

Why Toxicological Animal Tests Should Be Conducted by The NTP on Potable Water Treated with Silicofluorides ASAP

Over ninety percent of U.S. fluoridated water, in systems serving 150 million people,¹ is being treated with 200,000 tons per year of commercial grade silicofluorides² (H_2SiF_6 and Na_2SiF_6), henceforth referred to as "SiFs." These SiFs have been used for water fluoridation since 1947³ and the Environmental Protection Agency has acknowledged to Congress,⁴ and others,⁵ that it is unaware of any human health safety testing of these silicofluoride compounds. Less than ten percent of fluoridated water is treated with sodium fluoride (NaF), the compound whose health safety has been widely tested.

In 1952, a Select Congressional Committee (82nd Cong., 2d Session) requested studies "to determine the long-range effects upon the aged and chronically ill of the ingestion of water containing inorganic fluorides,"⁶ but there is no evidence that any Federal Health agency ever developed a research program to address the issue of health safety of SiFs. Health effects studies of fluoridated water performed with animals, including those conducted by the National Institute of Health's National Toxicology Program, have only employed sodium fluoride (NaF), the agent first used in water fluoridation in 1945, and not SiFs, the principal agents currently added to water.^{7,8,9,10,11,12,13,14,15,16}

Water treated with SiFs is dissimilar from water treated with NaF, notwithstanding claims to the contrary.¹⁷ In particular, SiFs are unlikely to dissociate completely under water plant conditions, producing only free fluoride and silicic acid without side reactions,^{18,19} given that the silicofluoride moiety $[\text{SiF}_6]^{2-}$ can react with $\text{Al}(\text{OH})_3$ to produce a number of derivative compounds. Products of $[\text{SiF}_6]^{2-}$ dissociation include fluorinated low molecular weight silicic acid oligomers which are not subject to reversible equilibrium reactions. Others are created by reversible reaction the extent of which depends on pH and concentration. The latter suggests that SiF residues ingested with fluoridated water will re-associate, both within the stomach (at intra-gastric pH levels around 2.0)²⁰, and during various food preparation steps, producing SiF-related species including silicon tetrafluoride, (SiF_4), a known toxin.^{21,22,23,24,25,26}

In addition, SiF treated water supplies are likely to be contaminated with fluosiloxanes,²⁷ with arsenic and other heavy metals,²⁸ as well as with alpha-emitting radionuclides,²⁹ since commercial SiFs are in fact by-products of phosphate rock processes antecedent to those by which uranium is extracted from the phosphoric acid so produced.^{30,31,32,33}

In 1950 the U.S. Public Health Service endorsed fluoridation with SiFs in place of NaF based largely on cost factors, and the biological rationale that fluoride uptake by teeth from water treated with Na_2SiF_6 would equal that from NaF.³⁴ They did so despite the fact that they were aware of 1935 animal studies showing that even when the amount of fluoride ingested was equal and the total amount of fluoride excreted was also equal, nevertheless animals exposed to F from NaF eliminated more F in feces, while animals exposed to the SiF compounds eliminated three-fold more fluoride in urine.³⁵ Thus, SiF exposed animals would be expected to have higher blood levels of fluoride as well, since higher urine excretion implies at least momentary peaking of blood fluoride -- if not continuously higher circulating blood fluoride levels.

Moreover, in 1983 when the Surgeon General appointed an expert panel to review “non-dental health effects” of fluoridated water, it was instructed to ignore dental fluorosis because an earlier panel had concluded that fluorosis was merely “cosmetic.” The 1983 panel, therefore, limited the scope of its review to “death (poisoning), gastrointestinal hemorrhage, gastrointestinal irritation, arthralgias, and crippling fluorosis,” given the essential absence of information about other possible effects in children.³⁶

This panel also took no interest in any difference in effects from ingestion of SiFs compared with NaF, notwithstanding the fact that a 1974 German study had found that acetylcholinesterase inhibition, the intended action of “nerve gases” as well as the high-risk organophosphate and carbamate pesticides widely used in agriculture and around residences, is exaggerated in the presence of SiF as compared to NaF.³⁷

Enzyme inhibition by F is also consistent with the fact that the prevalence of dental fluorosis, (pre-eruption tooth enamel malformation due to ingested F), which in 1945 was expected to be only 10-12 percent in “optimally fluoridated” areas,³⁸ is now over 25 percent on average, and in some fluoridated communities exceeds 80 percent including a substantial amount of moderate to severe fluorosis.³⁹

Three studies analyzing data collected from 400,000 children in Massachusetts, New York, and elsewhere where NHANES III was carried out, found compelling statistical epidemiologic evidence ($p < 0.001$) that exposure to water fluoridated with SiFs somehow increases blood lead levels in children. These analyses were controlled for race, housing age, poverty, population density, and parental education.^{40,41}

Elevated blood levels have been found responsible for adverse health effects inflicted *in utero* such as impaired immune capacity,⁴² brain damage and developmental problems,^{43, 44, 45} as well as in early childhood,^{46, 47, 48, 49, 50, 51} and into puberty and adolescence as cognitive impairment and loss of impulse control,^{52, 52} and into adulthood as nephropathy and hypertension,^{53, 55} and into geriatric life⁵⁶ and, ironically, elevated blood lead has also been found to impair tooth enamel integrity,⁵⁷ thereby off-setting the intended benefits from exposure to fluoride.

Finally, in contrast to potential risks from exposure to SiFs added to water supplies, the prevalence of dental caries in “optimally fluoridated” communities today is barely distinguishable from that in non-fluoridated communities^{58, 59, 60, 61, 62, 63, 64} and the Journal of the American Dental Association recently published a comprehensive study showing that fluoride does not benefit teeth by ingestion, but only via by topical contact.⁶⁵

In light of the “Precautionary Principle” as a cornerstone of preventive public health policy, and taking into account Executive Order #13045 which calls upon all federal agencies to ensure that environmental health policies and regulations consider the special sensitivities and vulnerabilities of children, it is urgent that the NTP undertake toxicological studies of the SiFs promptly.

9/9/02 Myron J. Coplan, PE (Intelleguity)
508 653-6147
mikecoplan@aol.com

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