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SALT FLUORIDATION STUDY IN FOUR COLOMBIAN COMMUNITIES

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PAN AMERICAN HEALTH ORGANIZATION
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SALT FLUORIDATION STUDY IN FOUR COLOMBIAN COMMUNITIES*

During the First Meeting of the PAHO/ACMR consideration was given to the desirability of a study of salt fluoridation as a caries preventive measure. The country selected for this purpose was Colombia, where there is a federal monopoly of common salt production and distribution and where it would be easier to run a well controlled study. The institution which seemed to offer the best possibilities to take major responsibility in this research was the University of Antioquía, in Medellín.

The Dental and Nutrition Advisors of PAHO visited the University, explained the proposed research plan, and assisted in the preparation of the grant application to the National Institutes of Health, USPHS. The application was approved last December and the project was initiated early in 1962. The two advisors mentioned are acting as consultants to the project. There are also three additional consultants, from the National Institute of Dental Research, National Institutes of Health, USPHS.

The research will be conducted jointly by the Dental and Medical Schools of the University of Antioquía. The principal investigator is the Professor of Public Health in the Dental School and the co-principal investigator is the Chief of the Nutrition Section in the Medical School. The project will run for five years at an estimated total cost of $250,961, with expenditures for the first year estimated at $83,874.

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Fifteen persons will work on this project, 12 of them on a full-time basis. Of the fifteen persons involved, 6 are dentists and one is a physician.

The specific aims of the project are:

1. To study the effectiveness of common salt as a vehicle in fluoridation programs for caries prevention.
2. To compare the effectiveness of sodium and calcium fluoride as salt additives in caries prevention.
3. To establish optimum levels of fluorides in salt, for general, safe application.

Four communities in the Department of Antioquía have been selected for the study: Armenia, Guarne, Montebello and San Pedro. These communities are basically similar in composition, population, geographic location, climate, social development and health status. The populations are also stable, migration being slight or non-existent.

The total population of each of these communities is approximately 10,000 and is distributed between urban concentration and surrounding rural dwellings. Similar populations in the age group up to 16 years of age have been estimated (approximately 4,000 in each community), and similar birth rates (approximately 400 per annum in each community) recorded. All four populations are situated in rural mountain areas, approximately thirty miles from Medellín, the State capital. Similar rainfall and average temperatures have been recorded in all areas. Biological environment, health status and health services are comparable in these communities, as are their cultural and social development.

Previous studies in similar areas of Antioquía (and in San Pedro)

indicate a constant high prevalence of caries in permanent teeth (4.19 DMF teeth in eight-year olds) with a high annual increment (1.45 DMF teeth per annum). Water fluoride levels are constantly below 0.1 p.p.m. in all four communities.

Each community has a single controllable source of salt supply, which, in turn, originates from a single source (Medellín) for the entire state. Close collaboration and interest on the part of the community authorities and leaders has been assured for the purposes of this study.

According to the basic plan of the study, one community, Guarne, will continue to receive its normal supply of common table salt as used in Colombia, and will serve as the control population. Two of the other communities, Armenia and Montebello, will receive, respectively, common salt with added sodium fluoride-tricalcium phosphate mixture, and common salt with added calcium-fluoride. Arrangements for the preparation and provision of these mixtures have been made with the Monsanto Chemical Company of St. Louis, Missouri. The remaining community, San Pedro, will be provided with a water fluoridation program so as to obtain comparable data on caries prevention and urinary fluoride excretion.

With reference to the two communities that will receive fluoridated salt, arrangements will be made to assure a complete change over of non-fluoridated salt to fluoridated salt at the appropriate time, and to insure a continous adequate supply of same.

A census of each population is being taken, identifying each inhabitant by name, age, sex, domicile and social status, and a detailed map is being drawn up describing the location of each family.

A basic dietary survey is being carried out on a 10 per cent

randomly selected sample of each community, using a seven day observation-weighing technique. Special attention is given to the consumption of salt in the younger age groups.

Clinical nutrition studies will be carried out on the same sub-sample (1) and X-ray examination made of the hand and wrist bones to determine bone density and development (2).

All of the above mentioned studies are being carried out by trained personnel of the Section of Nutrition of the University of Antioquía, including the two dieticians that are budgeted.

Excretion patterns of urinary fluorides will be determined by the method of McClure (3) in a small selected sample of young children in each community following intakes of varying levels of fluorides (sodium and calcium). These figures, combined with dietary and water survey results will permit determination of starting amounts of fluoride, in the salt of the experimental communities. These studies will be carried out by trained personnel of the Department of Biochemistry of the University of Antioquía.

Arrangements were made for the installation of a salt-fluoridation plant in the University, and preliminary trials of fluoride mixtures will be carried out in conjunction with the above mentioned urinary excretion studies.

Three dentists who are graduates of the University of Antioquía, were selected to serve as community dentists in three of the four towns to be studied. In the fourth town, the Department of Health of Antioquía has appointed a dentist whose full collaboration in this study is assured. These dentists maintain community collaboration in the project

by providing a minimal dental care program. They also serve as community observers, will report on any local changes liable to affect the study, and will participate in the annual dental survey in all communities.

It is expected that all of these preliminary studies and arrangements will be completed during the first year (January 1 to December 31, 1963).

Following the establishment of a supply of fluoridated salt for the two communities, and the initiation of a water-fluoridation program for the third, a base-line dental survey will be carried out in each community on a hundred or more children of each age group between three and sixteen years of age. For better collection of data, this sample will be selected within geographic areas of urban concentration. A team of four dentists, carefully selected, will carry out the survey of caries experience using "def" and DMF indices as described by Klein, Palmer and Knutson (4). Enamel opacities will also be recorded.

The survey will be repeated annually at the same time of the year throughout the study on a similarly selected group of children. It is probable that the sample will cover all children in these age groups in the urban concentration. An attempt will be made to maintain the original team of examiners throughout the study. If any replacements are necessary the incoming examiner will be carefully briefed by the departing member.

Dietary surveys will be repeated at two-year intervals on the originally selected sample in each population to insure consistency of dietary habits and salt intakes.

Clinical nutrition studies will be carried out at yearly intervals on the originally selected sample.

Urinary fluoride excretion studies, following the stabilization of intake, will be carried out at three monthly intervals using as a basis for comparison the urinary excretion patterns obtained in the town with fluoridated water and levels obtained in other populations in Colombia and the U. S. A., where an optimal amount of fluoride has been added to the water. Further modifications of intake will be made if indicated.

A record of the sale of salt will be established in each community in order to know the consumption and distribution of salt in the rural areas.

Following annual dental surveys, periodic evaluation of the study will be carried out. At the end of 1967 a decision will be taken on whether or not it is desirable that the study be extended.

At present the only effective mass-method of caries prevention is by fluoridation of water, which usually implies the processing of large water reservoirs supplying large urban areas. It must however be born in mind that, according to a recent study by PAHO (5) some hundred million inhabitants of the Americas are without an adequate water supply, and consequently are physically unable to avail themselves of water treatment procedures. Even when water supplies in Latin America are improved, the great percentage of rural dwellers (60 per cent of total population in Colombia, for example) will still be dependent on small local water supplies that will not be adaptable to fluoridation procedures. It is therefore of urgent necessity to seek some other vehicle of universal need and use, such as salt, in order that such populations can benefit from fluoridation programs.

Even in the technically advanced areas of the world, insurmountable social resistance is often encountered to water fluoridation programs, thus depriving interested inhabitants of these areas from potential benefits. The fluoridation of a certain percentage of salt produced in a given area would offer an excellent means of achieving voluntary participation in such public health measures. Furthermore, in developed countries fluoridation of salt might be the answer to the lack of fluoride in rural areas.

Finally, it has been estimated that the fluoridation of salt, as opposed to that of water, is a procedure which is far less costly , a fact of considerable significance in the developing areas, where budget for health services is frequently minimal.

This research project represents the first positive accomplishment in PAHO's dental research program. Attention will now turn to the other activities mentioned in the PAHO/ACMR report, namely the training of research workers and the establishment of a center for services to dental research.

R E F E R E N C E S

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(5) Salud Mundial, OMS, September - October, page 19. 1961