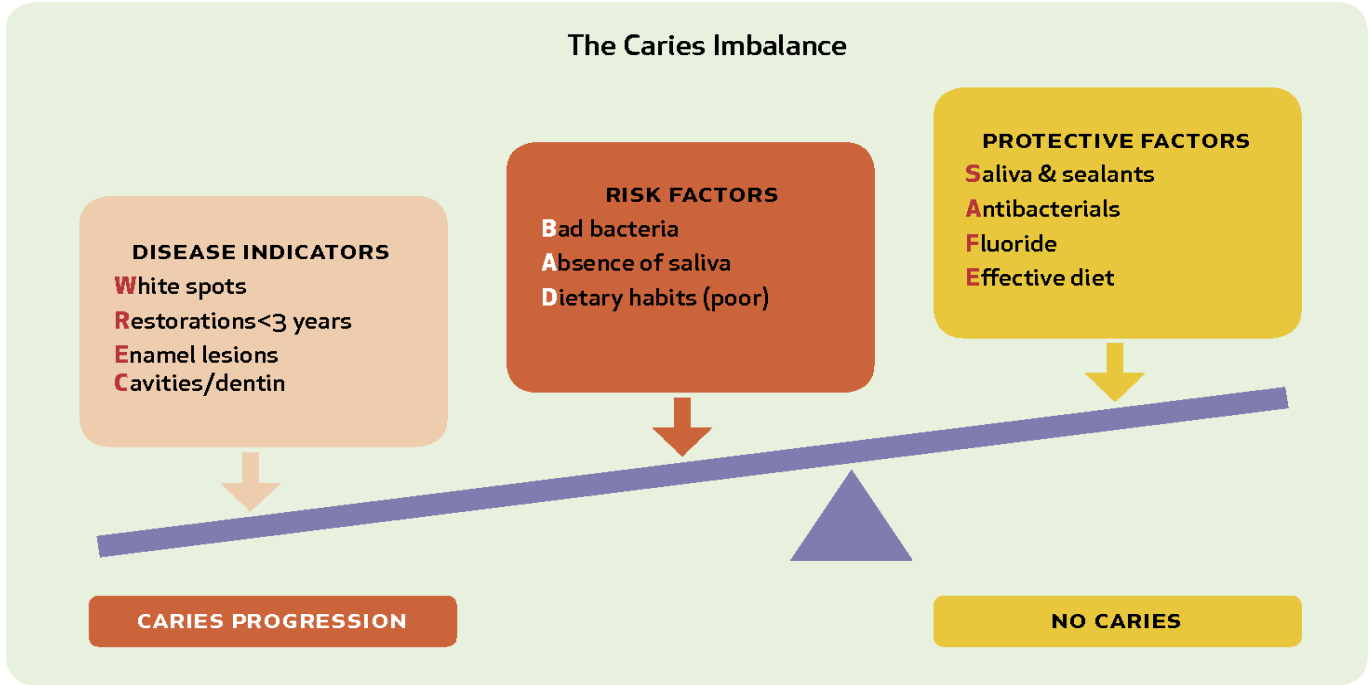
Overall assessment of the child's dental caries risk: High ☐ Moderate ☐ Low ☐

CARIES RISK ASSESSMENT

CAMBRA [CARIES MANAGEMENT BY RISK ASSESSMENT]

- The caries process is dependent upon the interaction of protective and pathologic factors in saliva and plaque biofilm as well as the balance between the cariogenic and non-cariogenic microbial populations that reside in saliva.

- Confirmed 'CARIES BALANCE CONCEPT' [Fl^- alone can't prevent caries, but other factors are also responsible]



Featherstone, Young & Wolff. J Calif Dent Assoc 2007; 35
Featherstone, Chaffe. Advances in Dent Res 2018; 29(1):9-14

CARIES RISK ASSESSMENT

NUS-CRA [NATIONAL UNIVERSITY OF SINGAPORE]

- Algorithm based program similar to cariogram
- Sensitivity/Specificity are higher than all CRA tools > 160%
- **Socidemographic factors**
- **Behavioral factors** (Feeding, Diet and Fluoride),
- **Clinical factors** (OHI, Past caries experience, Systemic health)
- **Salivary and microbiological** (S.Mutans & Lactobacillius count)

Gao X *et al.* J Dent 2013; 41(9): 787-95

CARIES DETECTION SYSTEMS

WHO 1979 [211]	WHO basic methods [212]	NIDRC/NHANES [4, 45]	BASCD [5]	Nyvad *et al.* [18, 174]	ICDAS [89, 90]
Initial caries Enamel caries	Decayed	Incipient lesions Frank lesions	Arrested dentinal decay Caries in dentine	Inactive lesion, surface intact Inactive lesion, surface discontinuity	First visual change in enamel Distinct visual change in enamel
Dentine caries			Decay with pulpal involvement	Inactive lesion, cavitated	Localized enamel breakdown because of caries with no visible dentin or underlying shadow
Pulpal involvement				Active lesion, surface intact	Underlying dark shadow from dentin with or without localized enamel breakdown
				Active lesion, surface discontinuity	Distinct cavity with visible dentin
				Active lesion, cavitated	Extensive distinct cavity with visible dentin

Ole Fejerskov, Bente Nyvad, Edwina Kidd.
Dental Caries: The Disease and its clinical Management. 3rd Edn

ICDAS II FOR CARIES ASSESSMENT (2007)

[Modified from Ekstrand Criteria: V0 – V4]

CODE	DESCRIPTION
0	No/slight change in enamel translucency after 5 secs air drying
1	First visual change in enamel seen after prolonged drying
2	Distinct changes in enamel without air drying
3	Localized enamel breakdown or in opaque/discoloured enamel (without visual signs of dentinal involvement)
4	Enamel breakdown with a dark shadow underling of dentin. No frank dentinal exposure
5	Distinct cavity with frank dentinal exposure
6	Extensive caries with dentin forming half the extent of the base

Ismail AI *et al.* The International Caries Detection and Assessment System (ICDAS): an integrated system for measuring dental caries. Community Dent Oral Epidemiol 2007; 35: 170-78.

pufa, PUFA index

An index of clinical consequences of untreated dental caries

- Recorded separately from the DMFT/dmft and scores the presence of either a visible pulp , ulceration of the oral mucosa due to root fragments, a fistula or an abscess
- Score ranges from 0 to 20 pufa for primary teeth and 0 to 32 PUFA for permanent teeth
- Untreated Caries, PUFA Ratio = PUFA + pufa / D + d * 100

Monse B et al. PUFA - An index of clinical consequences of untreated dental caries. Community Dent Oral Epidemiol 2010; 38: 77-82.

IMPLICATIONS OF ECC

- Pulpally involved teeth as chronic septic foci

Finucane D. Journal of the Irish Dental Association 2012; . 58. 31-42.

- Potential to result in painful dental emergencies

Patil R. International Journal of Contemporary Dental and Medical Reviews (2017), Article ID 040117.

- Severe debilitating condition of the oral apparatus

Finucane D. Journal of the Irish Dental Association 2012; . 58. 31-42.

- Substantial loss of masticatory efficiency leading to malnutrition, growth retardation

Sokal-Gutierrez. BMC Nutrition. 2016; 2. 10.1186

IMPLICATIONS OF ECC

- Loss of incisors – alteration of normal swallowing pattern – immature infantile swallow

Acharya S, Tandon S. Contemp Clin Dent. 2011 Apr-Jun; 2(2): 98–101.

- Altered phonation (Sounds ‘f’, ‘v’)

Anil S. Front Pediatr. 2017; 5: 157.

- Psychological issues, personality changes

Carvalho TS. Int J Paediatr Dent. 2018 Jan;28(1):23-32.

- Loss of arch length requiring space maintenance or space regaining

Valérie Collado et al. Med Oral Patol Oral Cir Bucal. 2017 May; 22(3): e333–e341.

IMPLICATIONS OF ECC

- Loss of school days

Edelstein BL. J Am Dent Assoc 2015; 146(8): 565-6

- Diminished ability to learn

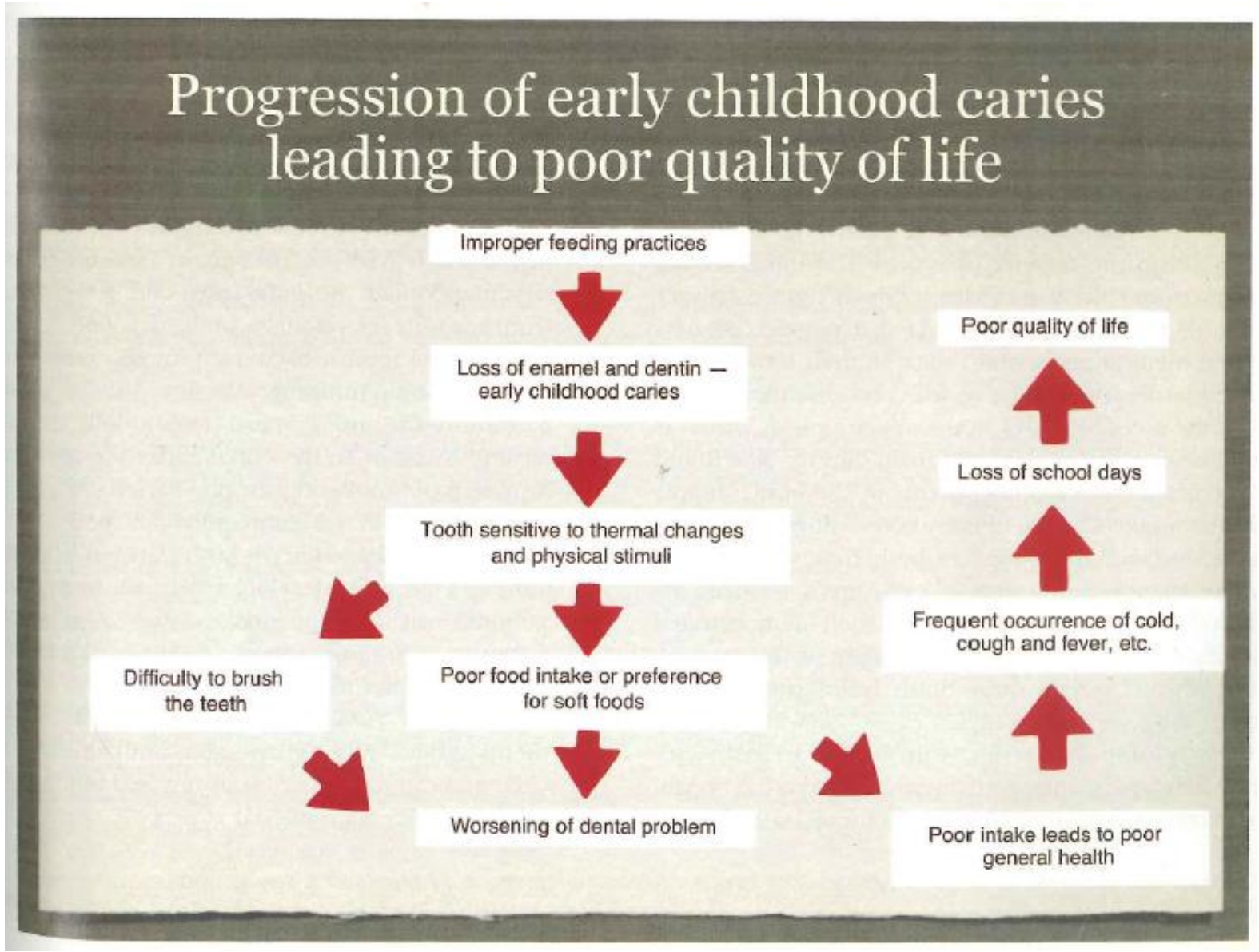
Blumenshine SL. J Public Health Dent 2008; 68(2): 82-7

- Morbidity & Mortality (M & M) Pyramid

Casamassimo PS, Thikkurissy S, Edelstein BL *et al.* J Am Dent Assoc 2009; 140: 650-657

- Diminished Oral Health Quality of Life

Filstrup SL *et al.* Pediatr Dent 2003; 25(5): 431-40
Cassamassimo *et al.* J Am Dent Assoc 2009; 140(6): 650-7



VISCIOUS CYCLE OF ECC

MEASURING TOOLS

1. ECOHIS – Early Childhood Oral Health Impact Scale

2. OHRQoL – Oral Health Related Quality of Life

3. P-CPQ - Parental Caregivers Perceptions Questionnaire

4. FIS - Family Impact Scale

SUGGESTED FURTHER READING

EPIDEMIOLOGY

1. Frencken JE, Sharma P, Stenhouse L, Green D, Laverty D, Dietrich T. Global epidemiology of dental caries and severe periodontitis – a comprehensive review. J Clin Periodontol 2017; 44 (Suppl. 18): S94–S105.

2. Moreira, Rafael. (2012). Epidemiology of Dental Caries in the World. 10.5772/31951.

RISK FACTORS IN ECC

1. Leong PM, Gussy MG, Barrow SY et al. A systematic review of risk factors during first year of life for early childhood caries. Int J Paediatr Dent 2013; 23(4): 235-250.

2. Narrenthran JS, Muthu MS, Renugalakshmi A. Invivo scanning electron microscope assessment of enamel permeability in primary teeth with and without early childhood caries. Caries Res 2015; 49; 209-215

3. Valaitis R, Passarelli C, Sinton J. A systematic review of the relationship between breastfeeding and Early childhood caries. Can J Public Health 2000; 91; 6: 411-417

4. Saxena D, Caufield PW, Li Y *et al*. Genetic classification of severe ECC by use of subtracted DNA fragments from S. Mutans. J Clin Microbiol 2008; 46(9): 2868-2873.

Nothing is so shocking to a dentist as the examination of a child suffering from rampant caries… I would like to believe that when someone reads Dr. Fass's paper 35 years from now, in 2032, the issues of terminology, etiology, prevention and policy will no longer need to be discussed because the era of dental caries in infants will be long gone!!

Tinanoff N. Introduction to the early childhood caries conference: Initial description and current understanding. Comm Dent Oral Epidemiol 1998; 6: S1: 5-7.

THANK YOU FOR YOUR KIND ATTENTION !!