

Failure of Environmental Lighting to Influence Dental Caries Rate (38866)

I. L. SHANNON, J. I. THORNBYS, K. O. MADSEN, AND E. J. EDMONDS

Oral Disease Research Laboratory, VA Hospital, and University of Texas Dental Branch, Houston, Texas 77031

We have previously reported (1) a significant increase in dental caries in cotton rats (*Sigmodon hispidus*) housed under conventional cool-white fluorescent lighting as compared to an artificial sunlight source. We have not been able to reproduce these results and now must retract the original observations and suggest that the error was probably occasioned by an inappropriate statistical evaluation.

Materials and Methods. In each of two identical experiments, littermate cotton rats, 12 in each group, were weaned at 12 days of age (2) and housed for 18 days under continuous cool-white fluorescent light or artificial sunlight (Vita-Lite, Duro-Test Corp., North Bergen, NJ). Specific characteristics of these lights, nature of the cariogenic diet, and other experimental details have been presented (1).

Caries incidence was calculated by a lesion count in susceptible fissure sites and caries extent was estimated by grinding the tooth and assigning a numerical score based upon size and depth of the lesion as viewed under a dissecting microscope.

Results. Caries score data for the two experiments for both forms of environmental lighting are presented in Table I. In neither experiment was there a significant effect of lighting on caries experience. These findings are in distinct disagreement with our previously reported results with the same species on the same diet and under the same lighting (1).

Discussion. Chi-square analyses of data in our earlier study (1) indicated significantly ($P < 0.001$) higher caries incidence and extent for animals under cool-white fluorescent lighting than under artificial sunlight. When similar analysis of the data of the present study revealed a lack of significance, additional statistical consultation was obtained. Testing (t) of both previous and present results indicated no significant differences in any case. The data were then processed

through the Wilcoxon rank sum test (4), the procedure selected as most appropriate for data of this type since it provides sensitivity approximating that of the t test without requiring as many assumptions in the data. Again, there were no significant differences in caries incidence associated with the type of environmental lighting.

An appropriate companion analysis for the Wilcoxon test is the calculation of a median estimate of the difference between groups (5). Confidence intervals (95%) for each of the experiments reported earlier (1) and the work presented here, bracketed zero and thus pointed out why the studies failed to show significant differences in the Wilcoxon analysis.

It thus became apparent that the significance of our earlier observations was related to the choice of the chi-square analytical method. This was inappropriate since the chi-square test can be applied only when all observations are completely independent of each other, and when an individual observation is either success (no caries) or failure (caries) on a single trial. This is clearly not the case in these experiments since different teeth in the same animal are not independent of each other although teeth in different animals could be thus classified. Even though caries scores differed by more than 30% in the previously reported study (1), this would not have been interpreted as significant had the proper statistical method been applied to the data.

Summary. Two experiments involving littermate cotton rats were conducted to determine the effect of cool-white fluorescent versus artificial sunlight environments on caries incidence. There were no significant differences in either the incidence or extent of caries associated with the different types of lighting. This contradicts our previous observations (1) with this species using identical experimentation and calls for a retraction. It is suggested that the difference is

TABLE I. EFFECT OF LIGHT SOURCE ON CARIES SCORE

Experiment	Cool-white fluorescent	Artificial sunlight	<i>P</i>
I			
Incidence	11.80 (6.70) ^a	11.73 (3.61)	NS
Extent	23.70 (13.50)	23.45 (7.22)	NS
II			
Incidence	8.17 (4.69)	7.92 (4.96)	NS
Extent	16.67 (9.88)	16.08 (10.32)	NS

^a Mean (SD) for caries score.

due primarily to the application of an inappropriate statistical approach in the earlier work.

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