

A Bibliography of Scientific Literature on Fluoride

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Fluoride & Bone Fracture: Epidemiological Studies ([back to top](#))

Studies reporting association between fluoridated water (< 1.2 ppm fluoride) & hip fracture. ([back to top](#))

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Danielson C, et al. (1992). Hip fractures and fluoridation in Utah's elderly population. *Journal of the American Medical Association* 268(6): 746-748. ([See abstract](#))

Hegmann KT, et al. (2000). The effects of fluoridation on degenerative joint disease (DJD) and hip Fractures. Abstract # 71 of the 33rd annual meeting of the Society for Epidemiological Research. *American Journal of Epidemiology* S18. ([See abstract](#)).

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b) Jacqmin-Gadda H, et al. (1998). Risk factors for fractures in the elderly. *Epidemiology* 9(4): 417-423. (An elaboration of the 1995 study referred to in the JAMA letter). ([See abstract](#))

Keller C. (1991) Fluorides in drinking water. Unpublished results. Discussed in: Gordon SL, Corbin SB. (1992). Summary of Workshop on Drinking Water Fluoride Influence on Hip Fracture on Bone Health. *Osteoporosis International* 2: 109-117. ([See excerpt](#))

Kurtio PN, et al. (1999). Exposure to natural fluoride in well water and hip fracture: A cohort analysis in Finland. *American Journal of Epidemiology* 150(8): 817-824. ([See abstract](#))

May DS, Wilson MG. (1992). Hip fractures in relation to water fluoridation: an ecologic analysis. Unpublished results. Discussed in: Gordon SL, Corbin SB. (1992). Summary of Workshop on Drinking Water Fluoride Influence on Hip Fracture on Bone Health. *Osteoporosis International* 2: 109-117. ([See excerpt](#))

Suarez-Almazor M, et al. (1993). The fluoridation of drinking water and hip fracture hospitalization rates in two Canadian communities. *American Journal of Public Health* 83: 689-693. ([See abstract](#))

The authors of this study conclude there is no association between fluoridation and hip fracture. However, their own data reveals a significant

increase in hip fracture for men living in the fluoridated area. According to the study, "although a statistically significant increase in the risk of hip fracture was observed among Edmonton men, this increase was relatively small (RR=1.12)."

b) Studies investigating association between water-fluoride levels higher than fluoridated water (2 to 5 ppm) & bone/hip fracture. ([back to top](#))

Alarcon-Herrera MT, et al. (2001). Well Water Fluoride, Dental fluorosis, Bone Fractures in the Guadiana Valley of Mexico. *Fluoride* 34(2): 139-149. ([See study](#))

Li Y, et al. (2001). Effect of long-term exposure to fluoride in drinking water on risks of bone fractures. *Journal of Bone and Mineral Research* 16(5):932-9. ([See abstract](#))

Sowers MR, et al. (1986). The relationship of bone mass and fracture history to fluoride and calcium intake: a study of three communities. *American Journal of Clinical Nutrition* 44:889-98. ([See abstract](#))

Sowers M, et al. (1991). A prospective study of bone mineral content and fracture in communities with differential fluoride exposure. *American Journal of Epidemiology* 133: 649-660. ([See abstract](#))

Sowers M, et al.(2005) Elevated serum fluoride concentrations in women are not related to fractures and bone mineral density. *Journal of Nutrition* 135:2247-52. ([See abstract](#))

c) Studies reporting no association, or a negative association, between fluoridated water & hip fracture. ([back to top](#))

(Note that in 3 of these 9 studies, an association was found between fluoride and some form of fracture - i.e. distal forearm. See notes and quotes below.)

Arnala I, et al. (1986). Hip fracture incidence not affected by fluoridation. Osteofluorosis studied in Finland. *Acta Orthopaedica Scandinavica* 57: 344-348. ([See abstract](#))

Cauley J. et al. (1995). Effects of fluoridated drinking water on bone mass and fractures: the study of osteoporotic fractures. *Journal of Bone and Mineral Research* 10(7): 1076-86. ([See abstract](#))

Feskanich D, et al. (1998). Use of toenail fluoride levels as an indicator for the risk of hip and forearm fractures in women. *Epidemiology* 9(4): 412-6. ([See abstract](#))

While this study didn't find an association between water fluoride and hip fracture, it did find an association - albeit non-significant 1.6 (0.8-3.1) - between fluoride exposure and elevated rates of forearm fracture.

Hillier S, et al. (2000). Fluoride in drinking water and risk of hip fracture in the UK: a case control study. *The Lancet* 335: 265-2690. ([See abstract](#))

Jacobsen SJ, et al. (1993). Hip fracture incidence before and after the fluoridation of the public water supply, Rochester, Minnesota. *American Journal of Public Health* 83: 743-745. ([See abstract](#))

Karagas MR, et al. (1996). Patterns of fracture among the United States elderly: Geographic and fluoride effects. *Annals of Epidemiology* 6 (3): 209-216. ([See abstract](#) | [See critique of study](#))

As with Feskanich (1998) this study didn't find an association between fluoridation & hip fracture, but it did find an association between fluoridation and distal forearm fracture, as well as proximal humerus fracture. "Independent of geographic effects, men in fluoridated areas had modestly higher rates of fractures of the distal forearm and proximal humerus than did men in nonfluoridated areas."

Lehmann R, et al. (1998). Drinking water fluoridation: Bone mineral density and hip fracture incidence. *Bone* 22: 273-278. ([See abstract](#))

Madans J, et al. (1983). The relationship between hip fracture and water fluoridation: an analysis of national data. *American Journal of Public Health* 73: 296-298. ([See abstract](#))

Phipps KR, et al. (2000). Community water fluoridation, bone mineral density and fractures: prospective study of effects in older women. *British Medical Journal* 321: 860-4. ([See abstract](#) | [See Study](#) | [See BMJ letter responding to study](#) | [See critique of study](#))

This study reported a decreased incidence of hip fracture in fluoridated areas. However, as with Feskanich (1998) and Karagas (1996), the study also found an association between fluoridation and other types of fracture - in this case, wrist fracture. "There was a non-significant trend toward an increased risk of wrist fracture."

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Bernstein DS, et al. (1966). Prevalence of osteoporosis in high- and low-fluoride areas in North Dakota. *Journal of the American Medical Association* 198: 499-504. ([See abstract & critique](#))

Lee JR. (1993). Fluoridation & hip fracture. *Fluoride* 26(4): 274-277. ([See paper](#))

National Research Council. (2006). Musculoskeletal Effects. In: Fluoride in Drinking Water: A Scientific Review of EPA's Standards. National Academies Press, Washington D.C. ([See chapter](#))

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Chachra D, et al. (1999). The effect of fluoride treatment on bone mineral in rabbits. *Calcified Tissue International* 64: 345-51. ([See abstract](#))

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Kragstrup J, et al. (1984). Experimental osteo-fluorosis in the domestic pig: a histomorphometric study of vertebral trabecular bone. *Journal of Dental Research* 63: 885-889.

Fratzl P, et al. (1996). Effects of sodium fluoride and alendronate on the bone mineral in minipigs: a small-angle X-ray scattering and backscattered electron imaging study. *Journal of Bone and Mineral Research* 11(2):248-53. ([See abstract](#))

Golub L, et al. (1968). The effect of sodium fluoride on the rates of synthesis and degradation of bone collagen in tissue culture. *Proceedings of the Society for Experimental Biology and Medicine* 129: 973-977.

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Jiang Y, et al. (1996). Effects of low-dose long-term sodium fluoride preventive treatment on rat bone mass and biomechanical properties. *Calcified Tissue International* 58: 30-9. ([See abstract](#))

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Mosekilde L, et al. (1987). Compressive strength, ash weight, and volume of vertebral trabecular bone in experimental fluorosis in pigs. *Calcified Tissue International* 40: 318-22. ([See abstract](#))

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Rockert H. (1963). X-ray absorption and x-ray fluorescence micro-analysis of mineralized tissue of rats which have ingested fluoridated water. *Acta Pathologica et Microbiologica Scandinavica* 59: 32-38.

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Turner RT, et al. (1989). The effects of fluoride on bone and implant histomorphometry in growing rats. *Journal of Bone and Mineral Research* 4(4):477-84. ([See abstract](#))

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