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OMICS Group International is a pioneer and leading science event organizer, which publishes around 400 open access journals and conducts over 300 Medical, Clinical, Engineering, Life Sciences, Phrama scientific conferences all over the globe annually with the support of more than 1000 scientific associations and 30,000 editorial board members and 3.5 million followers to its credit.

OMICS Group has organized 500 conferences, workshops and national symposiums across the major cities including San Francisco, Las Vegas, San Antonio, Omaha, Orlando, Raleigh, Santa Clara, Chicago, Philadelphia, Baltimore, United Kingdom, Valencia, Dubai, Beijing, Hyderabad, Bengaluru and Mumbai.

Virulence and Transmission of Bacteria Inducing Tooth Decay

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UCSF

CHILDREN'S ORAL HEALTH RESEARCH UC SAN FRANCISCO

bridging clinical care & research

CAN DO

What is Dental Caries?

- Dental caries is tooth decay
- Specific bacteria (mutans streptococci and lactobacilli …) on the tooth surface metabolize fermentable carbohydrates and generate acids as waste products
- Acids diffuse into the tooth and dissolve mineral

Dental Caries is the most prevalent chronic infectious disease in children in the U. S.

- Dental caries affects
  - 28% of 2-5 yrs old
  - 49% of 6-11 yrs old
- 15% children accounts for 85% of total decay
- Cost of treating caries under GA- $15-20K/visit
- Annual cost to treat dental caries is $4.5 billion in the U.S.

Tooth Decay: Transmissible Infectious Disease

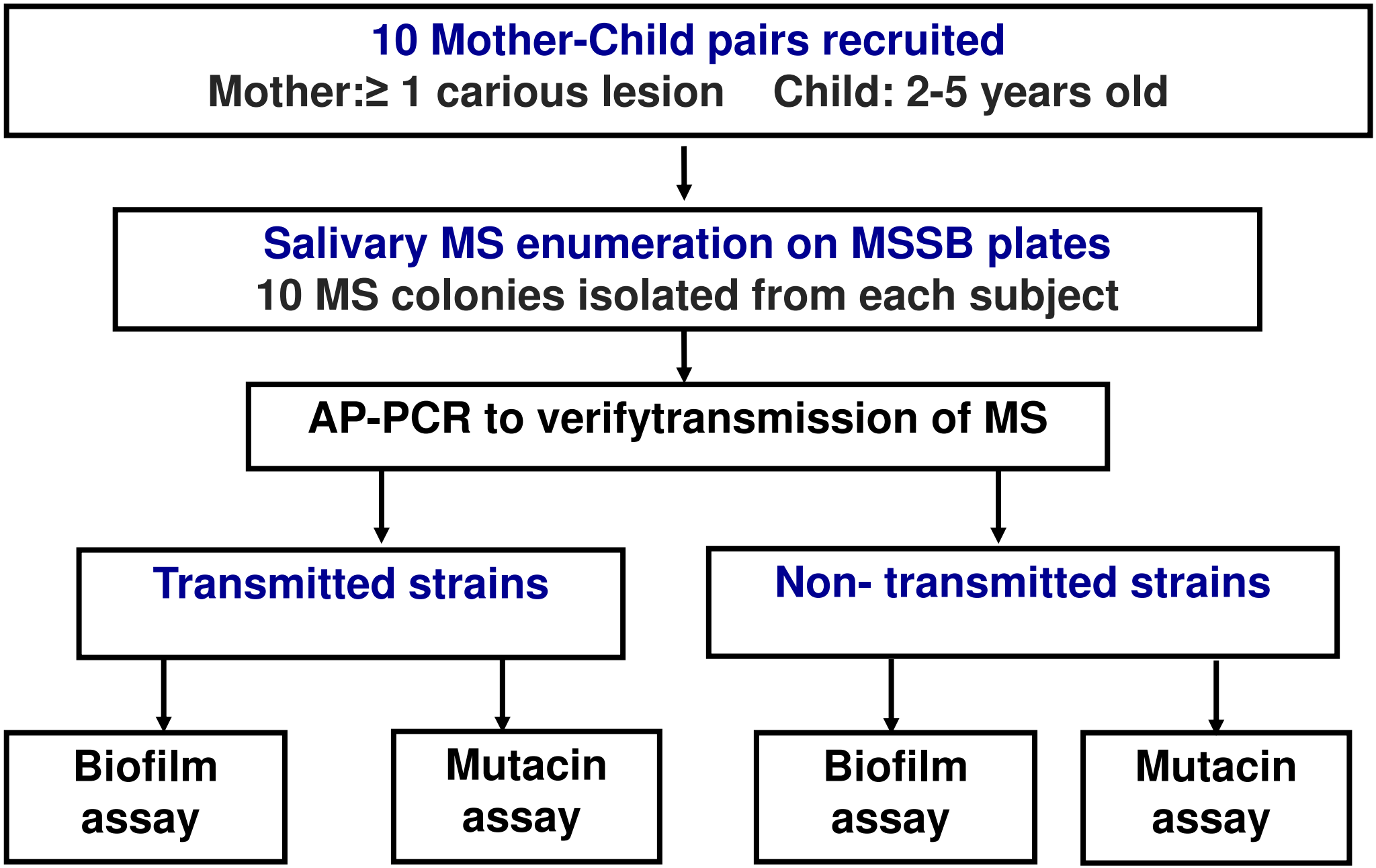
- Mutans streptococci (MS) - major cariogenic bacteria
- Birth – 2 years: critical time for MS transmission
- MS can be transmitted from caregivers, siblings or playmates who the child have close contact with
- Children with early MS colonization- 4 times more likely to develop tooth decay
- Routine fillings can not reduce MS levels and prevent future tooth decay

What to do to break the chain and reduce the infection?

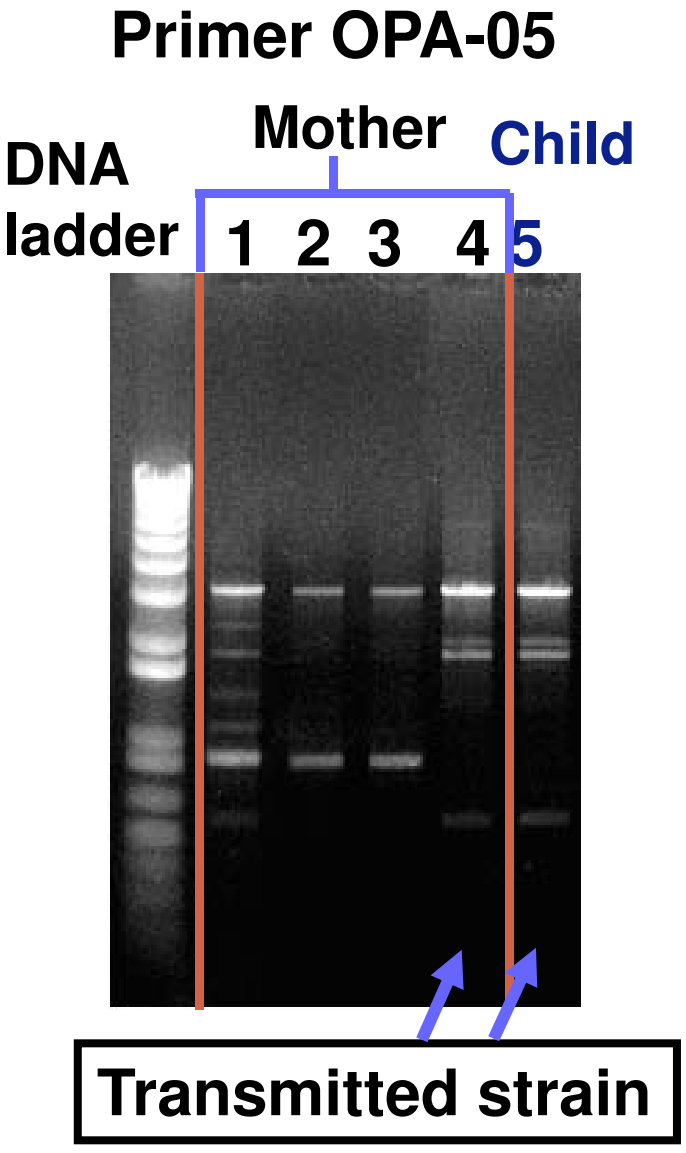
Factors related to maternal transmission of mutans streptococci in high-risk children-pilot study.

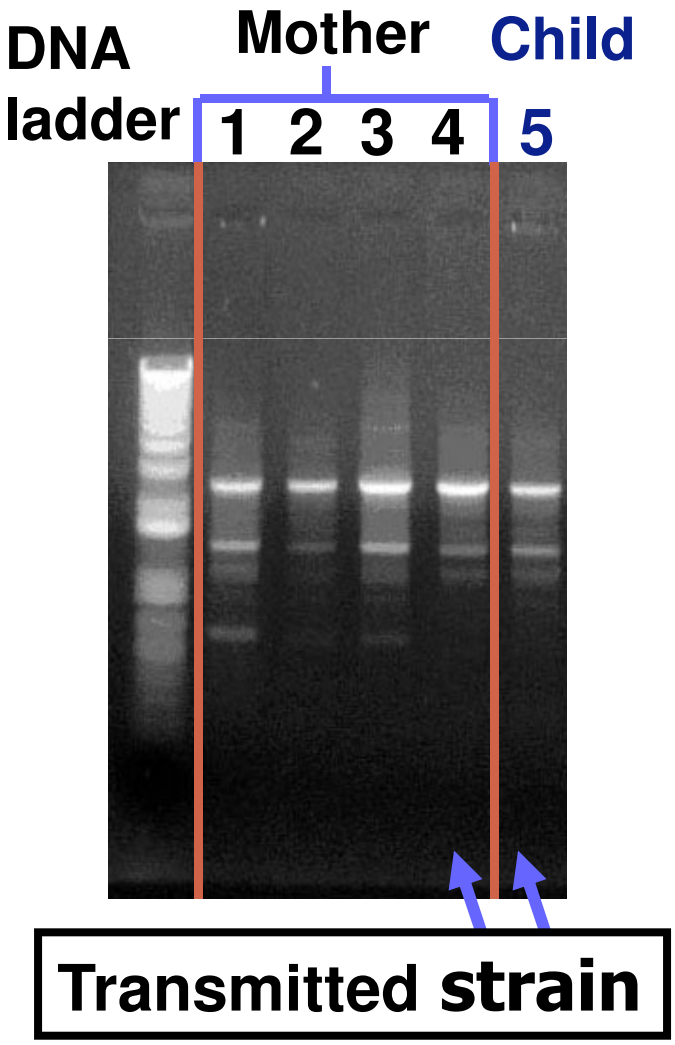
ZHAN L, TAN S, DEN BESTEN P, FEATHERSTONE JD, AND HOOVER CI.

PEDIATR DENT. 2012;34(4):E86-91


10 Mother-Child pairs recruited
Mother:≥ 1 carious lesion Child: 2-5 years old
Salivary MS enumeration on MSSB plates
10 MS colonies isolated from each subject
AP-PCR to verifytransmission of MS
Transmitted strains
Non- transmitted strains
Biofilm assay
Mutacin assay
Biofilm assay
Mutacin assay

Determination of Different Strains
AP-PCR results for mother-child pair #4





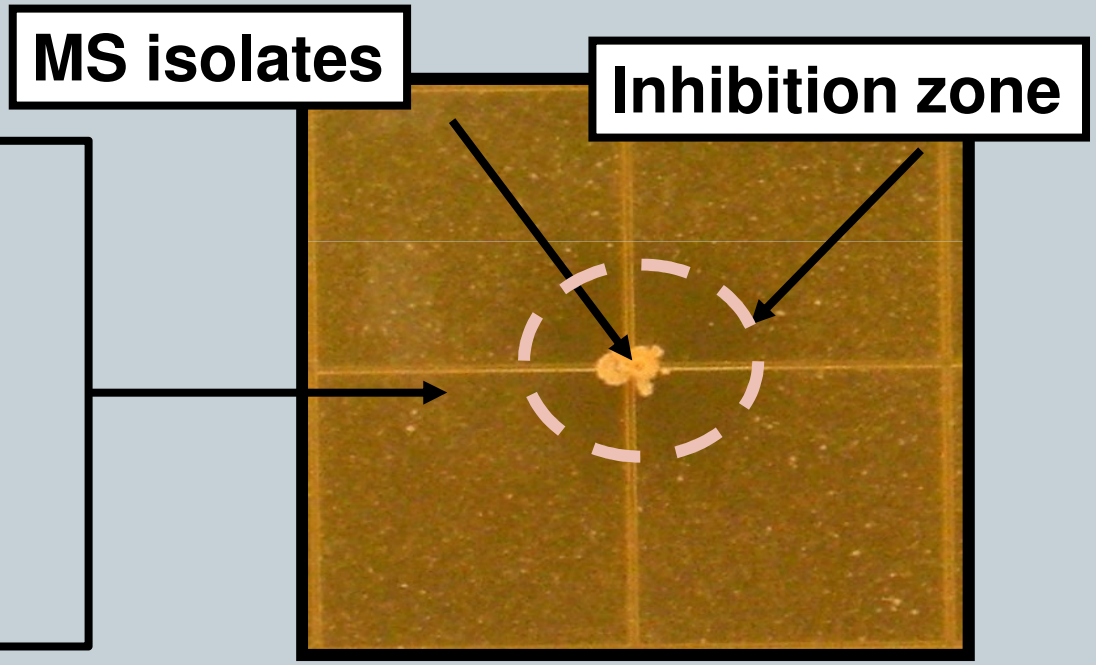
Result

- Only 7 out of 36 genotypes (20%) from mother transmitted to children
- Only only 40% of the young children had MS genotypes from their mothers
- 60% of children had no MS from their mothers
- 90% of children had MS from other sources.

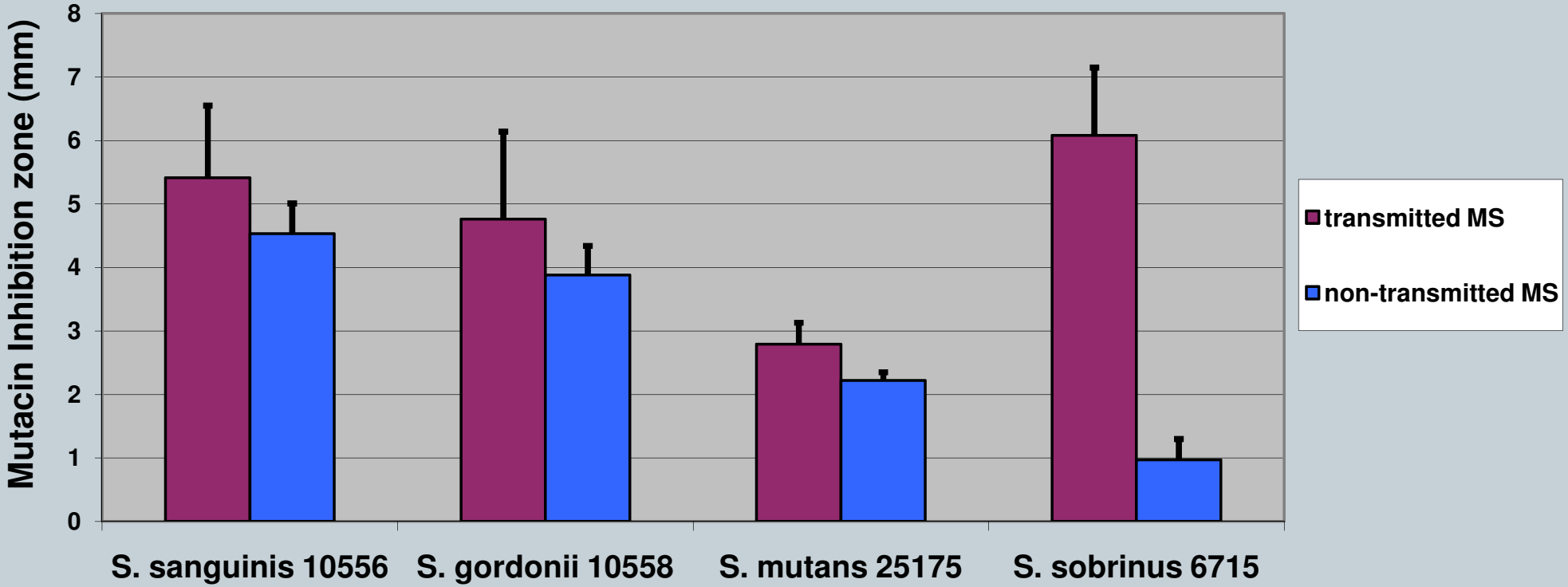
Mutacin Activity Assay

Reference Strains

***S. sanguinis* 10556**
***S. gordonii* 10558**
***S. mutans*25175**
***S. sobrinus* 6715**



MutancinFormation and Transmission of MS



p=.45 **P=.42** **P=.09** **P<.05**

- **Transmitted MS strains produced significantly more mutacin against *S. sobrinus* (p<0.05).**

Full Genomic Sequencing study on MS from children with ECC or caries Free

(Ling Zhan, Michael Fischbach, Mohamed AbouDonia and Joe DeRisi)

- High-throughput Illumina sequencing on MS from children with severe ECC or with no caries
- Data analyzed by PRICE system
- 100% of MS full genomes are covered

Approach

Functional assays

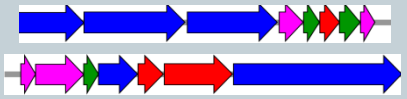
67 clinical strains (ECC and Caries-free)

Bioinformatics

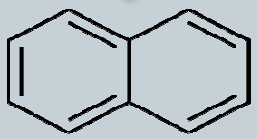
Illumina Sequencing (2 lanes)

Chemistry

Functional Data

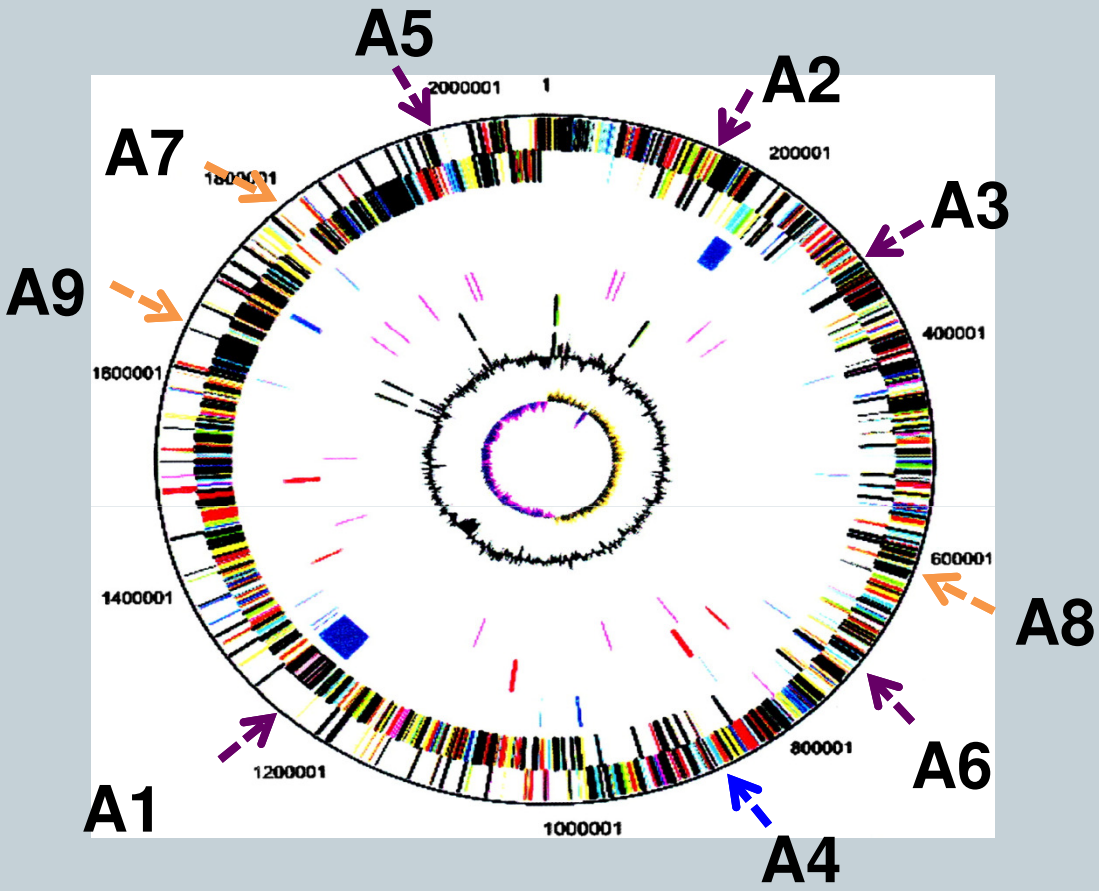


Biosynthetic gene clusters



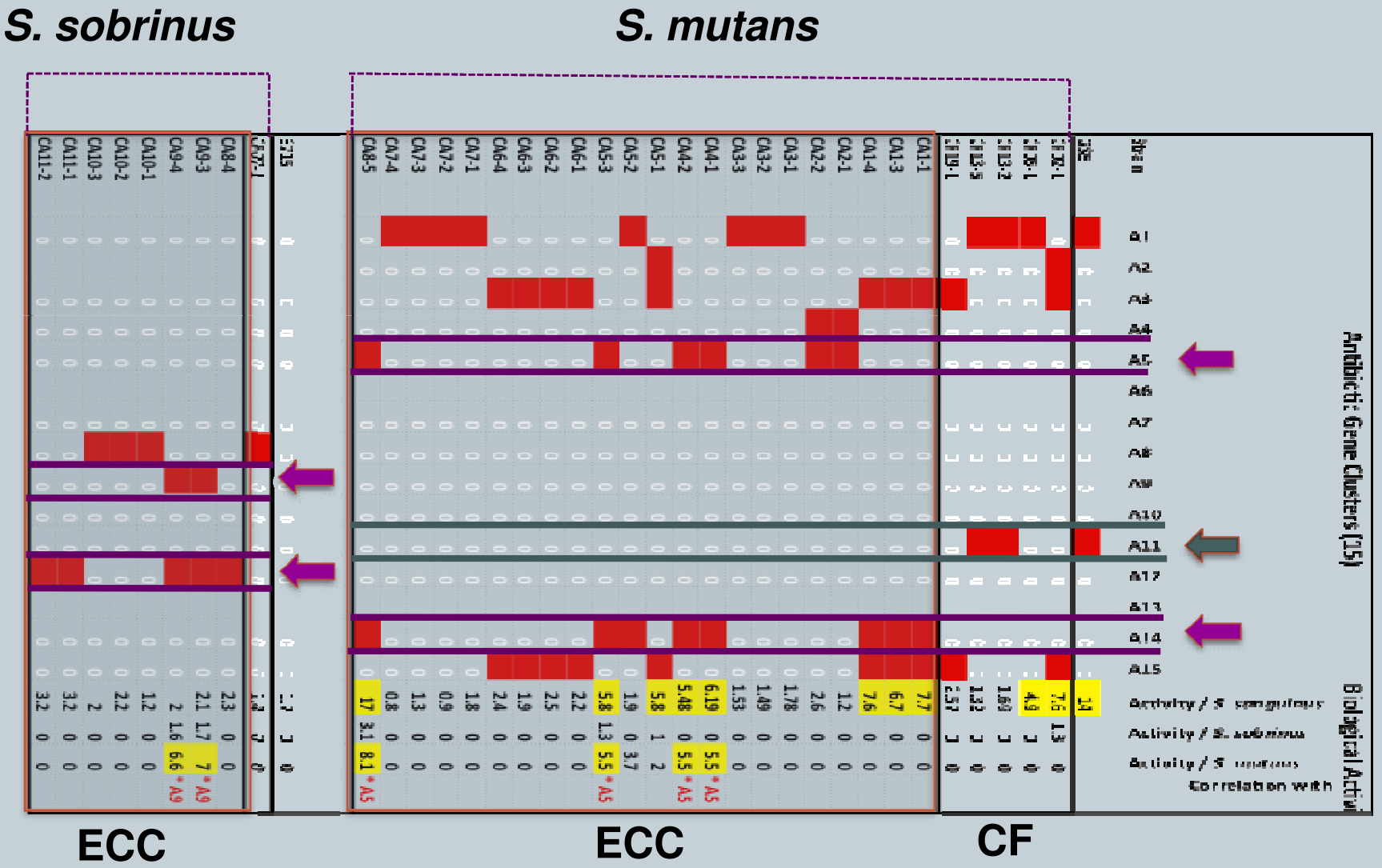
Small molecules

S. mutans UA159 genome

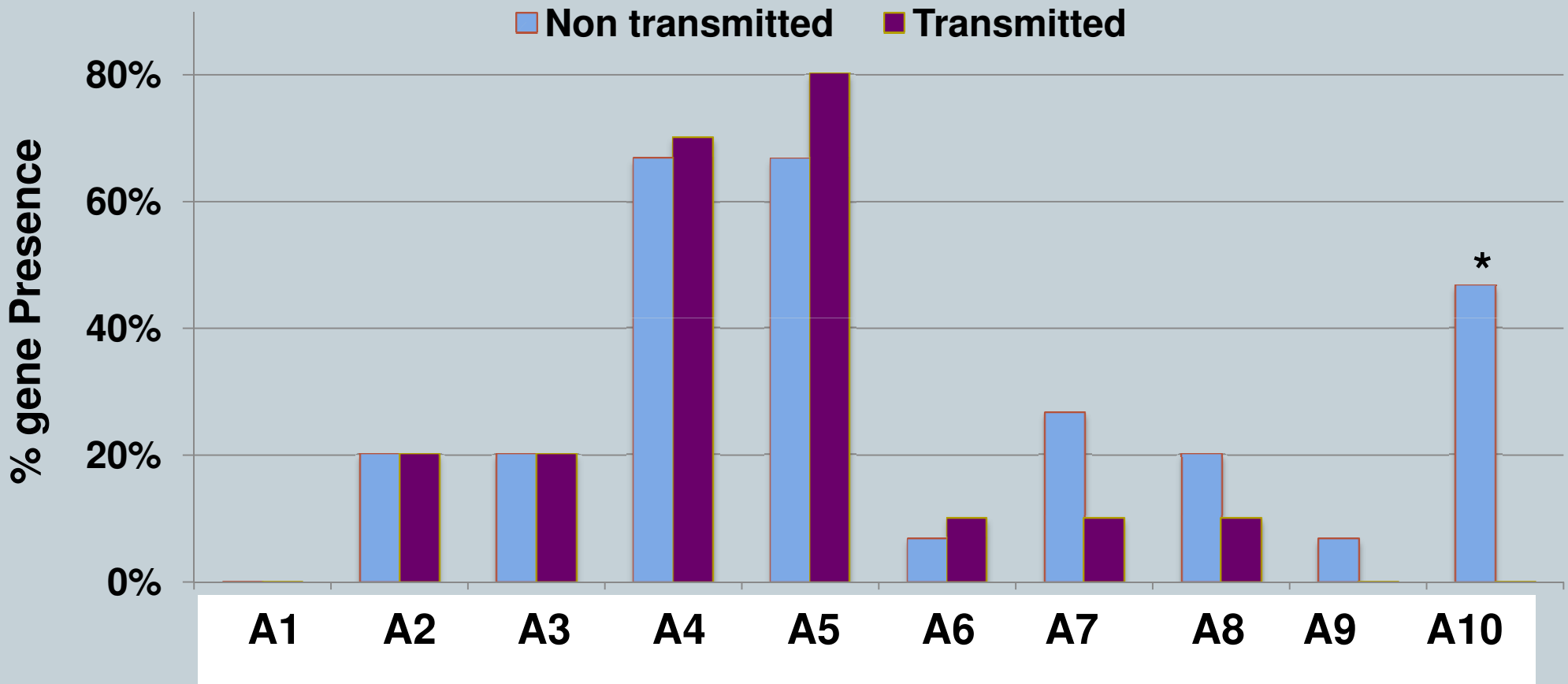


Genomes of *S. mutans* isolatesare virtually identical except for islands harboring biosynthetic gene clusters for small molecules

Antibiotic Peptide Cluster of MS by Genomic Sequencing from Children with/without Caries



Biosynthetic Genes in Transmitted and Non-transmitted MS



A10 gene significantly related to non-transmission (P=.02).

Results

- Not all maternal MS genotypes were transmitted
- Mutacin production may related the transmission
- Further study needed to investigate the function of biosynthetic genes in MS transmission

Multi-generational colonization by mutans streptococci in early childhood caries

J. Rahman, JDB Featherstone, L. Zhan, & C.I. Hoover

- Determine the multi-generational transmission of MS in ECC families where grandmothers provide significant childcare (≥20 hours/week)
- 10 grandmother-mother-child triads recruited
- 10 MS isolates collected from each subjects
- MS transmission studied by AP-PCR to determine the extent of multi-generational transmission of MS

Patterns and rates of MS transmission

Transmission Pattern	#/total groups	%
G-M-C	1/9	11%
G-M	1/9	11%
M-C	3/10	30%
G-C	4/9	44%

Conclusion

- Demonstrated multigenerational transmission mode of MS in ECC families
- Support more broadly based family-oriented strategies are needed to reduce MS transmission and the incidence of ECC.

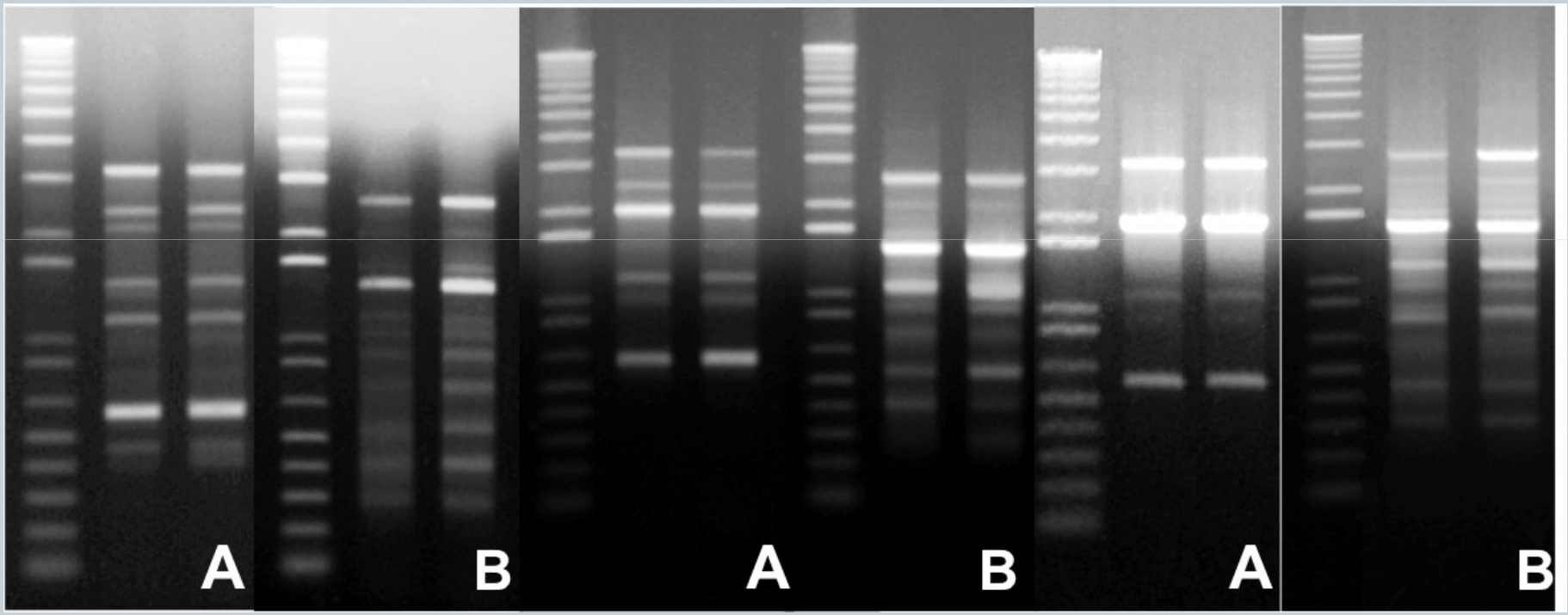
Genotypic Diversity and Horizontal Transmission of Mutans Streptococci in Children Aged 5-6 Years.

S Domejean, L Zhan, JD Featherstone et al.

- Horizontal transmission of MS was studied in a cohort of 95 5-6 yr old kindergarten children in 3 Bay-Area schools.

J. Dent. Res. 2010

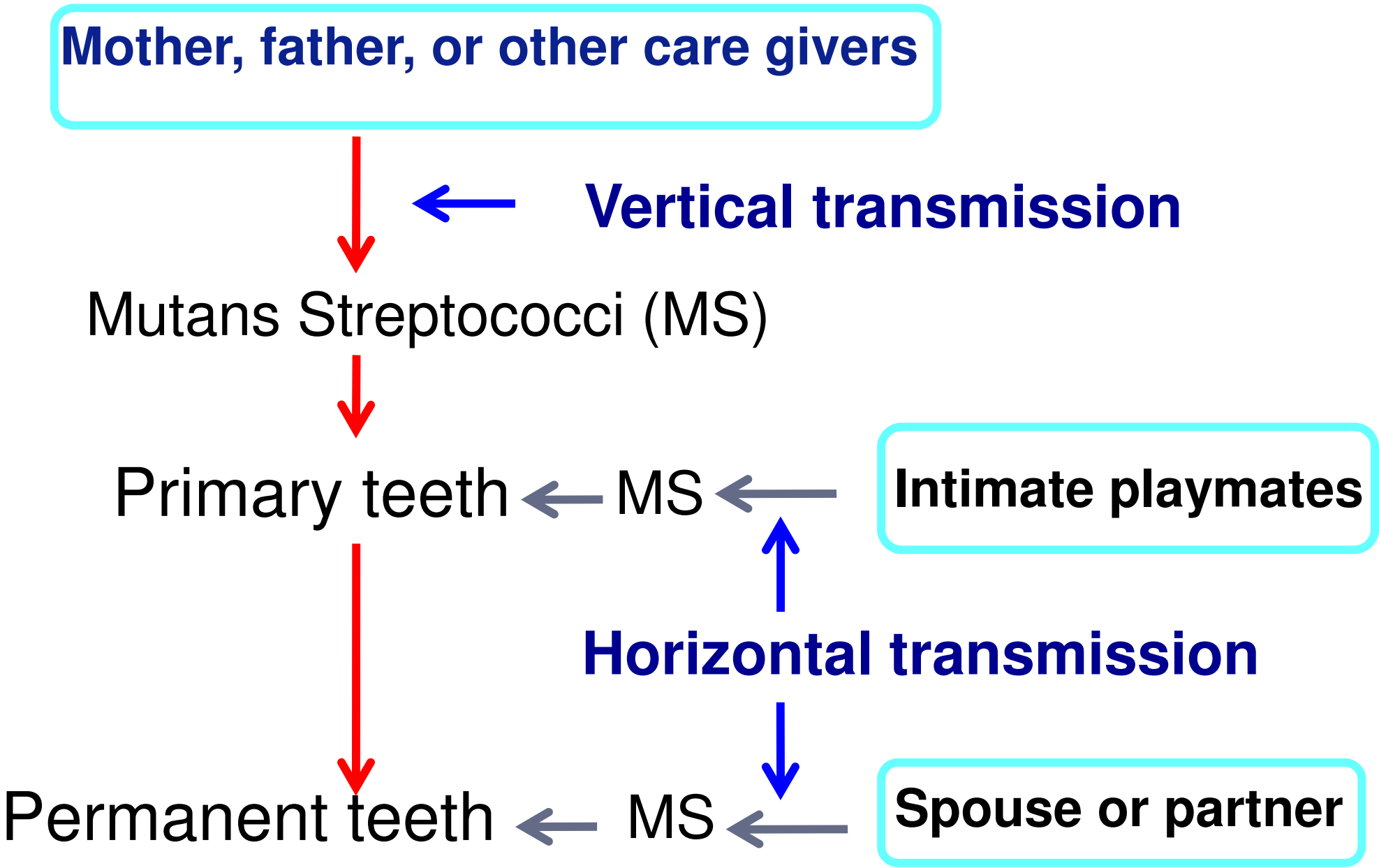
AP-PCR pattens of 3 pairs of subjects sharing S. mutans strains



A. primer OPA 05 B. primer OPA 13

Conclusion

The presence of matching genotypes of *S. mutans* in 3 pairs of children indicates horizontal transmission of this species between kindergarten children.


Mother, father, or other care givers
Vertical transmission
Mutans Streptococci (MS)
Primary teeth
MS
Intimate playmates
Horizontal transmission
Permanent teeth
MS
Spouse or partner

Caries is a Transmissible Infection
We Need to Break the Chain

Bacteria Testing and Antibacterial Therapy

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