ABSTRACTS

DENTAL SURVEY IN AUCKLAND, NEW ZEALAND

ENAMEL DEFECTS AND DENTAL CARIES IN 9-YEAR-OLD CHILDREN LIVING IN FLUORIDATED AND NONFLUORIDATED AREAS OF AUCKLAND, NEW ZEALAND

OBJECTIVES: This epidemiological study aims to investigate the developmental enamel defects and dental caries among 9-year-old children resident in fluoridated and nonfluoridated regions in Auckland, New Zealand.

METHODS: A stratified, two-stage random selection design where strata were defined by fluoridation status, school size, and school decile. After informed consent was obtained, parents completed oral health questionnaires and children underwent dental examinations at school clinics.

RESULTS: 612 children from 38 schools participated in the study. Overall, 175 (29%) children had lived continuously in fluoridated areas, 149 (24%) had lived continuously in nonfluoridated areas, and 288 (47%) had resided intermittently in fluoridated areas. Diffuse opacities were present in 117 (19%) children and deciduous teeth dental caries was seen in 370 (60%) children. After adjustment for covariates, a strong dose–response relationship between diffuse opacity and fluoridation status was found, with children who lived continuously in fluoridated areas being 4.17 times as likely to have diffuse opacities as children who lived continuously in nonfluoridated areas (P<0.001). Conversely, a strong protective dose–response relationship between caries experience and fluoridation status was seen, with children who lived continuously in fluoridated areas being 0.42 times as likely to have dental caries as children who lived continuously in nonfluoridated areas (P<0.001).

CONCLUSIONS: Reticulated water fluoridation in Auckland reduces the risk of dental caries but increases the risk of diffuse opacities in 9-year-old children. Guidelines and health-promotion strategies that enable children to minimize their risk to diffuse opacities yet reduce their risk of dental caries should be reviewed.

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Keywords: Dental survey in Auckland, NZ; Dental caries; Diffuse opacities; Fluoridation in Auckland, NZ.

FLUORIDE AND CNS OXIDATIVE STRESS

EFFECT OF MATERNAL EXPOSURE OF FLUORIDE ON BIOMETALS AND OXIDATIVE STRESS PARAMETERS IN DEVELOPING CNS OF RATS

The developing CNS (central nervous system) is highly vulnerable to environmental agents, including fluoride. Fluorosis is one such disorder resulting from excessive consumption of fluoride in water and/or foods that poses a significant threat to life and health. The present study concerns perturbations caused by fluoride toxicity on the levels of biometals and antioxidant homeostasis and their interactions. Pregnant Wistar rats were exposed to 100- and 200-ppm fluoride ion in drinking water and controls to tap water. The pups born of these rats were then used in the study. On 21st postnatal day, the concentration of fluoride, biometals, and oxidative stress markers were determined in discrete regions of the CNS. The levels of fluoride, copper, and iron increased, whereas manganese and zinc decreased considerably. Among antioxidant enzymes, catalase, superoxide dismutase, and glutathione peroxidase were decreased, and lipid peroxidation was increased with regional variations. Correlation coefficient values among oxidative stress markers and biometals were either positive or negative but were not
statistically significant. The results confirm that fluoride provoked oxidative stress and that biometal deformations that successively govern neuronal damage and the developing CNS is synergistic and unable to prevent exacerbations by fluoride.

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Keywords: Antioxidant enzymes; Biometals; Catalase; Central nervous system; Fluoride neurotoxicity; Glutathione peroxidase; Homeostasis; Newborn rats; Superoxidase dismutase.


**FLUORIDE AND THYROID DYSFUNCTION**

**FLUORIDE-INDUCED THYROID DYSFUNCTION IN RATS: ROLES OF DIETARY PROTEIN AND CALCIUM LEVEL**

To assess the roles of dietary protein (Pr) and calcium (Ca) level associated with excessive fluoride (F) intake and the impact of dietary Pr, Ca, and F on thyroid function, 144 30-day-old Wistar albino rats were randomly allotted to six groups of 24 (female: male = 1:1). The six groups were fed (1) a normal control (NC) diet (17.92% Pr, 0.85% Ca = NC group); (2) the NC diet and high F (338 mg NaF [=150 mg F ion]/L in their drinking water = NC+F group); (3) low Pr and low Ca diet (10.01% Pr, 0.24% Ca = LPrLCa group); (4) low P and low Ca diet plus high F = LPrLCa+F group; (5) high Pr and low Ca diet plus high F (25.52% Pr, 0.25% Ca = HPrLCa+F group); and (6) low Pr and high Ca diet plus high F (10.60% Pr, 1.93% Ca = LPrHCa+F group). The areas of thyroid follicles were determined by Image-Proplus 5.1, and triiodothyronine (T3), free T3 (FT3), thyroxine (T4), and free T4 (FT4) levels in serum were measured by radioimmunoassay. The histopathological study revealed obviously flattened follicular epithelia cells and hyperplastic nodules consisting of thyroid parafollicular cells that appeared from excessive F ingestion on the 120th day. Pr or Ca supplementation reversed the F-induced damage during malnutrition. The serum T3, FT3, T4, and FT4 levels were significantly decreased in the NC+F group and significantly increased in the LPrLCa+F group. Thus, excessive F administration induces thyroid dysfunction in rats, while dietary Pr and Ca levels play key roles affecting F-induced thyroid dysfunction.

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Keywords: Calcium; Dietary deficiency; Fluoride toxicity; Protein; Radioimmunoassay; Thyroid and rats; Triiodothyronine, Thyroid dysfunction; Thyroxine.


**FLUORIDE CONTAMINATION OF GROUNDWATER**

**HEALTH EFFECTS OF GROUNDWATER FLUORIDE CONTAMINATION**

INTRODUCTION: The people in Berhait block, Sahibganj district, Jharkhand state, India, have been exposed chronically to fluoride-contaminated groundwater. Here we report clinical effects of chronic exposure to fluoride. METHODS: The study population was a convenience sample of 342 adults and 258 children living in the affected area. All volunteers filled out questionnaires and were examined. Well water from the six affected villages and urine samples were analyzed for fluoride using a fluoride ion-sensitive electrode. RESULTS: Twenty nine percent of 89 well water samples had fluoride concentrations above the Indian permissible limit of fluoride in drinking water. Eighty-five children and 72 adults had clinical fluorosis. Urine fluoride concentrations in children were 0.758–2.88 mg/L whereas in adults they were 0.331–10.36 mg/L. DISCUSSION: Clinical effects of
fluoride included abnormal tooth enamel in children; adults had joint pain and deformity of the limbs and spine, along with ligamentous calcifications and exostosis formations in seven patients. Elevated urine fluoride concentrations supported the clinical diagnosis of fluorosis. Owing to insufficient fluoride-safe wells and lack of awareness of the danger of fluoride toxicity, villagers often drink fluoride-contaminated water. CONCLUSION: Villagers of Berhait block, including children, are at risk from chronic fluoride toxicity. To combat the situation, villagers need fluoride-safe water, education, and awareness of the danger of fluoride toxicity.

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Keywords: Berhait block; Clinical effects; Exostoses; Fluoride water; Fluorosis; Groundwater fluoride; Jharkhand, India; Ligamentous calcification; Sahibganj district.

METHIONINE AND ANTIOXIDANT ENZYME ACTIVITY
INFLUENCE OF METHIONINE UPON THE ACTIVITY OF ANTIOXIDATIVE ENZYMES IN THE KIDNEY OF RATS EXPOSED TO SODIUM FLUORIDE

The intensified or uncontrolled formation of reactive oxygen species leads to disturbances of numerous biochemical processes. Factors inducing intensified free radical processes include fluoride ions, among others. One of the organs most exposed to the toxic activity of fluorides is the kidney. In the study presented here, the influence of fluoride ions upon the activity of selected antioxidant enzymes in rat kidney has been examined, as well as antioxidant properties of methionine during intoxication with sodium fluoride. The experiment was carried out on Wistar FL rats (adult females) that for 35 days were administered water, NaF, NaF with methionine (dosages: 10 mg NaF/kg bw/day, 10 mg Met/kg bw/day). The influence of administered NaF and Met upon the antioxidative system in the kidney was examined by analyzing the activity of the most important antioxidative enzymes (SOD, CAT, GPX, GR, GST). The studies carried out confirmed the disadvantageous effect of NaF upon the antioxidative system in rats (decrease in activity of antioxidative enzymes). Methionine increased the activity of antioxidative enzymes, most efficiently that of GPX, GR, and GST.

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Keywords: Antioxidant enzymes; Fluoride and antioxidants; Methionine; Rat kidneys; Reactive oxygen species.

FLUORIDE LEVELS FROM SEVOFLURANE AND PROPOFOL
RENAL INTEGRITY IN SEVOFLURANE SEDATION IN THE INTENSIVE CAREUNIT WITH THE ANESTHETIC-CONSERVING DEVICE: A COMPARISON WITH INTRAVENOUS PROPOFOL SEDATION

BACKGROUND: Increased inorganic fluoride levels after methoxyflurane exposure in the 1970s and prolonged intraoperative sevoflurane use have been suggested to be potentially nephrotoxic. In the intensive care unit we evaluated the effect on renal integrity of short-term inhaled postoperative sedation with sevoflurane using the Anesthetic Conserving Device (ACD) compared with propofol. METHODS: In this prospective, randomized, single-blinded study, after major abdominal, vascular or thoracic surgery, 125 patients were allocated to receive either sevoflurane (n = 64) via the ACD (end-tidal 0.5–1 vol%) or i.v. propofol (n = 61) for postoperative sedation up to 24 hr. Urinary alpha-
glutathione-S-transferase as primary outcome variable, urinary N-acetyl-glucosaminidase, serum creatinine, and inorganic fluoride concentrations, urine output, and fluid management were measured preoperatively, at the end of surgery, and at 24 and 48 hr postoperatively. RESULTS: The sedation time in the intensive care unit was comparable between the sevoflurane (9.2 ± 4.3 hr) and the propofol (9.3 ± 4.7 hr) group. Alpha-glutathione-S-transferase levels were significantly increased at 24 and 48 hr postoperatively compared with preoperative values in both groups, without significant differences between the groups. N-acetyl-glucosaminidase and serum creatinine remained unchanged in both study groups, and urine output and creatinine clearance were comparable between the groups throughout the study period. Inorganic fluoride levels increased significantly (P < 0.001) at 24 hr after sevoflurane exposure (39 ± 25 micromol/L) compared with propofol (3 ± 6 micromol/L) and remained elevated 48 hr later (33 ± 26 vs 3 ± 5 micromol/L). One patient in each group suffered from renal insufficiency, requiring intensive diuretic therapy, but not dialysis, during hospital stay. CONCLUSIONS: Short-term sedation with either sevoflurane using ACD or propofol did not negatively affect renal function postoperatively. Although inorganic fluoride levels were elevated after sevoflurane exposure, glomerular and tubular renal integrity were preserved throughout the hospital stay.

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Keywords: Fluoride anesthetics; Methoxyflurane; Propofol; Sedation time; Sevoflurane.

SKELETAL FLUOROSIS NEUROLOGY

NEUROLOGY OF ENDEMIC SKELETAL FLUOROSIS

Endemic skeletal fluorosis is widely prevalent in India and is a major public health problem. The first ever report of endemic skeletal fluorosis and neurological manifestation was from Prakasam district in Andhra Pradesh in the year 1937. Epidemiological and experimental studies in the endemic areas suggest the role of temperate climate, hard physical labor, nutritional status, presence of abnormal concentrations of trace elements like strontium, uranium, silica in water supplies, high fluoride levels in foods, and presence of kidney disease in the development of skeletal fluorosis. Neurological complications of endemic skeletal fluorosis, namely radiculopathy, myelopathy or both, are mechanical in nature, and to date the evidence for direct neurotoxicity of fluoride is lacking. Prevention of the disease should be the aim, knowing the pathogenesis of fluorosis. Surgery has a limited role in alleviating the neurological disability and should be tailored to the individual based on the imaging findings.

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Keywords: Neurological manifestations; Nutritional status; India; Skeletal fluorosis; Temperate climate; Trace elements.
Source; Neurol India. 2009 Jan-Feb;57(1):7-12.
DENTAL FLUOROSIS AND BONE DENSITY IN CHILDREN
THE RELATIONSHIPS BETWEEN TWO DIFFERENT DRINKING WATER FLUORIDE LEVELS, DENTAL FLUOROSIS AND BONE MINERAL DENSITY OF CHILDREN

This field study included the whole population of children aged 10–15 years (77 from an area with 0.19 mg F/L in the drinking water and 89 from an area with 3.00 mg F/L in the drinking water) and with similar nutritional, dietary habits, and similar ethnic and socioeconomic status. The fluoride concentration in the drinking water, the bone mineral content, the bone density, and the degree of dental fluorosis were determined. The left radius was measured for bone width, bone mineral content, and bone mineral density. The mean fluorosis score was 1.3 in the low fluoride area and 3.6 in the high fluoride area. More than half the children in the low fluoride area had no fluorosis (scores 0 and 1) while only 5% in the high fluoride area had none. Severe fluorosis (30%) was only observed in the high fluoride area. The Wilcoxon Rank Sum Test indicated that fluorosis levels differed significantly (p < 0.05) between the two areas. No relationships were found between dental fluorosis and bone width or between fluorosis and bone mineral density in the two areas (Spearman Rank correlations). A significant increase in bone width was found with age but no differences amongst and boys and girls. A significant positive correlation was found in the high fluoride area between bone mineral density and age. In the 12–13 and 13–14 year age groups in the high fluoride area, girls had higher bone mineral densities. However, a significant negative correlation (p<0.02) was found for the low fluoride area with age.

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Keywords: Bone density; Bone mineral content; Dental fluorosis; Fluoride areas.

INTERNSHIP IN FLUOROSIS FOR TEACHING FACULTY OF MEDICAL AND DENTAL SCHOOLS OF DEVELOPED COUNTRIES, JANUARY 18–22, 2010, DELHI, INDIA

In response requests by several eminent medical and dental professionals from the developed world, I have made arrangements for an internship programme in fluorosis. I invite applications from the faculty of medical and dental schools and colleges in the developed world for attending a 5-day internship programme, January 18–22, 2010, at the Fluorosis Foundation of India, Delhi, India. Further details are given in Fluoride 2009;423(2):158.

The application form, fee structure, and other details for the first internship, January 18–22, 2010, may be obtained from the Fluorosis Foundation of India’s website: www.fluorideandfluorosis.com. During January, in North India, it is winter and weather will be cold with the temperature ranging from 10 to 15°C. The closing date for applications is October 30, 2009. The class size is limited and early application is advised.

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