

Table 4. Fluoride studies: IQ and Behavioral Effects	
Study	Details
<p>Fluoride Vol. 36 No. 2 84-94 2003</p> <p>EFFECT OF FLUORIDE IN DRINKING WATER ON CHILDREN'S INTELLIGENCE</p> <p>Xiang Q, Liang Y, Chen L, Wang C, Chen B, Chen X, Zhou M</p> <p>(a) Department of Occupational Health, School of Public Health, Fudan University (Formerly Shanghai Medical University, China (b) Center for Disease Control and Prevention, Jiangsu Province, China. (c) Control and Prevention, Sihong County, Jiangsu Province, China.</p>	<p>The Intelligence Quotient (IQ) was measured in 512 children, aged 8–13 years, living in two villages in Sihong County, Jiangsu Province, China, differing in the level of fluoride in their drinking water. In the high fluoride village of Wamiao (water fluoride: 2.47±0.79 mg/L; range: 0.57–4.50 mg/L), the mean IQ of 222 children was significantly lower (92.02±13.00; range: 54–126) than in the low-fluoride village of Xinhuai (water fluoride: 0.36±0.15 mg/L; range: 0.18–0.76 mg/L), where the mean IQ of 290 children was higher (100.41±13.21; range: 60–128).</p> <p>In endemic fluorosis areas, drinking water fluoride levels greater than 1.0 mg/L may adversely affect the development of children's intelligence.</p> <p>FULL STUDY</p>
<p>Fluoride Vol. 33 No. 2 74-78 2000</p> <p>EFFECT OF HIGH-FLUORIDE WATER ON INTELLIGENCE IN CHILDREN</p> <p>Y Lu, ZR Sun, LN Wu, X Wang, W Lu, SS Liub Tianjin, China</p> <p>Department of Environmental Health, Tianjin Medical University, Tianjin, China.</p>	<p>The Intelligence Quotient (IQ) was measured in 118 children, aged 10-12 years, who were life-long residents in two villages of similar population size and social, educational and economic background but differing in the level of fluoride in drinking water.</p> <p>High-fluoride area (drinking water fluoride 3.15 ± 0.61 mg/L [ppm]) (mean ± S.D.)</p> <p>Low-fluoride area (drinking water fluoride 0.37 ± 0.04 mg/L)</p> <p>The IQ of the 60 children in the high-fluoride area was significantly lower, mean 92.27 ± 20.45, than that of the 58 children in the low-fluoride area, mean 103.05 ± 13.86. More children in the high-fluoride area, 21.6%, were in the retardation (<70) or borderline (70-79) categories of IQ than children in the low fluoride area, 3.4%. An inverse relationship was also present between IQ and the urinary fluoride level. Exposure of children to high levels of fluoride may therefore carry the risk of impaired development of intelligence.</p> <p>FULL STUDY</p>
Continued ...	

<p>Wei Sheng Yan Jiu. 1999 Nov;28(6):337-8.</p> <p>[Effect of fluoride-arsenic exposure on the neurobehavioral development of rats offspring]</p> <p>Zhang C, Ling B, Liu J, Wang G</p> <p>College of Public Health, Xinjiang Medical University, Urumqi 830054, China.</p>	<p>Wistar rats were exposed to fluoride and arsenic for two generations.</p> <p>The results demonstrated that: with the increasing concentrations of fluoride and arsenic, the positive rates of early physiological development and nerve reflex were decreased obviously, and the abilities of learning and memory of the offspring were decreased, the swimming and enduring anoxia time gradually shortened. The pathological changes of brain under electron microscope were as follows: decreased number of nerve cells, irregular cell nucleus, organelles degeneration, and obvious decreased number of synapses. It was demonstrated that fluoride-arsenic displayed distinct damage on the nerve system of the offspring.</p> <p>Abstract</p>
<p>Wei Sheng Yan Jiu. 1999 Jul;28(4):210-2.</p> <p>[Effect of fluoride exposure on synaptic structure of brain areas related to learning-memory in mice]</p> <p>Zhang Z, XU X, Shen X, XU X</p> <p>Department of Biology, Zhejiang Normal University, Jinhua 321004, China.</p>	<p>The learning-memory behavior was tested in mice on a Y-maze after drinking different concentration of sodium fluoride.</p> <p>The impairment on the structure of Gray 1 synaptic interface in the CA3 area of mice hippocampus were quantitatively analyzed by electron microscopy and computer image processing appliance.</p> <p>The main results are as follows: the learning ability of mice drinking high concentration of fluoride presented remarkable deterioration, the thickness of post-synaptic density (PSD) was decreased, and the width of synaptic cleft was remarkably increased. The results suggested that the impairment on the learning capability induced by fluorosis may be closely related with the pathological changes of synaptic structure in the brain of mice.</p> <p>Abstract</p>
<p>Neurotoxicol Teratol. 1995 Mar-Apr;17(2):169-77.</p> <p>Neurotoxicity of sodium fluoride in rats</p> <p>Mullenix PJ (1,2), Denbesten PK (3), Schunior A (3), Kernan WJ (4)</p> <p>(1) Toxicology Dept., Forsyth Research Institute, Boston MA (2) Dept. of Radiation Oncology, Harvard Medical School, Boston MA (3) Dept. of Pediatric Dentistry, Eastman Dental Center, Rochester NY (4) Veterinary Diagnostic Laboratory, Iowa State University, Ames IA</p>	<p>Behavior was tested in a computer pattern recognition system</p> <p>... Dose dependent increases in plasma fluoride were measured in all exposed rats. Six week exposure to 100 or 125ppm fluoride altered behavior in female rats, while male rats exhibited altered behavior after 11 weeks of exposure to 125ppm. Levels of plasma fluoride that impacted on behavior were 0.107ppm for females, and 0.126 and 0.170 in males. Adult rats exposed to 100ppm fluoride for 6 weeks showed no reduction in body weight and behavioral effects appeared only in females. Adult female rats exhibited behavior deficits at 0.077ppm plasma fluoride...</p> <p>After weanling and adult exposures the severity of deficits increased with increasing F levels found in plasma and specific brain regions such as the hippocampus.</p> <p>Fluoride levels increased in the medulla oblongata in both sexes and in the hippocampus in females. The authors conclude that certain levels of fluoride exposure lead to behavior disruption consistent with interrupted hippocampal development in the rat.</p> <p>Abstract FULL STUDY at Science Direct</p>
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<p>Zhonghua Bing Li Xue Za Zhi. 1989 Dec;18(4):290-2.</p> <p>[Experimental study of behavior and cerebral morphology of rat pups generated by fluorotic female rat]</p> <p>Liu WX</p>	<p>In order to study the effects of fluoride on the central nervous system, 33-42-day old rat pups generated by three groups of female Wistar rats, which were given distilled water containing 0, 30 and 60 ppm NaF respectively beforehand as drinking water for 85 days, were used for behavior test and cerebral morphological examination.</p> <p>The results of behavior test showed that the latent period of pain reaction and that of conditioned reflex in the 30 ppm F and 60 ppm F groups were longer than that in the control group (P less than 0.05 or P less than 0.01). morphological examination of the pup brains showed that the nerve cell density of the 60 ppm F group was higher than that of the control group (P less than 0.05). Electronmicroscopically, mild degeneration of organelles of the nerve cells was observed in those brains of the 60 ppm F group.</p> <p>Abstract</p>
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