Newburgh-Kingston Caries-Fluorine Study

II. Pediatric Aspects—Preliminary Report


Director, Bureau of Maternal and Child Health; Associate Physician, Pediatric Research, Newburgh-Kingston Caries-Fluorine Study; and Statistician, State Department of Health, Albany, N. Y.

EXTENSIVE epidemiological investigation has led to general acceptance of the inhibitory effect of naturally occurring fluoride in drinking water on the development of dental caries.1 Acceptance of this concept has led to the planning and execution of long-term studies of the effect of artificial introduction of fluoride into communal water supplies. If the promise of such studies as the one at Newburgh and Kingston, reported upon at this session by Ast, Finn, and McCaffrey,2 is borne out on more prolonged investigation, use of fluoride in communal water supplies may become a routine public health procedure affecting large segments of the population.

Before any public health procedure can be recommended for routine use, every effort should be made, within limits of available techniques, to ascertain the safety of the procedure in question. Although there is no acceptable evidence that naturally occurring fluoride in the concentration used in drinking water as a caries-deterrent, exerts any deleterious systemic effects, it is desirable to make carefully controlled observations of children receiving fluoride introduced into their drinking water, especially while it is still possible to do so before public clamor for routine use of fluoride precludes controlled studies. McClure1 has stated this succinctly in a recent review, “Although further studies of population groups exposed to fluoride waters are undoubtedly desirable, it seems unlikely that prolonged ingestion of fluorine via a domestic drinking water containing 1.0 to 1.5 parts per million of fluorine, or perhaps more, presents a public health hazard.”

At the time the Newburgh-Kingston Caries-Fluorine Study was being planned, possible toxic effects of fluoride were in the forefront of consideration, especially in view of certain unpublished reports regarding fluoride toxicity then in circulation which have not been verified subsequently. Planners of the project felt that a unique contribution could be made by including in the study a pediatric research clinic, utilizing laboratory and roentgenologic methods. Careful periodic evaluation was therefore instituted of a group of children in the city of Newburgh, receiving drinking water containing artificially introduced fluoride in a concentration of 1.2 p.p.m. of fluorine, and of a control group in the city of Kingston, the drinking water supply of which contains a negligible amount of fluoride. These two cities,
about 30 miles apart on the west bank of the Hudson River, bore a close resemblance to each other in respect to size and socio-economic conditions.

METHODS OF STUDY

Initially a group of 500 children was chosen for study in each city. The age distribution of each group was about as follows: Under 1 year of age, 100; 1 year of age, 100; 2 to 5 years of age, 200; and 5 to 9 years of age, 100. During each of the first 3 years of the study an additional group of infants under 1 year of age was enrolled in the pediatric research clinic in each city. The sexes were equally represented at each age in so far as possible.

An effort was made to select the children in proportion to the population in various parts of each city, concentrating upon enrollment of children from families which might reasonably be expected to remain for the duration of the study. Attention was also paid to obtaining a comparable selection of children in each city according to socio-economic status. This was not entirely possible because of the voluntary nature of the examinations.

The same research clinic team conducts the medical examinations in both cities. The physical examinations are performed by a board-qualified pediatrician (D.E.O.) who also directs the work of an experienced public health nurse, a laboratory technician, and a clerk receptionist.

A careful medical history is taken at the time of each child’s initial visit to the research clinic and the history is supplemented at each annual visit. A physical examination is performed annually, with special emphasis placed upon tissues and organs which have been mentioned as possibly affected by fluoride. Thus, special attention has been paid to oiliness or dryness of the skin, to skin turgor, to abnormal markings or brittleness of the nails. Physical measurements made at each visit consist of weight, standing and sitting height, circumference of head and circumference of chest.

In Newburgh the following laboratory examinations are performed at each visit: routine urine analysis, hemoglobin, total leucocyte count, and total erythrocyte count. If the total leucocyte count is outside the range of 5,000–10,000 per cu. mm., a differential leucocyte count is also made. These examinations were also made in Kingston during the first three years of the study. If any deviations are observed from the base line observations in Newburgh, the laboratory examinations will be resumed in the control city.

Roentgen films are taken of the right wrist and both knees of each child at annual intervals. These films are read by Dr. John Caffey, professor of clinical pediatrics at the College of Physicians and Surgeons, Columbia University. Special attention is paid to any possible change in bone density in view of the occurrence of osteosclerosis in chronic fluoride intoxication.

Certain special examinations are made of small groups of children in Newburgh. A group of 25 children of various ages, selected from those enrolled at the pediatric research clinic, has been given special ophthalmological examinations, including mapping of visual fields and determination of transparency of cornea and lens. The same group of 25 children has received special otological examinations including audiometric tests. Special examinations on selected groups of children will be repeated annually. If any pathological trend becomes evident in Newburgh, similar examinations will be performed in Kingston for control purposes.

Other special studies are being conducted or planned to answer special questions in connection with the Newburgh–Kingston study. A study is well under way, in cooperation with Barnett and McNamara at the New York Hos-
pital in New York City, to determine
the mode of excretion of fluoride in the
urine of children having impaired renal
function compared with a group of chil-
dren of the same age with normal renal
function. Another study being planned
will attempt to utilize objective quanti-
tative methods for the determination of
bone density of children in Newburgh
and Kingston.

RESULTS
Comparison of the results of the medi-
cal examinations of children in the two
cities at the time of the introduction of
fluoride into the Newburgh drinking
water supply and three years afterward,
and between the children in Newburgh
during the same interval, has failed to
disclose any significant deviation in any
of the factors studied.

After careful study of the roentgen
films, Dr. Caffey found no detectable
difference in bone density in children in
the two cities studied. Dr. Caffey also
found both groups of children to be
within the normal range of skeletal
maturation on clinical estimation.

No abnormalities have been found in
the visual field and no opacities have
been discovered in the cornea or lens of
the children given special ophthalmol-
logical examinations. Similarly audio-
metric tests, as part of the special otological examinations, have given re-
sults within the range of normal hearing
for the ages studied.

The results thus far in the study have
disclosed no deleterious systemic effects
from the ingestion of fluoride in drinking
water in the dosage employed. It must
be emphasized, however, that a longer
period of observation is required before
final conclusions can be drawn. The
possibility of demonstrating cumulative
effects of fluoride in the final years of
the 10 year study cannot be eliminated
at this time. More refined techniques
may also be available in the future in
studying pertinent aspects of the prob-
lem.

SUMMARY AND CONCLUSIONS
1. The preliminary results of the pediatric
examinations at the start and 3 years after
introduction of fluoride at the Newburgh-
Kingston caries-fluorine study are reported.
2. Special examinations, including physical
examinations, laboratory tests, and roentgen
studies, fail to disclose any significant devia-
tions in any of the factors studied in groups
of children ingesting fluoride as compared with
a control group.
3. Final conclusions regarding the possible
systemic effects of fluoride in the dosage em-
ployed should not be drawn before termination
of the 10 year study.

REFERENCES
1. McClure, F. J. Fluorine and Other Trace Elements
2. Ast, D. B., Finn, S. B., and McCaffrey, I. The
Newburgh-Kingston Caries-Fluorine Study: I. Dental
Findings after Three Years of Water Fluoridation.
This issue A.J.P.H.