EDITORIAL

FLUORIDE IN OSTEOPOROSIS

In 1935 Brasovan and Serdarusic (1) injected rabbits intravenously with NaF prior to the induction of experimental fractures and observed accelerated healing of the fractures. Concurrently, Callam (2) reported similar results. Volkmann (3), failed to confirm these observations when he administered a 1% solution of NaF to 24 humans who had fractures with slow callus formation and beginning pseudoarthrosis. Negative results were also reported in subsequent experiments on rats given 20 to 100 ppm of NaF (4) and 266 ppm of NaF (5). More recently Gubareff and Platt (6) reported accelerated healing of fractures in monkeys, dogs and rats which had received sodium fluoride-chloride supplements in their diet in a proportion of 2.27% NaF to 97.73% NaCl for a period of 35 days.

In 1961, Rich and Ensinck (7) administered 60 mgF^-/day to 6 patients with osteoporosis and to one with Paget's disease. The patients reverted from a negative to a positive calcium balance within 6 to 8 weeks. Their urinary calcium output dropped from 204-240 to 24-68 mg per day. In 1964 Rich et al. (8) reported no significant calcium retention during the first 10 weeks of F^- treatment, but subsequently both phosphorus and calcium were retained in increasing amounts.

Many papers on this subject have appeared in recent years suggesting that F^- in doses of the order of 60 to 100 mg/day reduced bone pain, restored a negative calcium balance and increased bone density in patients with osteoporosis. In most of these clinical trials adverse reactions were encountered mainly nausea, vomiting, spastic pains in the abdomen and arthritis. In one instance, optic retinitis was attributed to this form of treatment (9).

Bernstein et al. (10) noted a higher incidence of reduced bone density and of collapsed vertebrae in women in "low" fluoride (0.15 to 0.3 ppm) communities of North Dakota than in areas where F^- levels were "high" (4 to 4.5 ppm). In this study no attention was given to F^- intake through sources other than drinking water. Fluoride content of produce is unpredictable especially where artesian wells have a high F^- content. Hegsted (11) pointed to a lack of control in the diet of those surveyed and suggested the possibility that magnesium deficiency had contributed to atherosclerosis. Furthermore, doubt has been cast upon the proper selection of cities which the authors designated as using high and low fluoride waters. For instance, in Grafton, which was classified as "low" in fluoride (0.1 to 0.3 ppm), water from one well had contained 3.5 ppm (12); at a subsequent analysis, pooled water from 4 wells revealed 2.8 ppm (13). In 1959, however, Grafton's water contained 0.9 ppm according to the U.S. Public Health Service (14). In the towns designated high in fluoride (4 to 4.5 ppm) the F^- content of the wells actually ranged from 1.2 to 2.2 ppm (14).

The question of safety of fluoride therapy in osteoporosis has been raised by several authors: Whereas fluoride seems to stabilize the apatite in bone substance, Faccini (15) noted, as the result of F^- therapy (200 ppm in drinking water of young rabbits and sheep for 4 to 8 weeks) overactivity of the parathyroid glands which in turn causes increased resorption of non-fluoride-containing, pre-experimental bone. In parathyroid glands of fluorotic sheep he observed as much as five times higher levels of F^- than in control animals (16).

The other significant question concerns deposition of calcium in blood vessels. In at least 5 articles (17, 18, 19, 20, 21) calcification of blood vessels has been associated with fluorosis. Among soft tissues, blood vessels show the greatest accumulation of F^- (22). What portion of the absorbed calcium, following administration of large doses of F^-, enters blood vessels has not been determined.

Reutter and Siebenmann (23) noted calcium depositions in ligaments of patients who received 50 to 100 mg F^- per day for 4 to 8 weeks. Calcification of connective tissue could conceivably be the main reason for arthritic involvement which has been described following F^- treatment.

The current issue of FLUORIDE contains three papers dealing with the effect of F^- supplementation upon bones. In a comprehensive study on cows, Freitag et al. (page 167) confirmed that newly formed bone in cattle following F^- supplementation is indeed abnormal, unhealthy bone: The number of Haversian canals and vascularization of bone is increased, distribution of osteocytes is irregular, Howslip's lacunae are wider than in normal bone structure.

A paralell study by Ramberg and Olsson (page 175) conclude that increased skeletal mineralization following F^- intake is only the initial phase of a pathological process which is followed by a suppression of calcium absorption from the gastro-intestinal tract. This decreased utilization of alimentary calcium was compensated by increased calcium resorption from bone, which accounted for the calcium loss induced by fluoride. This same course of events which had earlier been recognized by Roholm, was further demonstrated most impressibly by Soriano in his description of fluorosis due to F^- contaminated wine (22). He demonstrated all phases of osteomalacia associated with osteosclerosis, spontaneous fractures and serious arthritic change as the result of high F^- intake in individuals with evident liver damage due to alcoholism.

A third paper by Hendrickson et al. (page 204) serves to shed considerable light on fluoride's action in bones. They induced osteoporosis by feeding a low calcium high-protein diet for 42 weeks to beagle dogs. Thereupon they added F^- supplements at levels which corresponded to 1.8, 6.0, 20.6, 68.2 mg/day in the diet of a human of average weight. Bone radiography, specific gravity, bending and tension tests, and ash-per-volume revealed no effect of F^- on the degree of osteoporosis. However, they reported a significant decrease in mineral mass with increased dietary fluoride.

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