

at Bedford College, London, found that both the amount of gastric juice and the acidity were reduced materially by administration of large doses of fluoride (0.02 M or 380 ppm) to cats in which the gastric secretory activity had been stimulated by histamine and similar agents. Have you any opinion on this point in connection with your data?

Dr. Leemann: We have only done pH levels on the rumen. Fluoride supplementation in cattle with the doses which we employed produced no changes of the pH level. Blood enzymes, Ca and alkaline phosphatase levels were all normal.

---

### CRIPPLING ARTHRITIS RELATED TO FLUORIDE INTAKE (CASE REPORT)

by

H. A. Cook  
London, England

**SUMMARY:** In a 55 year-old woman with long-standing arthritis, but no obvious signs of fluorosis, X-rays exhibited degeneration of discs and calcification in disc spaces. Her daily fluoride intake, mainly from tea, exceeded 9 mg; her daily urinary excretion was 3 mg. When she discontinued consuming tea, her fluoride intake fell below 1 mg daily; excretion through the urine exceeded intake; the arthritic pains diminished and virtually ceased in 6 months; mobility of her spine was restored and she was able to resume work. These observations suggest that arthritis of the spine of unknown cause might represent sub-clinical fluorosis which is not demonstrable radiologically.

Rheumatic and joint pains, major manifestations of fluorosis, are not uncommon among people residing in fluoridated areas.

A former public health inspector F. A. I. who resided in Maldon, Essex, a high fluoride area (4-5 ppm), had noted repeatedly that his arthritic pains improved when he moved away from that area, and tended to return whenever he revisited it. He, himself, linked his pains with the fluoride content of the water. Numerous other individuals, who have resided most of their lives in the same small natural fluoride area have had severe arthritis.

In 1968, the author carried out a survey (1) on ingestion of fluoride among British children and adults associated with their fluid intake. From flu-

Presented at the Fourth Annual Conference of I. S. F. R., The Hague, 10/24-27/71.

FLUORIDE

ids children and adults ingested on the average 2 1/4 mg and 3 1/2 mg fluoride per day respectively in nonfluoridated areas, 3 1/4 and 5 1/2 mg per day respectively in fluoridated areas. These values - far in excess of those previously assumed - did not take into account beer-drinking by adults. Most fluoride was derived from tea: 92.5% of children in Britain over 5 years of age drink tea regularly.

The variations in fluoride intake showed that the maximum fluoride intake of British children from tea alone reaches nearly 6 mg per day in unfluoridated areas and nearly 7 mg per day in fluoridated areas. Maximum intakes for adults were unobtainable.

These figures contrast with the fluoride intake in the U.S.A., where the average tea consumption is 0.6 lbs. per head per year. In Britain 9.2 lbs. per head is consumed annually. Jolly (2) has shown that crippling fluorosis is endemic in the Punjab - another tea-drinking area. Here dental or skeletal fluorosis varied inversely with the hardness of water supplies, i. e. with its calcium and magnesium content.

The actual fluoride intake required to produce skeletal fluorosis is unknown. The disease has been found in areas where the fluoride level in water varies from less than 1 ppm upwards (2, 3). Production of skeletal fluorosis is influenced not only by the fluoride content of the water supplies, but also by that of food and beverages, by industrial gaseous or particulate emissions of fluoride, by the calcium and magnesium intake, and by the efficiency of the kidney function. Siddiqui (4) has shown that individuals with fluorosis retain more fluoride than do normal individuals. In its early stage fluorosis is usually associated with pains in the spine which suggest the diagnosis of rheumatism or arthritis (5, 6). It cannot be diagnosed radiologically until it has reached the advanced stage, at which time, in most cases, it is associated with crippling.

Singh and Jolly (7) noted that a daily intake of 8 mg or more of fluoride is necessary to produce skeletal fluorosis. Those cases in which the disease could not be demonstrated radiologically were excluded. Neuromuscular effects of fluoride ingestion include pains in the muscles and joints (6, 3, 8). In the Hampshire case (3) of skeletal fluorosis with neurological complications, the fluoride content of water consumed by the patient throughout life was low. Apparently tea consumption was this patient's main source of fluoride intake. Therefore the high tea consumption in Britain could have caused the muscle and joint pains diagnosed as "rheumatism" or "arthritis".

#### Case Report

I encountered the case of a woman M. J. T. age 55, who had the habit of drinking more than 2 pints of tea per day. She had been crippled with arthritis for about 25 years for which she was under constant medication with the analgesic, phenylbutazone. To obtain relief this patient had moved 12 years pre-

viously to a natural fluoride area (0.67 ppm fluoride): she had been told that "fluoride was healthy for teeth and bones."

Her serum calcium, magnesium and inorganic phosphorus were within normal limits. The X-rays of the spine, released from the local hospital showed disc degeneration in the lumbar spine; some discs revealed evidence of excess calcification. There were some exostoses, but no obvious signs of the skeletal changes typical of fluorosis.

Her daily fluoride intake from drinking between 3 and 4 pints of tea was calculated to be 9 mg; the urinary fluoride excretion ranged from 4.5 to 6.5 mg. These figures pertain to fluid intake and urinary excretion exclusively. They do not include the fluoride content of food or feces.

As shown in table 1, the patient stopped drinking tea on 10/7/70 whereupon the urinary fluoride excretion dropped dramatically. Six weeks later she reported relief from pain; she could move easily and her improvement continued progressively. Following elimination of tea, the urinary fluoride excretion equalled or exceeded the intake. The latter had dropped below 1 mg daily.

TABLE 1

Daily Fluoride Intake Through Tea And Water

Date	24-hr F <sup>-</sup> intake from tea & water	24-hr urinary F <sup>-</sup> excretion
9.2.70	6.90 mg	--
16.2.70	9.34	2.76 mg
4.6.70	6.32	1.56
3.7.70	7.62	3.07
10.7.70	Tea intake ceased.	
24.8.70	0.76	0.75
24.9.70	0.66	1.50
19.10.70	0.68	0.66
25.11.70	0.53	0.58
1.4.71	0.48	0.72

On 11/11/70, X-rays by Dr. J. T. S. at the Kennedy Institute of Rheumatology, confirmed the diagnosis of a long-standing disc degeneration, and the absence of overt signs of fluorosis. There was some calcification in disc spaces. It is noteworthy that the urinary excretion of fluoride, before tea-drinking was stopped, was in the range of 1.5 to 2.0 ppm, which is indicative of fluoride retention (8).

Little more than 3 months after the patient stopped drinking tea she reported that the pain had lessened to the extent that she was almost able to be without drugs. The mobility of the spine had returned sufficiently to enable her to take a job which involved considerable walking. After 6 months,

she reported that she was virtually free of pain. She no longer required drugs. This improvement was confirmed again in May 1971. In July 1971, one year after she had stopped drinking tea she reported that further improvement had apparently ceased, but there was no deterioration. She was able to do without pain-killing drugs except in emergency. Her physician noted only slight residual restriction in movement of the spine and sensitiveness on palpation which he attributed to the disc degeneration. The condition subsided completely after November 1971 when the patient moved from the Wimborne, Dorset area where water contained 0.67 ppm fluoride to Yeovil where waterborne fluoride is only 0.13 ppm.

This case supports the premise that some forms of arthritis are related to sub-clinical fluorosis, i. e. fluorosis which is not sufficiently advanced to show the characteristic skeletal changes radiologically. It appears that the spinal disc degeneration and sub-clinical fluorosis were co-existent.

#### Bibliography

1. Cook, H. A.: Fluoride Intake Through Tea in British Children. *Fluoride*, 3:12-18, 1970.
2. Jolly, S. S., Singh B. M., Mathur, O. C., and Malhotra, K. C.: Epidemiological, Clinical and Biochemical Study of Endemic Dental and Skeletal Fluorosis in Punjab. *British Medical Journal*, 4:427-29, 1968.
3. Webb-Peploe, M. M., Bradley, W. G.: Endemic Fluorosis with Neurological Complications in a Hampshire Man. *Journal Neurol. Neurosurg. and Psychiat.*, 29:577-83, 1966.
4. Siddiqui, A. H.; Fluorosis in Nalgonda District, Hyderabad - Deccan. *Brit. Med. Journ.*, 2:1408-13, 1955.
5. Rodriguez, I. A.: *Estudio Medico del Fluor.* Univ. Salamanca, 1955.
6. Waldbott, G. L. and Cecilioni, V. A.: "Neighborhood" Fluorosis. *Fluoride*, 2:387-96, 1969.
7. Singh, A. and Jolly, S. S.: *Chronic Toxic Effects on the Skeletal System, in Fluorides and Human Health.* W.H.O. Monograph, 1970, p. 239.
8. Machle, W. and Largent, E. J.: The Absorption and Excretion of Fluoride. II, The Metabolism at High Levels of Intake. *Journ. Ind. Hyg. Toxicol.*, 25:112-23, 1943.

#### Discussion

Dr. Waldbott: In 1962, I reported a similar case in the *International Archives of Allergy and Immunology*. Roentgenologists usually interpret the changes in the spine as degenerative osteoarthritis due to "old age."

Retention and excretion studies are of little value when urine is analyzed exclusively and when exact data on fluoride intake are not available. Fluoride content of faeces and sweat is also important.

One of my patients, Mrs. F. O. aged 55 exhibited features indicative of chronic fluorosis, namely arthritic changes in the lower spine, cephalgia, gastritis, ileitis, lower urinary tract disease, paresthesias in arms and legs, ulcers in the mouth. She was in the habit of imbibing 15 to 20 cups of tea daily for 25 years. From this source alone, her daily intake of fluoride amounted to 1.82 to 2.44 mg. She lived in an area where the water supply contained 0.4 ppm; 24-hour urinary fluoride excretion ranged from 1.7 to 6.3 mg (6 determinations).

Dr. Cook: The patient whose case I reported was only 55 years old. Apart from the fluoride intake from tea, that from other fluids and food remained approximately the same. Intake of fluoride through food is highly variable because many foods vary in fluoride content even from day to day.

Dr. Teotia: I consider the data in this case established it as fluorosis from intake of food and tea in Great Britain. We, too, determine fluoride in fluids and food as well as the urinary and fecal fluoride output.

Dr. Franke: Patients with chronic gastritis or gastric hyperacidity should never be treated with NaF for osteoporosis. It would most likely aggravate the gastric symptoms.

---

RELATION OF MINERAL AND HORMONE METABOLISM TO  
INTAKE OF WATER WITH A HIGH NATURAL CONTENT OF FLUORIDE

by

G. K. Tiagi, S. P. S. Teotia and M. Teotia  
Meerut, India

SUMMARY: The metabolic effects of intake of low and high natural fluoride water were studied on 8 subjects over a period of 180 days. In the four subjects drinking high fluoride water (10.35

From the Depts. of Pathology and Human Metabolism, L. L. R. M. Medical College, Meerut, India.

\*\*\*\*\*

Presented at the Fourth Annual Conference of I. S. F. R., The Hague, 10/24-27/71.