



The shift in the microbial diversity during transition from caries-free to caries-active in 3-year old children

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Background

Lower microbial diversity was associated with caries incidence.

Aim

To detect whether reduction of microbial diversity is the result of or reason for caries onset.

Design

The study included 130 caries-free children (61 males, 69 females) aged 36–40 months, all of whom underwent clinical examination and full-mouth supragingival plaque collection. The children were reexamined at 6 and 12 months. Total DNA was isolated from 390 samples, and PCR-DGGE analysis was conducted using universal primers.

Table 1: PCR-DGGE bands at 6 and 12 months in children with different caries statuses

Group (N)	Average bands	t value	p value
Caries-free at 6-month (86)	40.9±2.4	4.25	0.016*
Caries at 6-month (44)	34.5±3.4		
Caries-free at 12-month (58)	43.8±1.9	4.12	0.018*
Caries at 12-month (72)	33.3±3.2		

* p<0.05 by t test

Table 2: Average number of DGGE bands among children with different dft

dft	N	Average bands	t value	p value
0	144	44.6±1.9 ^a	4.27 ^a	0.015*
1	41	38.2±2.3 ^a		
2	32	37.6±2.4	4.25 ^b	0.016*
3	34	36.1±2.6 ^b		
≥4	9	30.9±2.9 ^b		

a: The comparison of average bands between caries-free children and children with one decayed and filled tooth.

b: The comparison of average bands between children with three decayed and filled teeth and children with four or more decayed and filled teeth.

* p<0.05 by t test

Figure 1

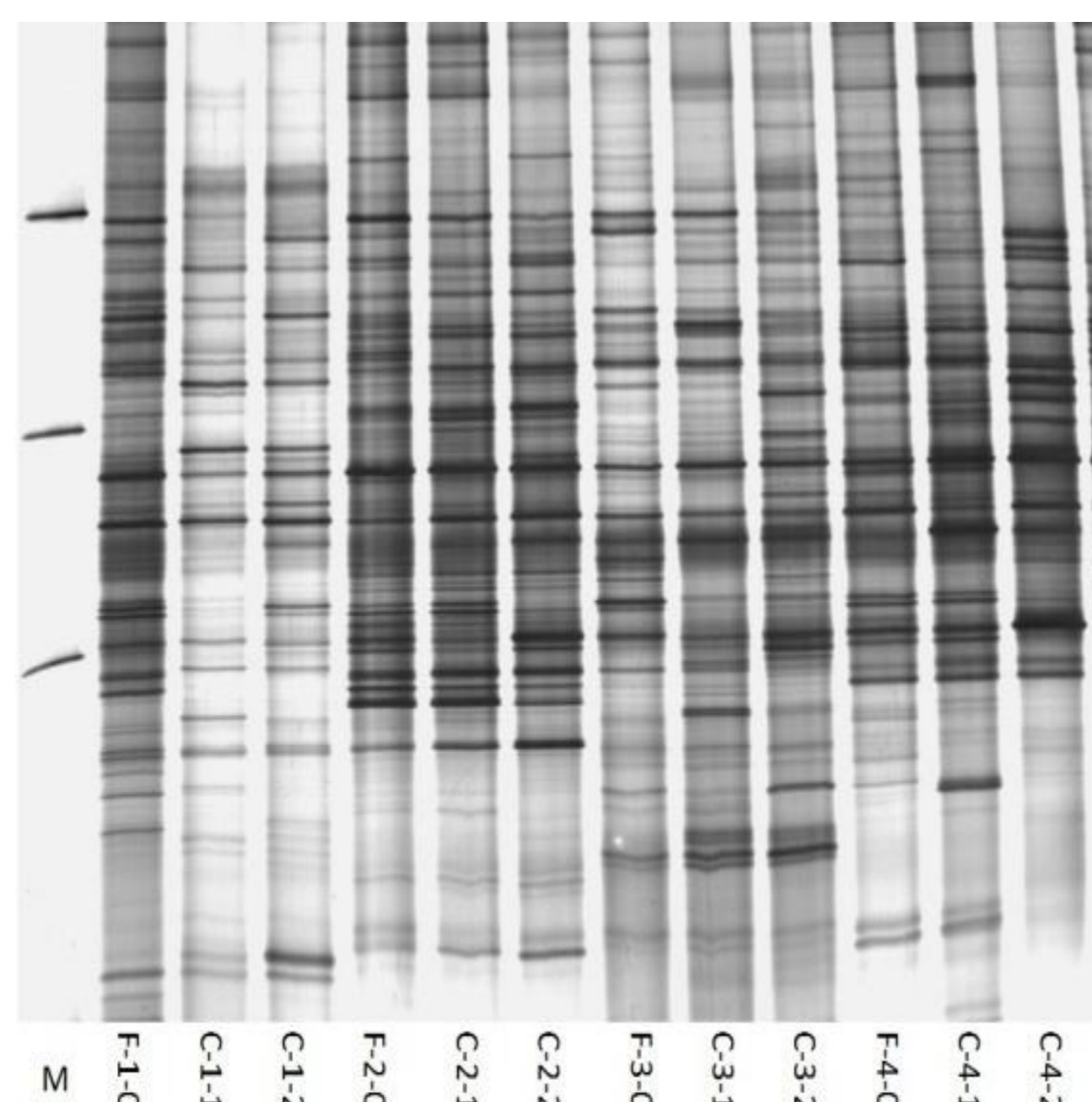


Figure 2

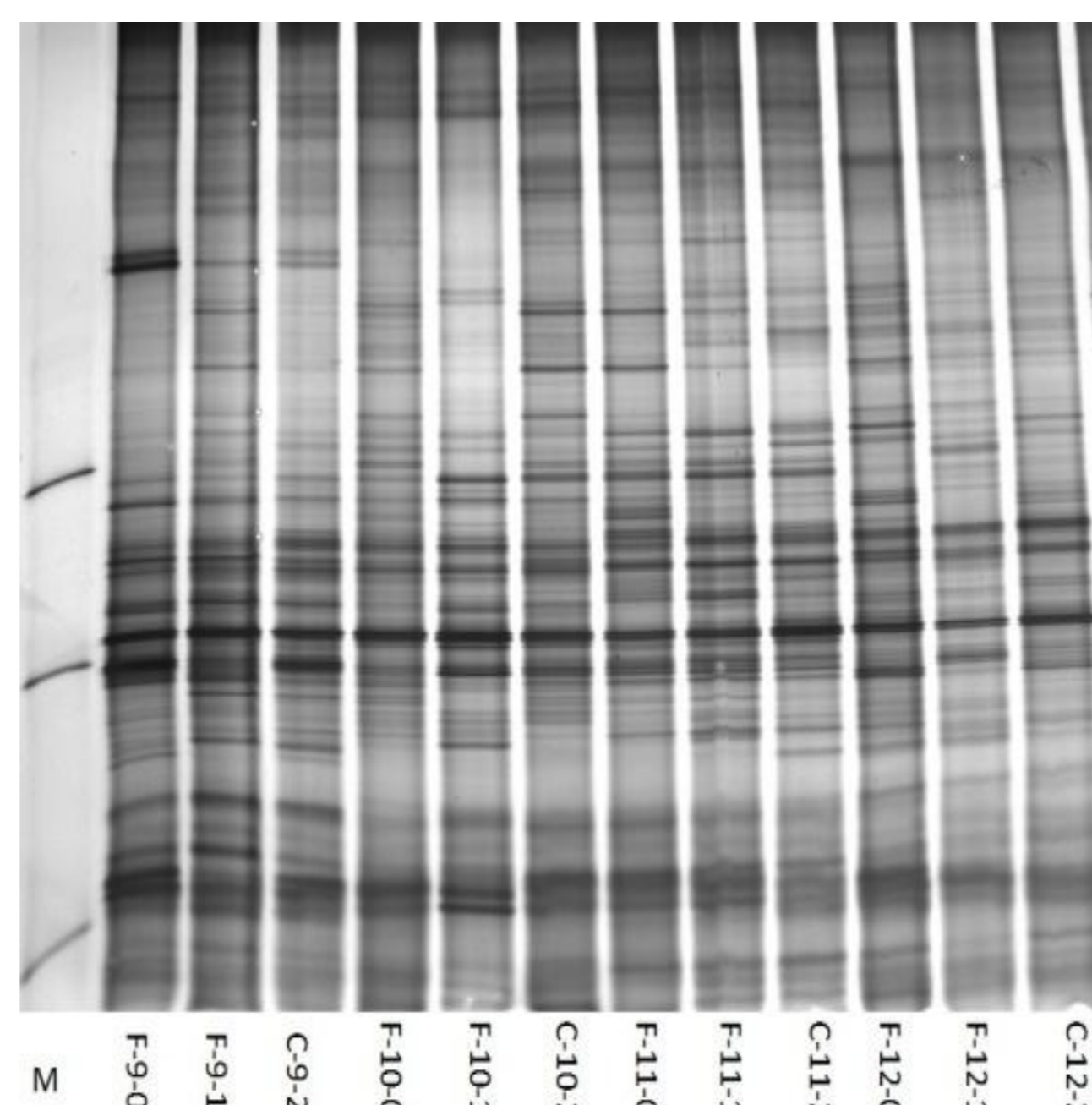


Figure 3

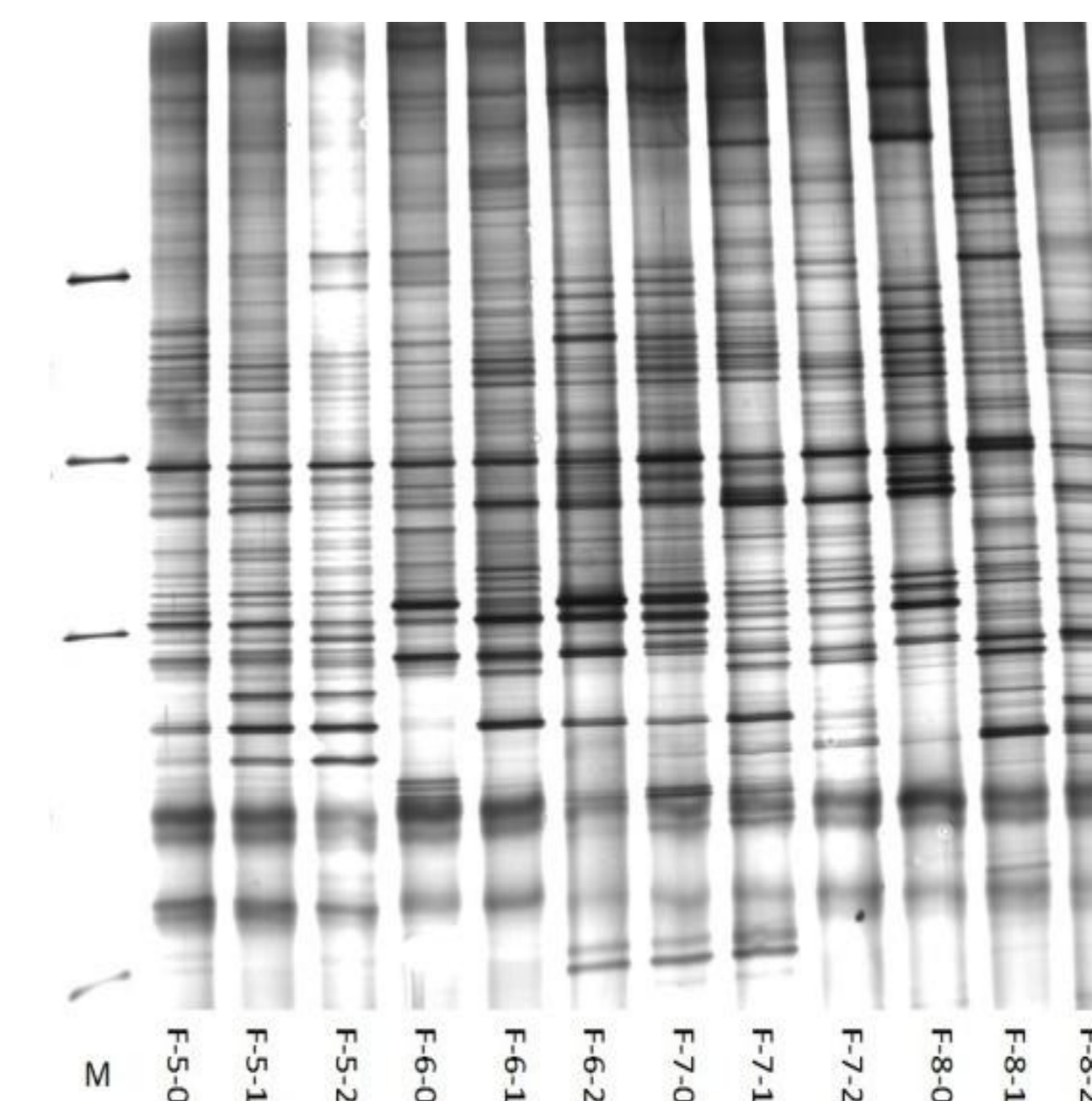


Figure 1-3: PCR-DGGE analysis of the predominant bacterial communities in the dental plaque of children. Three lanes represent one subject. 'F' signifies the caries-free and 'C' the caries-active state; 0, 1, and 2 represent baseline, 6 months, and 12 months, respectively.

Results

- (1) In the follow-up, 44 of 130 (33.8%) children had detectable caries at 6 months, and 28 children had it at 12 months. The other 58 children (44.6%) remained caries-free. The mean of decayed and filled teeth (dft) was 3.4 ± 0.5 at 6 months and 5.4 ± 2.1 at 12 months.
- (2) With PCR-DGGE analysis, the number of distinct bands in caries-active children was significantly lower than in caries-free subjects at 6 and 12 months ($P < 0.05$). The number of distinct bands among the 58 caries-free children was not significantly different at baseline, 6 months, and 12 months ($P > 0.05$).
- (3) At baseline, the number of distinct bands among children who had caries at 6 months was significantly lower than in caries-free children ($P < 0.05$). At 6 months, the number of distinct bands of children who were caries-free at 6 months but had caries at 12 months was significantly lower than in caries-free children ($P < 0.05$).
- (4) The DGGE profiles were summarized and divided into five groups according to the number of dft. The average number of DGGE bands of children with one dft was significantly lower than in caries-free children ($P < 0.05$). The average number of DGGE bands was not significantly different among children with one, two, or three dft. However, the average number of bands in children with four or more dft was significantly lower than in those with three dft ($P < 0.05$).
- (5) The correlation coefficient between the number of DGGE bands and number of dft was -0.201 .

Table 3: Number of PCR-DGGE bands among children with different caries statuses at baseline, 6 months, and 12 months

Group (N)	Average bands at baseline	Average bands at 6-month	Average bands at 12-month
Caries-free in 12-month follow-up period (58)	42.9±1.7 ^a	43.5±1.4 ^b	43.8±1.9
Caries-free at 6-month, but caries at 12-month (28)	41.9±3.7	38.3±3.4 ^b	32.6±3.3
Caries both at 6-month and 12-month (44)	40.8±2.5 ^a	34.5±3.4	33.9±3.1
t value	2.09	1.99	
p value	0.041 ^{*a}	0.043 ^{*b}	

a: The comparison of average bands at baseline between caries-free in 12-month follow-up period and caries both at 6-month and 12-month by t test.

B: The comparison of average bands at 6-month between caries-free in 12-month follow-up period and caries-free at 6-month, but caries at 12-month by t test.

* p<0.05 by t test

Conclusion

The reduction in microbial diversity is thought to be a cause of caries in young children. Caries-free children with reduced microbial diversity are at high risk to caries onset in the subsequent 6 months.