CARIES-FREE TEETH IN THE ABSENCE OF THE FLUORIDE ION*

By Kenneth J. Rothman, DMD, MPH,** Robert L. Glass, DMD, MPH, Dr.PH,**
Fabio Espinal, DMD, MPH,*** and Herman Velez, MD, MPH†

Dr. Rothman and his group present a finding in two nearby villages of Colombia that no factor could explain – a markedly low DMFS in the village of Heliconia.

Observers have noted that the children of Heliconia, a small village near Medellin, Colombia, have few carious teeth.[4] The prevalence of carious lesions in this region of Colombia is relatively high and comparable to that of white, urban populations in the United States.[2] A study was completed, therefore, to determine whether the children of the village of Heliconia truly exhibited an unusually low prevalence of lesions and, if so, to determine the reasons.

The Method of Study

All available school children 12 to 17 years of age in the village were examined. For a comparison, the school children of the same age in the nearby village of Don Matias also were examined. The total of 302 children examined consisted of 148 from Heliconia and 154 from Don Matias. Examinations were performed by one examiner who used standard dental mirrors and explorers and the sunlight only for illumination. All teeth were recorded as erupted or unerupted, permanent or primary, present or missing. When doubt existed concerning incipient caries-activity, the surface was diagnosed as sound.

The Findings

Some characteristics of the two villages are shown in Table I. A comparison of the children of the two villages by age and pertinent dental variables is shown in Table II. No significant differences were observed in age and numbers of erupted permanent teeth at risk. Eighteen subjects in each village were examined twice as a check on the reliability of the examiner. The rate of error was 3.0 percent for the 985 teeth when examined twice. The total mean count of DMF for Heliconia was 5.53 against a count of 13.91 for Don Matias. The children in Heliconia had a mean count of DMFS of 6.6 and the same figure for Don Matias was 16.8. Differences were present at each age-level for both sexes (see Table III) which were highly significant statistically.

Some Discussion

The difference in caries-experience between these two villages is striking. Heliconia and Don Matias are 32 miles apart and each is approximately 30 miles from the large central city of Medellin. Each is a small remote mountain community which exists in an agricultural economy. In Don Matias, dairy products constitute a large percentage of the agricultural output. In Heliconia, with its low caries-activity, the products primarily are sugar cane and other tropical carbohydrates. Inasmuch as Don Matias has a prevalence of caries-experience comparable to other villages in the area,[1] Heliconia exhibits an extremely low prevalence when compared to the surrounding region. To explain this

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**Department of Epidemiology, Harvard School of Public Health, 665 Huntington Avenue, Boston, Massachusetts 02115

***University of Antioquia, Facultad de Odontologia, Medellin, Colombia

†University of Antioquia, Facultad de Medicina, Medellin, Colombia

difference, the factors known to influence the frequency of caries-experience had to be studied. Five factors were examined.

Table I

Selected Characteristics of Two Villages in Colombia

	Heliconia	Don Matias
Population	8564	9041
Area (km^2)	170	138
Mean Temperature	70°F	66°F
Year of incorporation	1814	1787

Table II

Comparisons of Age and Selected Dental Variables from Two Villages in Colombia

	Heliconia		Don Matias	
	Mean	S.D.	Mean	S.D.
Age in months	164.98	18.51	165.94	18.89
Erupted teeth	27.32	1.34	27.40	1.51
Decayed teeth	4.56	3.75	8.24	5.02*
Filled teeth	0.08	0.68	2.55	3.88*
Missing teeth	0.89	1.51	3.12	3.10*
Decayed and filled surfaces	6.61	7.42	16.77	9.75*

*$p<.001$

Table III

Number of Subjects and DMF Count by Age and Sex

			Age (years)					
			12	13	14	15	16	17
Don Matias	Boys	Number	18	18	16	20	7	6
		DMF	13.4	12.9	13.4	17.3	16.7	13.7
	Girls	Number	20	18	17	7	8	
		DMF	11.4	12.9	14.2	16.4	17.8	
	Total	**Number**	**38**	**36**	**33**	**27**	**15**	**6**
		DMF	**12.3**	**12.9**	**13.9**	**17.1**	**17.3**	**13.7**
Heliconia	Boys	Number	18	20	13	11	12	2
		DMF	3.6	4.3	8.0	6.3	5.6	4.5
	Girls	Number	28	15	11	10	7	2
		DMF	3.4	6.0	6.4	9.3	8.6	6.5
	Total	**Number**	**46**	**35**	**24**	**21**	**19**	**4**
		DMF	**3.5**	**5.0**	**7.3**	**7.7**	**6.7**	**5.5**

1. Fluoride-ion

Samples of drinking water were collected from each village, and analyzed by a fluoride-ion electrode, measured against standard solutions. Levels of fluoride were less than 0.1 ppm in the water from both villages. To determine whether children in Heliconia ingested fluoride from some source other than the drinking water, Mejia et al.[4] examined the levels of fluoride in samples of urine from children in both villages. Both groups showed nearly identical, low levels of urinary fluoride.

2. Diet

Twenty-four hour dietary histories were obtained from each subject. Carbohydrates constituted a large part of the diet in both villages, but a greater part in the village with a low caries-experience. In Don Matias, the local dairy economy was reflected in the diet, whereas in Heliconia, sugar cane and some other carbohydrates were the predominant local crops which constituted a large portion of the diet.

3. Oral Hygiene

Each subject was questioned about his practice of oral hygiene. Toothbrushing was more frequent in Don Matias, where the mean was 2.5 times per day, compared with 2.0 times per day in Heliconia ($p<0.05$). The better hygiene reported in Don Matias may have been the result of the effort exerted by the local dentists, since no dentist resides in Heliconia. The presence of the dentist also might explain the higher proportion of filled surfaces in Don Matias as seen in Table II.

4. Genetics

Children in each village were classified by family name, and the distribution of caries-experience by family was examined within each village. No significant differences could be detected. This finding does not preclude genetic effects, inasmuch as these villages have old and inbred populations who experience little mobility. The genetic pool of one village might differ considerably from the other, even without differences being detected between families.

5. Location

Maps of each village were obtained and every dwelling unit marked in color and numbered to determine if caries-activity occurred in clusters. A cluster of caries-free individuals was suspected in Heliconia when the maps were inspected. Statistical analyses, however, failed to confirm this suspicion. The children residing outside the suspected cluster had significantly fewer carious teeth than children in Don Matias.

Jordan, Englander, and Lim[1] compared the prevalence of cariogenic streptococci in the two villages. They found that children in Heliconia were somewhat less likely to harbor these streptococci, but the magnitude of the difference appeared unlikely to explain any large part of the observed difference in caries-experience.

Russell and Elvove[3] noted that the prevalence of caries-activity generally is high in the Western Hemisphere and the only areas of low prevalence are those with an optimum or excessive level of fluoride in the drinking water. The virtual absence of fluoride in the drinking water of Heliconia indicates that this village is an interesting exception to these observations.

Summarizing

Two Colombian villages were compared to evaluate the relative frequency of caries-experience. The villages were found to differ markedly in respect to pertinent variables. Those variables known to explain differences in caries-experience then were

examined, in an attempt to explain the large difference observed. No explanations were apparent.

Conclusions

Three conclusions appear to be permitted as a result of this study:

1. the children of Heliconia, Colombia, between the ages of 12 to 17 years, have a markedly less caries-experience than children of the same age in nearby Don Matias;
2. both villages have similar, less than optimal amounts of fluoride in their drinking water;
3. no factor known to influence the activity of dental caries could be invoked to explain the low prevalence in Heliconia, although the role of undetermined or undiscovered environmental factors might be significant.

Bibliography

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Authority Challenged

Giving youths the authority now enjoyed has done them no favor. Children have been deceived until they think that 16 years of living in the limited environments of home and school, with very little responsibility demanded, are sufficient experience and knowledge to cope with, and solve the world's serious ills. Instead of setting a disciplined example, adults of the '50s and '60s attacked the existing institutions, deserted them, and demanded their downfall. With no one to explain that the right to freedom to pursue a goal implies no right to the goal itself, kids now infringe on the rights of others. They claim the right to select the curriculum, the right to an open campus, the right to declare a school's regulations void, the right to establish its policy, and the right to expect lenient amnesty whenever they break laws. Now a crisis confronts today's parents that adults built in the past two decades. (Joseph and Lois Bird in the Detroit News for July 16, 1972)

Why You Cannot Spit Back at Night

Investigators, supported by the National Institute of Dental Research, report that darkness at any hour reduces the flow of saliva from the parotid gland by 75 percent of its normal rate. (In Research News from NIDR for June, 1972)
