

# FLUORIDE/ARTHRITIS

## APPENDIX Y

Excessive exposure to fluoride causes an arthritic disease called [skeletal fluorosis](#).

Skeletal fluorosis, especially in its [early stages](#), is a [difficult disease to diagnose](#), and can be readily confused with various forms of arthritis including [osteoarthritis](#) and [rheumatoid arthritis](#).

The arthritic symptoms of fluorosis can occur [before](#) the onset of bone changes [detectable by x-ray](#), thereby making the early stages of fluorosis difficult to differentiate from arthritis.

In the advanced stages of skeletal fluorosis, the spine may closely resemble the appearance of [spondylosis/spondylitis](#) and [DISH \(Diffuse Idiopathic Skeletal Hyperostosis\)](#).

### General Info - Arthritis:

"The word arthritis literally means joint inflammation, but it is often used to refer to a group of more than 100 rheumatic diseases that can cause pain, stiffness, and swelling in the joints."

SOURCE: [National Institutes of Health](#)

"Arthritis and chronic joint symptoms affect nearly 70 million Americans, or about one of every three adults, making it one of the most prevalent diseases in the United States. As the population ages, this number will increase dramatically."

SOURCE: [Centers for Disease Control and Prevention](#)

### Articles of Interest - Fluoride/Arthritis:

- [Joint Pain? It could be fluorosis](#) - Times of India, December 17, 2006

### Excerpts from the Scientific Literature - Fluoride/Arthritis:

"This patient presented with chronic symmetrical arthralgia with accompanying gastrointestinal disturbance, raising the possibility of enteropathic arthritis. The diagnosis of skeletal fluorosis was surprising, with fluoride levels being high in body fluids and drinking water.

SOURCE: Gupta R, Kumar AN, Bandhu S, Gupta S. (2007) Skeletal fluorosis mimicking seronegative arthritis. [Scandinavian Journal of Rheumatology](#) 36(2):154-5.

"'Skeletal fluorosis' is a condition associated with prolonged accumulation of fluoride resulting in fragile bones having low tensile strength. It affects the joints as well as the bones. It is not easily recognizable till advanced stage. In its early stages, its symptoms may resemble those of [arthritis](#). In its most severe stages it becomes a crippling disability that has a major public health and socio-economic impact, affecting millions of people in various regions of Africa, China and India."

Ayoub S, Gupta AK. (2006). Fluoride in Drinking Water: A Review on the Status and Stress Effects. [Critical Reviews in Environmental Science and Technology](#) 36:433–487.

"The authors describe a 50-year-old man with previously treated cancer who was using tray-applied topical fluoride gel. He complained of [gastric symptoms](#), difficulty in swallowing, [leg muscle soreness](#) and [knee joint soreness](#)... The patient's fluoride regimen was altered, and within a short period his urinary fluoride levels returned to normal and his symptoms resolved."

SOURCE: Eichmiller FC, Eidelman N, Carey CM. (2005). Controlling the fluoride dosage in a patient with compromised salivary function. [Journal of the American Dental Association](#) 136:67-70.

"[A]rthropathy and arthritis affected a significant number of the (fluorosis) patients, resulting in functional disability... The physical signs of brick tea-type skeletal fluorosis were **elbow, shoulder and knee articular dysfunction, which was the most common pathology**. X-ray examination revealed that the interosseous membrane ossification, tendon attachment calcification and **articular degeneration** were the causes of these functional disorders."

SOURCE: Cao J, et al. (2003). Brick tea fluoride as a main source of adult fluorosis. Food and Chemical Toxicology 41:535-42.

"The radiological severity of **knee osteoarthritis** was greater in the endemic fluorosis group than in controls... [E]ndemic fluorosis may increase the severity of **osteoarthritis in the knees**."

SOURCE: Savas S, et al. (2001). Endemic fluorosis in Turkish patients: relationship with knee osteoarthritis. Rheumatology International 21: 30-5.

"Early signs [of skeletal fluorosis] are **vague pains and arthralgia**. This generally progresses to backache, pain in the spine, and signs of stiffness and rigidity..."

SOURCE: Littleton J. (1999). Paleopathology of skeletal fluorosis. American Journal of Physical Anthropology 109: 465-483.

"The initial symptoms usually were headache and weakness. These were followed by **multiple joint pains, mostly in the feet, knees, and back**. Spinal stiffness and kyphosis developed in a few patients."

SOURCE: Wang Y, et al. (1994). Endemic fluorosis of the skeleton: radiographic features in 127 patients. American Journal of Roentgenology 162: 93-8.

"Symptoms of pain, stiffness and diffuse aches may be dismissed as functional, but may in fact be **early signs of fluoride damage to tendinous insertions and ligaments as well as joint capsules**."

SOURCE: Anand JK, Roberts JT. (1990). Chronic fluorine poisoning in man: a review of literature in English (1946-1989) and indications for research. Biomedicine & Pharmacotherapy 44: 417-420.

"Clinical Phase 1 Fluorosis: Sporadic pain; stiffness of joints; osteosclerosis of pelvis & vertebral column. Clinical Phase 2 Fluorosis: Chronic joint pain; arthritic symptoms; slight calcification of ligaments..."

SOURCE: Department of Health and Human Services. (1991). Review of fluoride: benefits and risks. Report of the Ad Hoc Subcommittee on Fluoride. Washington, DC.

"**Vague, diffuse aches and stiffness of joints with decreased range of motion are common initial symptoms**. With disease progression, kyphosis with limited spinal mobility, flexion contracture of lower extremities, and restricted chest wall expansion occur."

SOURCE: Fisher RL, et al. (1989). Endemic fluorosis with spinal cord compression. A case report and review. Archives of Internal Medicine 149: 697-700.

"Although skeletal fluorosis has been studied intensely in other countries for more than 40 years, **virtually no research has been done in the U.S. to determine how many people are afflicted with the earlier stages of the disease, particularly the preclinical stages**. Because some of the clinical symptoms mimic arthritis, the first two clinical phases of skeletal fluorosis could be easily misdiagnosed... Even if a doctor is aware of the disease, the early stages are difficult to diagnose. "

SOURCE: Hileman B. (1988). Fluoridation of water. Questions about health risks and benefits remain after more than 40 years. Chemical and Engineering News August 1, 1988, 26-42.

"The most frequent symptoms in those exposed >6 yr were **low back pain, painful knee, elbow, and hip**... Analysis of workers' complaints showed no specific pain or other symptom that we could refer only to fluorosis... The only characteristic feature would be **multiple-joint involvement** in the case of fluorosis. **This would differentiate fluorosis from monoarticular osteoarthritis (OA), but unfortunately not from multiple-joint osteoarthritis or rheumatoid arthritis (RA)**."

SOURCE: Czerwinski E, et al. (1988). Bone and joint pathology in fluoride-exposed workers. Archives of Environmental Health 43: 340-343.

"According to our survey, clinical manifestations of fluoride injury were systemic. **A wide variety of vague, subtle symptoms (i.e. backache, restricted joint movement, abdominal pain) occurred either prior to or simultaneously with**

the development of bone changes similar to those reported previously. Nonskeletal symptoms, therefore, are important for early diagnosis."

SOURCE: Zhiliang Y, et al. (1987). Industrial fluoride pollution in the metallurgical industry in China. Fluoride 20: 118-125.

"The clinical picture was characterized by new bone formation, musculo-skeletal dysfunction leading to arthralgia, arthritis, fixed flexion deformities, peripheral neuropathy and incapacitation."

SOURCE: Krishnamachari KA. (1986). Skeletal fluorosis in humans: a review of recent progress in the understanding of the disease. Progress in Food and Nutrition Sciences 10:279-314.

"[I]t is postulated that fluoride activates the calcification of cartilage... Thus it would be interesting to investigate the effect of fluoride on the evolution of joint alterations in rheumatoid arthritis and osteoarthritis."

SOURCE: Bang S, et al. (1985). Distribution of fluoride in calcified cartilage of a fluoride-treated osteoporotic patient. Bone 6: 207-210.

"Arthritis of spine and small joints of hands and fingers develops early in the course of the disease with or without demonstrable radiological changes."

SOURCE: Bhavsar BS, Desai VK, Mehta NR, Vashi RT, Krishnamachari KAVR. (1985). Neighborhood Fluorosis in Western India Part II: Population Study. Fluoride 18: 86-92.

"Early bone fluorosis is not clinically obvious; often the only complaints of young adults are vague pains in the small joints of the hands, feet, and lower back. Such cases may be misdiagnosed as rheumatoid arthritis or ankylosing spondylitis."

SOURCE: Smith GE. (1985). Repetitive Strain Injury, or Incipient Skeletal Fluorosis? (Letter.) New Zealand Medical Journal 98:328.

"Our findings demonstrate a highly significant relationship between the frequency of back and neck surgery, fractures, symptoms of musculoskeletal disease and a past history of diseases of the bones and joints. In the absence of so-called classic fluorosis, a disease complex was established which involves much more than merely the radiologic appearance of dense bone."

SOURCE: Carnow BW, Conibear SA. (1981). Industrial fluorosis. Fluoride 14: 172-181.

"Although a few subjects had no symptoms, the fluoride exposed workers had a higher frequency of joint pain and stiffness than the control group. This joint pain resulted in disability in some cases."

SOURCE: Boillat MA, et al. (1980). Radiological criteria of industrial fluorosis. Skeletal Radiology 5: 161-165.

"[E]xtensive research from India has revealed severe arthritic changes and crippling neurological complications even where the fluoride concentration in water naturally is as low as 1.5 ppm...Even though extensive bone deformities may not be found on a large scale from fluoride in water at the 1 ppm concentration, some of the early signs of the disease, such as calcifications of ligaments, joint capsules, and muscle attachments, are likely to occur. Indeed these conditions are characteristic of osteoarthritis, in which the formation of microcrystals of apatite (known to be promoted by fluoride) has now been clearly demonstrated... For example, Pinet and Pinet described in detail X-ray changes encountered in skeletal fluorosis in North Africa that are in every respect identical with those present in the arthritic spine of the elderly elsewhere."

SOURCE: Waldbott GL, Burgstahler AW, and McKinney HL. (1978). Fluoridation: The Great Dilemma. Coronado Press, Inc., Lawrence, Kansas.

"Understandably, it is not uncommon to find reference to arthritic changes, if for no other reason than the difficulty of distinguishing them from certain fluoride effects on bone."

SOURCE: Hodge HC, Smith FA. (1977). Occupational fluoride exposure. Journal of Occupational Medicine 19: 12-39.

"In our material we noted degenerative changes in the lumbar spine in 95% of cases, which suggests that fluoride accelerates these changes. In addition to pain in the lower spine which is associated with radiological changes, patients with negative x-ray findings also complain of pain in the lumbar-sacral area, an indication that symptoms precede changes demonstrable by x-ray."

SOURCE: Czerwinski E, Lankosz W. (1977). Fluoride-induced changes in 60 retired aluminum workers. Fluoride 10: 125-136.

"Most often the patients complained of back pain. Pains in the shoulders, elbows, forearms and lower legs were common. These pains differed in intensity and occurred constantly or periodically with no clear relationship to effort."  
SOURCE: Czerwinski E, Lankosz W. (1977). Fluoride-induced changes in 60retired aluminum workers. Fluoride 10: 125-136.

"The investigation of a high incidence of arthritis in 21 dairy herds disclosed elevated fluorine levels in bone samples... There was a statistical correlation between a high incidence of damage to peri-articular structures, resulting in debility and loss of production, and elevated bone fluorine."  
SOURCE: Griffith-Jones W. (1977). Fluorosis in dairy cattle. The Veterinary Record 100: 84-89.

"In early stages, fluorosis is usually associated only with stiffness, backache, and joint pains which may suggest the diagnosis of rheumatism, rheumatoid arthritis, ankylosing spondylitis and osteomalacia. At this stage the radiological findings of skeletal fluorosis may not be evident and therefore most of these cases are either misdiagnosed for other kinds of arthritis or the patients are treated symptomatically for pains of undetermined diagnosis (PUD). The majority of our patients had received treatment for rheumatoid arthritis and ankylosing spondylitis before they came under our observation."  
SOURCE: Teotia SPS, et al. (1976). Symposium on the Non-Skeletal Phase of Chronic Fluorosis: The Joints. Fluoride 9: 19-24.

"In the initial stages, the complaints of the patients are not remarkable. At first they experience vague rheumatic pains, then the pains become localized in the spine, especially in the lumbosacral region. Later, a sensation of stiffness in the lumbar and cervical spine develop. However, we also found patients with slight radiological changes who complained of intense pains in the spine and in the large joints. On the other hand, some patients whose fluorosis was radiologically distinct were almost without complaints."  
SOURCE: Franke J, et al. (1975). Industrial fluorosis. Fluoride 8: 61-83.

"Many workers complained of pains at night and while resting, but movement caused them to disappear."  
SOURCE: Franke J, et al. (1975). Industrial fluorosis. Fluoride 8: 61-83.

"All the patients had typical diagnostic features: skeletal pains, backache, stiffness, rigidity and restricted movements of the spine and other joints."  
SOURCE: Faccini JM, Teotia SPS. (1974). Histopathological assessment of endemic skeletal fluorosis. Calcified Tissue Research 16: 45-57.

"Schlegel presented data on 61 cases of skeletal fluorosis among workers of a Swiss aluminum factory... Their major symptoms were arthritic changes in the joints, especially in the spine... In contrast to non-industrial fluorosis, the author noted excessive involvement of the elbow joint which is presumably due to habitual use of the arms... The author also emphasizes the difficulty in differentiating spontaneous arthrosis from fluorotic arthritis."  
SOURCE: Schlegel HH. (1974). Industrial skeletal fluoroses: preliminary report on 61 cases from aluminum smelter. Sozial und Praventivmed. 19:269-74. (Abstracted in: Fluoride 1975; 8:177)

"Arthritis of the spinal column develops early in the disease with or without demonstrable radiological changes."  
SOURCE: Waldbott GL. (1974). The pre-skeletal phase of chronic fluorine intoxication. Fluoride 7:118-122.

"In spite of this distinctive clinical picture of advanced fluorosis, the earlier stages of the disease are more difficult to recognize. The initial symptoms are quite non-specific and not obviously linked to fluoride. The onset of fluorosis leads to tingling sensations in the hands and feet, pain similar to arthritic pain in the joints and the lower back, stiffness, and motor weakness. The first reliable diagnostic sign is increased bone density in X-ray examination, but in some early cases early bone changes are not radiologically detectable."  
SOURCE: Groth, E. (1973). Two Issues of Science and Public Policy: Air Pollution Control in the San Francisco Bay Area, and Fluoridation of Community Water Supplies. Ph.D. Dissertation, Department of Biological Sciences, Stanford University, May 1973.

"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."

SOURCE: Cook HA. (1972). Crippling fluorosis related to fluoride intake (case report). Fluoride 5: 209-213.

"Possibly some cases of pain diagnosed as rheumatism or arthritis may be due to subclinical fluorosis which is not radiologically demonstrable."

SOURCE: Cook HA. (1971). Fluoride studies in a patient with arthritis. The Lancet 1: 817.

"The onset of chronic fluorosis is insidious and may be confused with chronic debilitating diseases such as osteoarthritis, trace-element toxicosis, and trace-element deficiencies."

SOURCE: Shupe JL. (1970). Fluorine toxicosis and industry. American Industrial Hygiene Association Journal 31: 240-247.

"Whereas dental fluorosis is easily recognized, the skeletal involvement is not clinically obvious until the advanced stage of crippling fluorosis... Such early cases are usually in young adults whose only complaints are vague pains noted most frequently in the small joints of the hands and feet, in the knee joints and in the joints of the spine. These cases are frequent in the endemic area and may be misdiagnosed as rheumatoid or osteo arthritis."

SOURCE: Singh A, Jolly SS. (1970). Chronic toxic effects on the skeletal system. In: Fluorides and Human Health. World Health Organization. pp. 238-249.

"Most authors agree that chronic fluorosis can cause musculoskeletal discomfort and pain, despite the fact that well documented cases of fluorosis in patients without any clinical symptoms have been published... All but one of the 17 patients complained of vague pains and stiffness in the lower and upper extremities, shoulders, neck and lower back. In none of the cases could another disease of the bone or of the joints be found, except arthrotic lesions... If signs of fluorosis are present, they may lead to symptoms of the osteoarticular system."

SOURCE: Vischer TL, et al. (1970). Industrial fluorosis. In: TL Vischer, ed. (1970). Fluoride in Medicine. Hans Huber, Bern. pp. 96-105.

"Joint changes or fluoric arthrosis may be very severe especially in the hip, knee and elbow joints."

SOURCE: Soriano, M. (1968). Periostitis deformans due to wine fluorosis. Fluoride 1: 56-64.

"Fluoric Arthropathies: Around joints, thick marginal osteophytes develop. In some instances, they grow to such an extent as to block joint movement ('blocking arthrosis'). The joint block can also be induced by calcification of the periarticular ligament. The most common sites of articular involvement are the hips, the sacroiliac, elbow and knee joints. In older persons, the vertebral column is commonly affected. Advanced stages of the disease show atrophy and ulceration of joint cartilage."

SOURCE: Soriano, M. (1968). Periostitis deformans due to wine fluorosis. Fluoride 1: 56-64.

"Another frequent finding was the calcification of ligaments and muscle attachments ...Approximately three quarters of those later found to have radiological evidence of skeletal involvement did complain of pains mainly in the back, chest, and legs."

SOURCE: Latham MC, Grech P. (1967). The effects of excessive fluoride intake. American Journal of Public Health 57: 651-660.

"In general, the metabolic patterns of osteoblasts, ameloblasts, odontoblasts, and chondroblasts are sufficiently similar so that disturbances of cartilage might be expected... To date, any osteoarthritis observed in fluoride-treated cattle has been regarded as an unrelated process. However, excessive remodeling of the subchondral plate and cancellous end of the bone, such as occurs in osteofluorosis, will eventually lead to remodeling of the articular cartilage. Excessive cartilage remodeling leads to osteoarthritis of normal joints. Therefore, both the mechanical effects of fluoride induced remodeling and the direct action of fluoride on cartilage cells might alter cartilage. The fluoride levels and remodeling circumstances necessary to produce cartilage alteration in cattle - if it occurs - remain to be established."

SOURCE: Johnson LC. (1965). Histogenesis and mechanisms in the development of osteofluorosis. In: H.C.Hodge and F.A.Smith, eds : Fluorine chemistry, Vol. 4. New York, N.Y., Academic press (1965) 424-441.

"The ligamentous calcification [of skeletal fluorosis] is often periarticular and shows as osteoarthritis of the spine and hip joints as well as of the sacro-iliac joints."

SOURCE: Kumar SP, Harper RA. (1963). Fluorosis in Aden. British Journal of Radiology 36: 497-502.

In the early stages of skeletal fluorosis, the "only complaints are vague pains noted most frequently in the small joints of hands and feet, the knee joints and those of the spine. Such cases are frequent in the endemic area and may be misdiagnosed as rheumatoid or osteoarthritis. Such symptoms may be present prior to the development of definite radiological signs. A study of the incidence of rheumatic disorders in areas where fluoridation has been in progress for a number of years would be of interest."

SOURCE: Singh A, et al. (1963). Endemic fluorosis. Epidemiological, clinical and biochemical study of chronic fluoride intoxication in Punjab. Medicine 42: 229-246.

"The onset was insidious, and stiffness of the back and legs was a universal complaint. Almost all the patients complained of vague fleeting pains all over the body, particularly in the spine and in the knee-joints."

SOURCE: Singh A, et al. (1961). Skeletal fluorosis and its neurological complications. Lancet 1: 197-200.

"It is quite possible that endemic centres [of skeletal fluorosis] exist but that the cause of the disabling spondylitis or other joint affections has not been determined, and a diagnosis of chronic arthritis has resulted. Few cases in Canada or the United States will be found to be as dramatic as that recorded here from Southwest China, but by calling attention to the advanced stage of this condition help may be afforded to the diagnosis of early cases."

SOURCE: Kilborn LG, et al. (1950). Fluorosis with report of an advanced case. Canadian Medical Association Journal 62: 135-141.