Caries in the primary dentition

Differences, effects on the permanent dentition
Aetiology of dental caries

Although there is a genetic component to caries formation, heredity plays only a minor role. Dental caries is largely an acquired disease affected by environmental conditions. They are:

1. Susceptible tooth
2. Plaque
3. Substrate
4. Time
Susceptible tooth

• Aberrant anatomic and morphologic conditions (deep pits and grooves; broad, flat proximal contact areas)
• Abnormal position within the dental arch (crowding, decreased accessibility)
• Deficiencies during matrix formation or mineralization (hypoplasia, hypocalcification)
• Posteruption age (maturation)
Evidences:

• Caries is an infective disease
• Oral microflora is transmissible
• The source of the infection is usually the mother (or other close relatives)
Caries

• The oral cavity is sterile at birth
• The source of the infection is the mother (family members - similar S. mutans ribotypes)
• Bacterial colonisation starts at 6 months, at the beginning of teething
• Pioneer bacterium is the S. sanguis
• S. mutans will arrive soon
• Lactobacillus acidophylus is responsible for the progression
Plaque (biofilm)

• Acquired pellicle (glycoprotein film)
• Bacterial colonisation (100 million organisms per milligram of plaque)
  • Streptococcus mutans – extracellular polysaccharide (dextran) production → adhesion, antibiotic (mutacin) production → bacterial inhibition; responsible for the initiation of a carious lesion
  • Lactobacillus acidophilus – responsible for the progression of the lesion in the anaerobe subsurface areas
Streptococcus mutans

• Acid resistant (possible multiplication at pH 4)
• Acid production (carbohydrates → lactic acid)
• Extracellular polysaccharide synthesis (glycan matrix)
• Superficial filaments (100-300 nm, fimbria)
• Mutacin production
  • mutacin IV (narrow spectrum) – kills the members of the primer colony → attachment
  • Mutacin I (broad spectrum) - after colonisation it kills the competitors
Immune defense

The vast majority of salivary immunoglobulins are IgA (sIgA), minority IgG and IgM.

Maternal immunoglobulins are protecting the child till the age of 6-9 months.

Antibodies to S. mutans, sufficient amount of sIgA from 18-24 months.

Between these increased susceptibility (window of infectivity).
Substrate

• A source of substrate must be available for the metabolism of the bacteria
• Refined carbohydrates (sucrose)
  → dextran production
  → acid production
• Protective effect of saliva (remineralisation)
Time

• The occurrence of dental caries in children is based not on the quantity of fermentable carbohydrates consumed but rather on the consistency and frequency of consumption.

• The pH of plaque remains at a cariogenic level up to 30 minutes following consumption of carbohydrates.

• During sleep the protective effect of saliva is minimal because the flow rate is reduced.
Importance of secondary factors

• The role of saliva – flow rate, viscosity
• Entering school – first social stress – changes in the salivary flow rate
• Life style changes – changes of the components
• Salivary production is increasing with ageing (boys!)
• The viscosity of the saliva is significantly associated with the number of the carious lesions
• Diet rich in carbohydrates may cause reduced flow rate with increased viscosity
WHEN???

- **Circular caries** on incisors – immediately after eruption
- **Occlusal caries** on molars
- **Proximal caries** – from the development of the contact surface system to spacing
Early childhood caries
(formerly baby bottle/nursing bottle caries)

• The presence of one or more decayed (non-cavitated or cavitated lesions), missing teeth (due to caries), or filled tooth surfaces in any primary tooth in a child 72 of months age or younger.

• In children younger than 3 years of age, any sign of smooth-surface caries is indicative of severe early childhood caries (S-ECC). From ages 3 through 5, one or more cavitated, missing teeth (due to caries), or filled smooth surfaces in primary maxillary anterior teeth, or decayed, missing, or filled score of ≥4 (age 3), ≥5 (age 4), or ≥6 (age 5) surfaces constitutes S-ECC.

(AAPD definition)
Reasons to treat carious primary teeth

• Prevention of pain
• Prevention of pulpal inflammations → prevention of developmental defects
• Masticatory function
• Speech development
• Prevention of orthodontic disorders
• Healthy oral environment → reduced caries risk in the permanent dentition
• Aesthetics → psychic development
The effect of primary caries on permanent teeth

- Increased caries risk
  - Direct effect
  - Indirect effect
- Effect of consecutive diseases on permanent tooth germ
  - Turner tooth
- Malocclusion
  - Space loss
  - Decreased occlusal height
Factors influencing the decision to retain primary teeth I.

Medical history
• contraindications
  • congenital cardiac disease (risk of endocarditis)
  • immunosuppressed patients
  • poor healing potential (i.e. uncontrolled diabetes)
• indications
  • bleeding disorders and coagulopathies
  • oligodontia (i.e. ectodermal dysplasia)

Behaviour factors
• is the child a reasonable patient?(parents?)
Factors influencing the decision to retain primary teeth II.

Dental factors

• Contraindications
  • unrestorable tooth
  • tooth before exfoliation
  • acute odontogenic infection
  • excessive tooth mobility

• Indications
  • well-maintained arch
  • orthodontic considerations
  • lack of permanent successor
Differences between primary and permanent teeth
Primary Dentition

• 20 primary teeth as compared to 32 permanent teeth
• No premolars in the primary dentition
• The primary molars are replaced by the premolars
• The permanent molars erupt distal to the primary second molars
General morphologic considerations

- Crown
- Pulp
- Root
Crown of Primary Teeth

- Shorter
- Narrower occlusal table
- Constricted in the cervical portion
- Thinner enamel and dentin layers
- Enamel rods in the cervical area directed occlusally
- Aprismatic enamel surface layer (30-100 μ)
- Broad and flat contacts
- Color is usually lighter
Crown of Primary Teeth

- Prominent buccal cervical bulge (cingulum) seen in primary molars
- Incisors have no developmental grooves or mammelons
Primary Crown Anatomy

- **Mandibular Incisors** - central is symmetrically flat when viewed from buccal, lateral has a more rounded DI angle
- **Maxillary Incisors** - central is only tooth that has a greater width than height
- **Maxillary 1st Molar** - unique look, 3 cusps
- **Mandibular 1st Molar** - 4 cusps, transverse ridge dividing occlusal surface
Primary Crown Anatomy

• **Canines** - maxillary is long and sharp, mandibular has similar shape but smaller

• **Maxillary 2nd Molar** - resembles permanent maxillary first molar but smaller

• **Mandibular 2nd Molar** - resembles permanent mandibular first molar but smaller
Pulps of Primary Teeth

- Relatively larger
- Pulp horns are closer to the outer surface
- Great variation in size and location
- Mesial pulp horn is higher
- Pulp chamber shallow
- Form of the pulp follows the external anatomy
- Usually a pulp horn under each cusp
- Collateral pulp canals (floor of the pulp chamber, apical third of the root)
Roots of Primary Teeth

- Roots of anterior teeth are narrower mesio-distally
- Posterior teeth have longer and more slender roots in relation to crown size
- Molar roots flare more as they approach the apex
- Apical foramina may be larger and accessory canals often larger and more numerous
Summary

- Primary teeth have
  - Thinner enamel and dentin layers
  - Pulp horns closer to the outer surface
  - Mesial pulp horn much higher
  - Relatively larger pulps
  - Enamel rods direct slightly occlusally in the cervical area
  - Cervical area is constricted significantly
  - Roots flare as they approach the apex
  - More tortuous and irregular pulp canals
Influences of primary tooth morphology

Progress of caries

• Enamel is much thinner, thus dental caries is more active in primary teeth
• Dentin is proportionally thinner and caries progresses to pulpal tissue faster
Influences of primary tooth morphology
Tooth preparation

- Mesiobuccal pulp horns of primary first molars extend higher occlusally → in case of caries media preventive pulpotomy required
- Prominent mesiobuccal cervical bulges (cingulum) → reduced depth of proximal box
- Narrow occlusal table → altered occlusal preparation