ESTIMATED “THRESHOLD” DOSES FOR SKELETAL FLUOROSIS

F.A.N. | August 2012 | By Michael Connett

For over 40 years health authorities stated that in order to develop crippling skeletal fluorosis, one would need to ingest between 20 and 80 mg of fluoride per day for at least 10 to 20 years. This belief, however, which played an instrumental role in shaping current fluoride policies, has been acknowledged by the National Academy of Sciences (NAS) and other US health authorities to be incorrect.

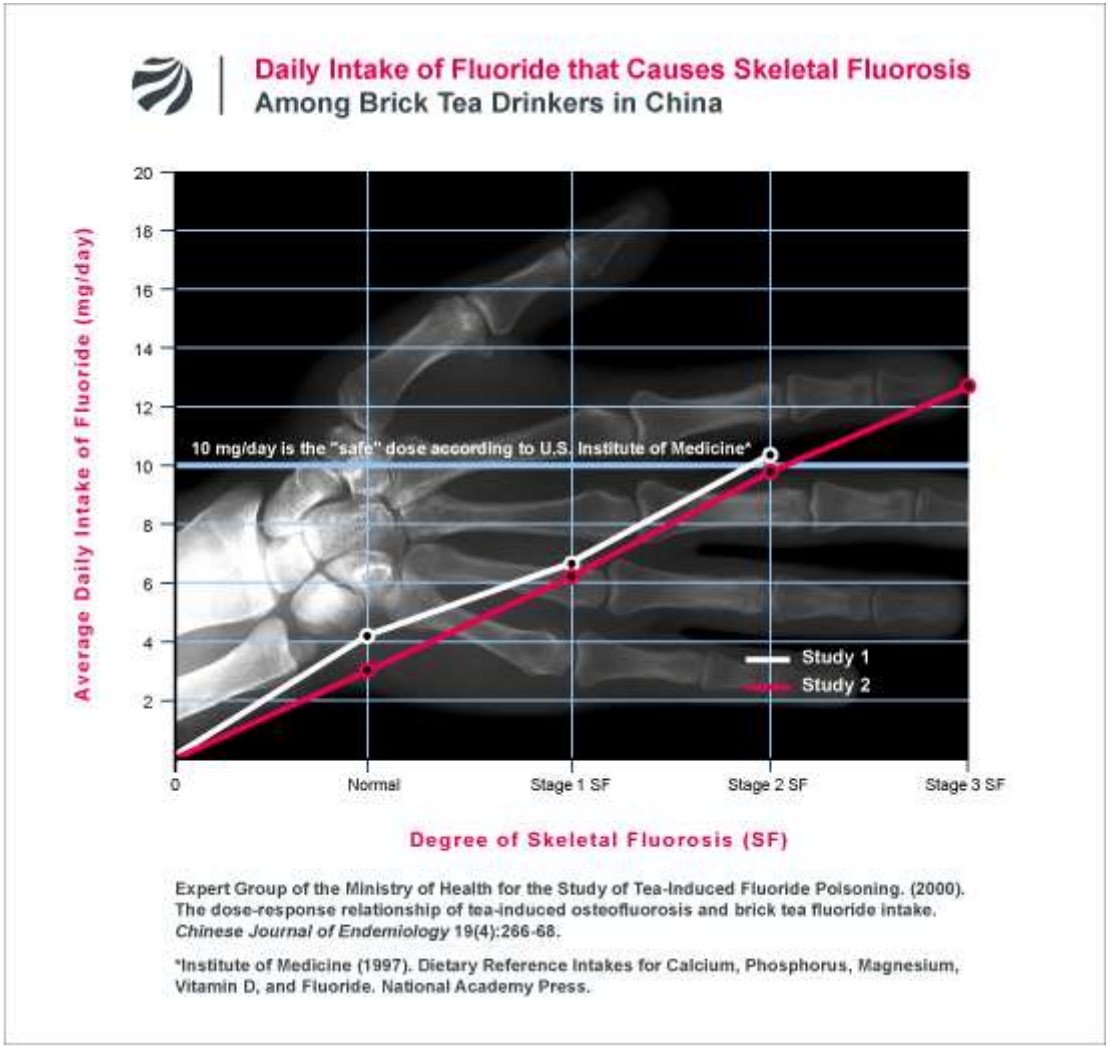
In 1993, the NAS revised this longstanding 20-80 mg/day estimate, stating in a report by the National Research Council that “Crippling skeletal fluorosis might occur in people who have ingested **10-20 mg** of fluoride per day for 10-20 years.” (NRC 1993). Since then, other health authorities, including the US Agency for Toxic Substances and Disease Registry (ATSDR), have repeated this estimate. (See quotes below).

Despite this, the NAS’s Institute of Medicine (IOM) has established an intake of **10 mg/day** as the ”upper tolerable intake” of exposure. The IOM did so based on its assertion that an intake exceeding “10 mg/day for ten or more years” causes “skeletal changes consistent with preclinical or stage 1 skeletal fluorosis.”

On one hand, the IOM’s selection of 10 mg/day as the upper tolerable intake is an acknowledgment that the previous 20 mg/day figure was too high. On the other hand, the 10 mg/day standard is, itself, riddled with problems. These include:

- The IOM never mentioned or addressed NRC’s conclusion from just four years prior that 10 mg/day can cause “crippling fluorosis,” not just “pre-clinical” or “stage 1″ fluorosis.
- The IOM did not apply a margin of safety to protect vulnerable members of the population, despite the fact that that it is well known that some people, particularly those with kidney disease (http://www.fluoridealert.org/studies/kidney01) are more vulnerable to developing fluorosis than others. In the Netherlands, for example, Dutch health authorities have recommended that people with kidney disease should ingest no more than **1.5 mg** per day (and that healthy individuals should ingest no more than **6 mg/day**).
- The IOM failed to address existing data showing that joint pain and other symptoms of pre-clinical fluorosis can occur at doses between **6 to 9 mg/day.** (Cook 1971).

The inadequacy of the IOM’s standard has been further demonstrated by subsequent research. In 2000, for example, a study (http://www.fluoridealert.org/uploads/expertsgroup-2000.pdf) conducted by a large number of health agencies and scientists in China, aimed to empirically determine the daily fluoride dose that causes the various stages of skeletal fluorosis in tea drinkers. As displayed in the following figure, the study found that a daily dose of just 6.5 mg/day is sufficient to cause stage 1 clinical fluorosis. (Experts Group 2000).



(http://www.fluoridealert.org/uploads/expert_figure.jpg)

Another study from China found very similar results, reporting in 2003 that a daily dose of **9 to 12 mg/day** caused crippling skeletal fluorosis. Based on these findings, the scientists specifically noted that the IOM’s standard ”may need to be revised/lowered on the basis of present data.” (Cao 2003)

PUBLISHED ESTIMATES OF THRESHOLD DOSE:

IN EUROPE, FLUORIDE WAS ONCE PRESCRIBED AS A DRUG TO REDUCE THYROID ACTIVITY. (HTTP://WWW.FLUORIDEALERT.ORG/ISSUES/HEALTH/THYROID/)

FLUORIDATION DISPROPORTIONATELY HARMS BLACK CHILDREN. (HTTP://WWW.FLUORIDEALERT.ORG/STUDIES/DENTAL_FLUOROSIS02/)

RELATED VIDEOS:

Fluorosis Bends Rural Gujurat at the Knees (http://fluoridealert.org/fan-tv/fluorosis-gujurat/)

RELATED ARTICLES:

Ministry of not-so-funny walks

The fluorosis problem is "enormous, unbelievable," says Andezhath Susheela of the Fluorosis Research and Rural Development Foundation in Delhi. She has been unravelling the national story for a decade during which time her estimate of the number of people leading "a painful and crippled life" from fluorosis has risen from one million to 25 million and now

“There is no fixed toxic level of fluoride, since the development of fluorosis depends upon environmental factors.”
SOURCE: Littleton J. (1999). Paleopathology of skeletal fluorosis. American Journal of Physical Anthropology 109: 465-483.

“Persons with chronic renal failures constitute a possible group at-risk with respect to the occurrence of skeletal fluorosis, because of an increased fluoride retention after oral intake. Based on the results of one study, in which the difference in retention between nephritic patients and healthy persons was quantified (average retention: 65% and 20%, respectively), a total daily intake of **about 1.5 mg appears to be the maximum acceptable intake for nephritic patients.** In view of the limitations of this comparative study and of the individual differences in retention and sensitivity, this figure must only be regarded as an indication.”
SOURCE: National Institute for Public Health and Environmental Protection. (1989). Integrated criteria document fluorides. Report No 758474010. The Netherlands.

“The levels of fluoride ingestion which can lead to long-term skeletal fluorosis **(2-8 mg/day**) appear to be exceeded in the diet of the average adult in a fluoridated community.”
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.

to 60 million -- six million of them children.
(http://fluoridealert.org/articles/guardian_fluorosis/)

An Examination of Statements by US Public Health Officials on Fluoride Toxicity: Part 2

In this bulletin, we address a statement about the alleged dose that causes skeletal fluorosis made by Colorado's Dental Director, Dr. Diane Brunson.
(http://fluoridealert.org/articles/science-watch18b/)

Skeletal Fluorosis in the U.S.

A new study, documenting a case of skeletal fluorosis from excessive tea consumption in the United States, made headlines in the press this week. According to the authors: “Our concern is that skeletal fluorosis might result from drinking instant teas, especially when excessive volumes in hot environments or extra-strength preparations are consumed, or when fluoridated or fluoride-contaminated water is used.”
(http://fluoridealert.org/articles/science-watch20/)

RELATED STUDIES:

Tea Intake Is a Risk Factor for Skeletal Fluorosis

A number of recent studies have found that heavy tea drinkers can develop skeletal fluorosis - a bone disease caused by excessive intake of fluoride.
(http://fluoridealert.org/studies/tea03/)

Fluoride & Arthritis

The doses that American adults now routinely ingest overlap the doses that may cause chronic joint pain.
(http://fluoridealert.org/studies/arthritis01/)

“In calcium-deficient children the toxic effects of fluoride mainfest even at marginally high (>**2.5 mg/d**) exposures to fluoride.”
SOURCE: Teotia M, Teotia SP, Singh KP. (1998). Endemic chronic fluoride toxicity and dietary calcium deficiency interaction syndromes of metabolic bone disease and deformities in India: year 2000. Indian Journal of Pediatrics 65:371-81.

”Skeletal fluorosis is associated with a systemic uptake exceeding **5 mg/day** in a relatively sensitive section of the general population.”
SOURCE: World Health Organization Regional Office for Europe. (2000). Air Quality Guidelines for Europe – Second Edition. WHO Regional Publications, European Series, No. 91, p. 158.

“In its final report, the Surgeon General’s panel said that radiologic changes have been found in bone when fluoride exposure has been about **5 mg per day**.”
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.

“Pandit, Raghavachari, Rao and Krishnamurti estimated, on the basis of 6 pints of daily water ingestion, that an intake of **5.4 mg** of fluoride produced a slight incidence of stiff backs.”
SOURCE: Cox GJ, Hodge HC. (1950). The toxicity of fluorides in relation to their use in dentistry. Journal of the American Dental Association 40:440-51.

Fluoride & Osteoarthritis

While the osteoarthritic effects that occurred from fluoride exposure were once considered to be limited to those with skeletal fluorosis, recent research shows that fluoride can cause osteoarthritis in the absence of traditionally defined fluorosis. Conventional methods used for detecting skeletal fluorosis, therefore, will fail to detect the full range of people suffering from fluoride-induced osteoarthritis.

(http://fluoridealert.org/studies/arthritis02/)

RELATED MISCELLANEOUS CONTENT:

Relationship between municipal water fluoridation and preterm birth in Upstate New York

Monday, November 9, 2009 Abstract #: 197468 TITLE: Relationship between municipal water fluoridation and preterm birth in Upstate New York AUTHORS: Rachel Hart, MPH, Division of HIV Health Care, NY State Department of Health AIDS Institute, Albany, NY Jonathan Feelemyer, MS, The Baron Edmond de Rothschild Chemical Dependency Institute, Beth Israel Medical Center, NY, NY Christina

(http://fluoridealert.org/content/relationship-between-municipal-water-fluoridation-and-preterm-birth-in-upstate-new-york/)

Top 10 Ways to Reduce Fluoride Exposure

The following 10 tips will allow you to significantly reduce your daily exposure to fluoride. 1) Stop Drinking Fluoridated Water: Tap water consumption is, on average, the largest daily source of fluoride exposure for people who live in areas that add fluoride to the water. Avoiding consumption of fluoridated water is especially

(http://fluoridealert.org/content/top_ten/)

“The histologic features of osteofluorosis were evident in the biopsy from the patient receiving the lowest amount of fluoride (**6 mg. daily for 5 months**)…”
SOURCE: Baylink DJ, Bernstein DS. (1967). The effects of fluoride therapy on metabolic bone disease. Clinical Orthopaedics and Related Research 55: 51-85.

“In Aba County, level 1, 2, and 3 osteofluorosis sufferers have an average daily intake of fluoride from drinking brick tea of **6.26**, 9.92, and 12.80 mg, respectively. In Chen banner, level 1 and level 2 osteofluorosis sufferers have a daily intake of fluoride from drinking brick tea of **6.26** and 10.23 mg, respectively . . . It is clear that in areas of endemic fluoride poisoning it is very difficult to completely prevent the onset of osteofluorosis, and the best possible result in treating the disease is to prevent the prevalence of osteofluorosis symptoms of medium or higher severity. According to the data in our study, in order to achieve this goal . . . the daily intake of fluoride from brick tea **must not exceed 5 mg**.”
SOURCE: Expert Group of the Ministry of Health for the Study of Tea-Induced Fluoride Poisoning. (2000). The dose-response relationship of tea-induced osteofluorosis and brick tea fluoride intake. Chinese Journal of Endemiology 19(4):266-68. [See study (http://www.fluoridealert.org/uploads/expertsgroup-2000.pdf)]

“One tenth mg of fluoride per kg per day is probably sufficient to produce serious poisoning.” [NOTE: For the average-weighing adult (70 kg), this equates to **7 mg** per day.]
SOURCE: Thienes CH, Haley TJ. Clinical Toxicology (5th Edition). Lea & Febiger, Philadelphia, 1972, p. 176.

“In areas of endemic fluorosis, levels of ingestion of fluoride from diet and water over **8 mg** daily are common, although in certain regions in India, changes typical of skeletal fluorosis have been stated to occur at estimated lower dosages.”
SOURCE: Singh A, Jolly SS. (1970). Chronic toxic effects on the skeletal system. In: Fluorides & Human Health. World Health Organization, Geneva. pp. 238-249.

“Singh and Jolly (1970) 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.”
SOURCE: Cook HA. (1972). Crippling fluorosis related to fluoride intake (case report). Fluoride 5: 209-213.

“According to our observations the prolific growth in periostitis deformans (skeletal fluorosis) continues as long as daily amounts greater than **8 to 10 mg** of F are ingested no matter through what vehicle.”
SOURCE: Soriano, M. (1968). Periostitis deformans due to wine fluorosis. Fluoride 1: 56-64.

“Only when relatively large amounts of fluoride (**8-20 mg/day**) are ingested for prolonged periods are generalized adverse effects encountered.”
SOURCE: Fisher JR, et al. (1981). Skeletal fluorosis from eating soil. Arizona Medicine 38: 833-5.

“The present paper shows that daily intakes of **9-12 mg** are associated with a very high prevalence of skeletal fluorosis. (The US Institute of Medicine’s) upper safe limit may need to be revised/lowered on the basis of present data.”
SOURCE: Cao J, et al. (2003). Brick tea fluoride as a main source of adult fluorosis. Food and Chemical Toxicology 41:535-42.

“This painful disorder [skeletal fluorosis] develops insidiously, generally when more than **10 mg** fluoride is consumed daily for at least 10 years.”
SOURCE: Kurland ES, et al. (2007). Recovery from skeletal fluorosis (an enigmatic, American case). J Bone Miner Res. 22(1):163-70.

“Skeletal fluorosis occurs when more than **10 mg/d** of fluoride is consumed for 10 years or longer.”
SOURCE: Hallanger Johnson JE, et al. (2007). Fluoride-related bone disease associated with habitual tea consumption. Mayo Clinic Proceedings 82(6):719-24.

“Most epidemiological research has indicated that an intake of at least **10 mg/day** for 10 or more years is needed to produce clinical signs of the milder forms of the condition.”
SOURCE: Institute of Medicine. (1997). Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride National Academy Press, Washington D.C. pp. 307

“Crippling skeletal fluorosis might occur in people who have ingested **10-20 mg** of fluoride per day for 10-20 years.”
SOURCE: National Research Council. (1993). Health Effects of Ingested Fluoride. National Academy Press, Washington DC.

“Most estimates indicate that crippling skeletal fluorosis occurs when **10-20 mg** of fluoride have been ingested on a daily basis for at least 10 years.”
SOURCE: Whitford G. (1996). The Metabolism and Toxicity of Fluoride. 2nd Revised Edition. Karger: Basel. pp. 138.

“It is generally stated that a dose of **10–20 mg/day** for at least 10 years is necessary for the development of crippling skeletal fluorosis, but individual variation, variation in nutritional status, and the difficulty of determining water fluoride levels in such situations make it difficult to determine the critical dose.”
SOURCE: Agency for Toxic Substances & Disease Registry [ATSDR]. (2003). Toxicological profile for Fluorides, Hydrogen Fluoride, and Fluorine. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

“Osteomalacia and osteoporosis may occur in older persons who ingest excessive fluorides (over **10-25 mg/d** for 10-20 years).”
SOURCE: Ellenhorn MJ, Barceloux DG. (1988). Medical Toxicology: Diagnosis and Treatment of Human Poisoning. Elsevier; New York. pp. 534.

“Crippling fluorosis as an occupational disease follows exposures estimated at **10 to over 25 mg** of fluoride daily during periods of 10-20 years.”
SOURCE: Hodge HC. (1979). The Safety of Fluoride Tablets or Drops. In: Johansen E, Taves DR, Olsen TO, Eds. Continuing Evaluation of the Use of Fluorides. AAAS Selected Symposium. Westview Press, Boulder, Colorado. pp. 253-274.

WHAT U.S. HEALTH AUTHORITIES USED TO SAY:

“Skeletal changes are among the prominent chronic effects observed after long-continued exposures to large amounts of fluoride (**20 to 80 mg** per day or more). These abnormalities of the skeleton manifest themselves as osteosclerosis, osteoporosis, and exostoses of the long bones and of the vertebra, pelvis, jaw bone, and other flat bones; with somewhat smaller amounts, yet many times the 1 p.p.m. of water fluoridation, minor alterations in bone architecture, e.g., thickening of trabeculae, have been reported.”
SOURCE: Food & Nutrition Board. (1953). The Problem of Providing Optimum Fluoride Intake for Prevention of Dental Caries. National Academy of Sciences. Publication #294.

“Crippling fluorosis occurs when men ingest or inhale **20 to 80 mg** of fluoride or more daily for a period of 10 to 20 years. Since 5 gallons of fluoridated water (at 1 ppm) contain 20 mg, it is obvious that crippling fluorosis can never be produced by drinking fluoridated water.”
SOURCE: Hodge HC. (1956). Fluoride metabolism: its significance in water

fluoridation. Journal of the American Dental Association 52:307-314.

“Crippling fluorosis, a rarely described entity, may follow exposure of 10 to 20 years’ duration when **20 to 80 mg**. or more of fluoride are taken into the body daily.”
SOURCE: Hodge HC. (1960). Notes on the effects of fluoride deposition on body tissues. Archives of Industrial Health 21: 350-352.

“This industrial disease identified by Roholm (1937) is described in his classic monograph Fluorine Intoxication. Danish workmen in the dusty cryolite industry became crippled and could no longer perform simple physical tasks. Exposures to **20 or 80 or more mg** F/day for 10-20 years were responsible for the development of osteosclerosis, exostoses, and calcification of the ligaments. The consequent fixation of the spinal column, the ‘poker back’, was crippling.”
SOURCE: Hodge HC. (1963). Safety factors in water fluoridation based on the toxicology of fluorides. Proceedings of the Nutrition Society 22: 111-117.

“Moller and Gudjonsson estimated that **20 to 80 (or more) mg** F inhaled daily for 10 to 20 years will produce crippling fluorosis.” (Note: Moller and Gudjonsson never produced such an estimate. Indeed, they provided no estimate at all of the dose that produced the skeletal fluorosis in the workers they studied.)
SOURCE: Hodge HC, Smith FA. (1970). Air quality criteria for the effects of fluorides on man. Journal of the Air Pollution Control Association 20:226-232.

“Crippling fluorosis as seen by Roholm is estimated to result from the daily

ingestion of **20-80 mg** for 10-20 years.”
SOURCE: National Research Council. (1971). Fluorides. Committee on Biologic Effects of Atmospheric Pollutants, Division of Medical Sciences, National Academy of Sciences, Washington, D.C.

“The daily fluoride exposures to bring about the bony changes were roughly estimated by Moller and Gudjonsson (1932) to range from **20 to 80 mg F** (or more) taken into the body daily for 10 to 20 years.” (Note: Moller and Gudjonsson never produced such an estimate. Indeed, they provided no estimate at all of the dose that produced the skeletal fluorosis in the workers they studied.)
SOURCE: Hodge HC, Smith FA. (1977). Occupational fluoride exposure. Journal of Occupational Medicine 19: 12-39.

“It is estimated that the development of crippling skeletal fluorosis, requires the daily consumption of **20 mg or more** of fluoride from all sources for 20 or more years.”
SOURCE: Environmental Protection Agency. (1985). National primary drinking water regulations; fluoride. Federal Register May 14; 50(93): 20164-20175.

Tags: Skeletal Fluorosis (http://fluoridealert.org/tag/skeletal-fluorosis/), Tea (http://fluoridealert.org/tag/tea/)

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