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A STUDY OF THE INTELLECTUAL ABILITY OF 8–14 YEAR-OLD CHILDREN IN HIGH FLUORIDE, LOW IODINE AREAS

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[SUMMARY: Wechsler Intelligence Test IQ scores of 160 children, 8–14 years old, from nine schools in an area of high fluoride and low iodine averaged 64.8 compared with 85.0 ($p < 0.01$) for 169 children of the same ages from seven schools in an area with low iodine only. Among the first group 65 (40.6%) had IQs below 60, but only 23 (13.6%) among the second group had scores this low. In each group the IQs of the boys and girls did not differ significantly. Clearly, exposure to the combination of high fluoride and low iodine was more deleterious than to low iodine alone.]

[Keywords: Children's IQ; High fluoride; Low iodine.]

INTRODUCTION

The effect of a harmful environment containing both high fluoride and low iodine on the development of child mental ability has yet to be reported on. To investigate this question, the authors used the Wechsler Intelligence Test to determine the IQs of a total of 329 eight- to fourteen-year-old children living in nine high fluoride, low iodine villages, and in seven villages that had only low levels of iodine. We discovered that the IQs of children from the high fluoride, low iodine villages were clearly lower than those from the villages with low iodine alone.

SUBJECTS, METHODS, AND RESULTS

Prior to the testing, personnel were rigorously trained, and three fixed, primary testers were chosen. The children were uniformly tested and scored based on standards suited to their grade level.

The test drew subjects from nine schools in the high fluoride, low iodine zone, a total of 160 students, including 83 boys and 77 girls. The boys had an average IQ of 68.6, with a standard deviation of 18.1; the girls had an average IQ of 68.5, with a standard deviation of 22.5. The IQ difference between the two genders was not significant ($u = 0.03$, $P > 0.05$).

From seven schools in the zone with low iodine alone 169 subjects were drawn, including 90 boys and 79 girls. The boys had an average IQ of 87.9, with a standard deviation of 22.1; the girls had an average IQ of 81.8, with a standard deviation of 24.8. The IQ difference between the two genders was not significant ($u = 1.73$, $P > 0.05$).

The average IQ for the entire subject group from the high fluoride, low iodine zone was 64.8, with a standard deviation of 20.4; for the zone with only low iodine, the average IQ of the subject group was 85, with a standard deviation of 22.3. Statistical analysis shows that this result is very significant ($u = 6.97$, $P < 0.01$).

If the girls from each zone and the boys from each zone are compared, the results are also very significant (boys: $u = 6.5$, $P < 0.01$; girls: $u = 3.54$, $P < 0.01$).

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Among the 160 students in the high fluoride, low iodine group, 65 of them had an IQ lower than 69, low enough to be classified as having an intellectual deficit; these children made up 40.6% of the group. Among the 169 students from a solely iodine deficient environment, there were 23 with an intellectual deficit, 13.6% of the total. The two results are very significant ($u = 5.51$, $P < 0.01$).^b In the high fluoride, low iodine zone, 68.1% of the children have IQs lower than 80, compared with 36.7% in the zone with low iodine alone (see Table).

Table. Distribution of student IQs for high fluoride, low iodine zone vs. merely low iodine zone

IQ	High fluoride, low iodine zone (9 schools)				Low iodine only zone (7 schools)			
	Boys	Girls	Total	%	Boys	Girls	Total	%
130 or higher	0	1	1	0.6	4	6	10	5.9
120-129	1	0	1	0.6	6	3	9	5.3
110-119	2	9	11	6.9	9	3	12	7.1
90-109	13	9	22	13.8	32	19	51	30.2
80-89	10	6	16	10.0	12	13	25	14.8
70-79	24	20	44	27.5	19	20	39	23.1
69 or lower	33	32	65	40.6	8	15	23	13.6
Total	83	77	160	100	90	79	169	100

DISCUSSION

From the results it is evident that disrupted child intellectual development is among the effects on the human body from a harmful environment containing both high fluoride and low iodine, and this disruption is clearly much more serious than the effects of iodine deficiency alone.

Based on the literature, possible reasons for this include:

a) The ability of fluoride to influence normal function of the central nervous system, causing memory deficits. It can also affect the excitability of the central nervous system. One survey found that patients suffering from fluoride poisoning tended to have lower nerve cell counts in their spinal anterior horns, and malformation of the cell nucleus or lateral funiculus. These findings indicate that prolonged exposure to high levels of fluoride has a direct negative effect on the central nervous system.

b) The excess uptake of fluoride can inhibit the physiological function of various enzymes, thus forming a barrier to the body's proper metabolic and physiological function. This would affect high-level brain activity, inhibiting cholinesterase and leading to a breakdown in nerve impulse transmission.

c) The occurrence of high fluoride together with low iodine might exacerbate the damage to the central nervous system caused by iodine deficiency alone, or the two might each have their own damaging effect on the central nervous system, the results we see here being therefore simply a composite of the two separate factors.

^b**Editorial note:** Chi-square analysis, with Yates' correction for one degree of freedom, for a nearly three-fold difference of 65/160 vs. 23/169, gives a chi-square, χ^2 , of 29.15, $P < 0.00001$, a very highly significant difference.