Maternal Transmission of Mutans Streptococci in Severe Early Childhood Caries.

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Introduction:

**Acquisition of MS**

- **Maternal source:**
  - High fidelity:
    - 71% in Birmingham, AL
    - 54% in Sweden
    - 51% in Japan
  - Low fidelity:
    - 38% in cleft palate patients
    - 44% in Chinese population
    - 33% in Japanese daycare children

  Li, 1995
  Emanuelsson, 1998
  Kozai, 1999
  De Soet, 1998
  Li, 2000
  Tedjosasongko, 2002
Introduction:

Acquisition of MS

• **Non-Maternal Sources:**
  - 8-31% evidence for paternal transmission
    - 1999 Kozai
    - 1998 Emanuelsson
    - 2002 Tedjosansongko
    - 2004 Ersin
  
  – Evidence for horizontal transfer between children in daycare
    - in Japanese (58%)  
      - Tedjosansongko 2002
    - In Brazil (% not reported)
      - Mattos-Graner 2001
Severe Early Childhood Caries (S-ECC)

- Clinical strategies to limit maternal MS transmission:
  - Recommended by AAPD, AAP, CDC
  - Predicated on maternal transmission being the primary means of MS acquisition in children with S-ECC

- Limited studies on transmission patterns in this population
Pulsed Field Gel Electrophoresis (PFGE)

- **Centers for Disease Control:**
  - Considered PFGE as the: "gold standard of bacterial DNA fingerprinting"
  - Use PFGE for epidemiological studies of bacterial infections

- **Strengths:**
  - Highly discriminative
  - Reproducible
Methods:

Cohort

- Medically healthy
- Between 18 months and 6 years of age
- Diagnosed with S-ECC (minimum def score of 6)
- Presented for full mouth dental rehabilitation under general anesthesia
- Biological mother present
Methods:

**Plaque Sampling**

- **Three preoperative:**
  - Mother’s dental plaque (M)
  - Child’s dental plaque (BP)
  - Plaque from child’s carious lesion (BC)

- **Samples placed in reduced transport media**
Methods:

Overview

Samples Cultured (MSB agar)

Eight MS isolates per sample type isolated (Todd Hewitt agar)

Unique genotypes identified via AP-PCR

DNA from representative isolates of MS genotypes were suspended in agarose plugs and digested with *SmaI*

Chromosomal Digests separated via PFGE

Dice coefficients were generated from gel banding patterns (Bionumerics software)

Dice coefficient >70% indicated match among PFGE genotypes
Results:

Demographics

- 27 mother/child pairs:
  - 4 sibling sets
  - 23 unique mothers
- Average Age — 41.7 m (Range: 19-82m)
- Gender: 78% male:22% female
- Race: 18% B, 78% W, 4% Arabic
PFGE Dendrograms - 100% maternal match

Mother/Child pair 18—All isolates share >90% similarity.
PFGE Dendrograms-
Partial maternal match

Mother/Child pair 26—Isolate 26BP-2 only 37% similar to maternal isolates. All other isolates >70% similar.
PFGE Dendrograms - No isolates match mother

Mother/Child pair 28. Maternal isolates are less than 30% similar with isolates found in the child.
PFGE Dendrogram Analysis

- 26% (7/27) — All child isolate matches maternal isolates
- 15% (4/27) — Some child isolates match maternal isolates/some do not
- 59% (16/27) — No child isolates match

74% (20/27) of patients possessed isolates that did not match maternal genotypes
PFGE Dendrograms-
Siblings match/no maternal match

- 4/4 siblings sets shared identical genotypes
- 3/4 siblings sets did not share genotypes in common with their mother
PFGE Dendrograms - Siblings match/no maternal match

Dice (Tot 1.0%-1.0%) (H>0.0% S>0.0%) [0.0%-100.0%]

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Notes:
- PFGE: Polyacrylamide Gel Electrophoresis
- Siblings match/no maternal match
- Dice similarity coefficient
Discussion:

Evidence for Maternal Transmission

• Observed in 41% of study population
• Evidence was neither:
  – Exclusive
  – Predominant
  • 74% of patients possessed isolates that did not match maternal genotypes
Low Fidelity of Transmission

- Not sampled at initial acquisition
  - Clonal instability
- Not colonized by maternal genotypes
  - Genetic/environmental susceptibility to other colonization mechanism
  - S-ECC patients have aberrant, high sucrose feeding habits
    - High sucrose diets:
      - Favor MS colonization
      - May allow indiscriminant colonization
Conclusions:

- Maternal transmission is not the predominant mode of MS transmission within this S-ECC population.
- Siblings with S-ECC may possess similar MS genotypes, even without receiving the genotype from their mother.
- Practices designed to limit maternal transmission of MS may have minimal impact on S-ECC.
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