From: Roger D. Masters
To: <coshita@oehha.ca.gov>
Date: 5/3/2009 8:26 PM
Subject: Silicofluorides
Attachments: SiF Pubs23g.doc; FluorideEditorial2005

I'm co-author, with Myron J. Coplan (a senior chemical engineer with long professional experience with hydrofluorosilicic acid) of a series of scientific papers on silicofluoride neurotoxicity published over the last decade (first enclosure). This work presents peer-reviewed empirical findings on the harmful effects of silicofluorides when added to water for the purpose of water "fluoridation."

Hydrofluorosilicic acid (H_2SiF_6) and sodium silicofluoride (Na_2SiF_6) are toxic chemicals that have never been tested for safety. It is essential to pass a moratorium on their use until and unless there is a governmental decision (based on experimental data from observed experiments that meet high experimental standards and have been approved bvykm

The second enclosure is an editorial in FLUORIDE magazine, requesting a moratorium in using silicofluorides to treat public water supplies until they have time to be studied.

If you have any further questions, please call me at 603 643 4205

Sincerely,

Roger d. masters, Research Professor of Government and Nelson A.Rockefeller
Prof of Government Emeritus, Dept of Government, Dartmouth College, Hanover, NH
03755

Roger D. Masters, "A Moratorium on Silicofluoride Usage Will Save $$Millions," Guest Editorial, *Fluoride,* 38 (2005), 1-5.

Abstract: Lead, a toxin that lowers dopamine function, has been associated with violent behavior as well as learning deficits. Hydrofluosilicic acid and sodium silicofluoride, which were substituted for sodium fluoride without testing as chemicals for public water treatment, increase absorption of lead from the environment and are associated with violent behavior. Given the costs of incarcerating violent criminals, these side-effects justify a moratorium on using silicofluorides for water treatment until they are shown to be safe.

Scientific studies have shown that two unsuspected factors have a significant effect on rates of violent crime: first, pollution from lead and other heavy metals (due to effects on brain chemistry); second use of silicofluorides in water treatment (which epidemiological studies found are associated with higher absorption of lead from sources in the environment). As a concrete example of the costs to local taxpayers from these links between toxic chemicals and violent crime, this editorial contains statistics focused on a single county in Oregon. These figures, originally computed to show the error of mandatory state fluoridation, reveal the enormous benefits to taxpayers of a moratorium on the use of silicofluorides until they are proven to be safe.

LEAD: Over the last 30 years, scientific evidence has discovered why toxins like lead or manganese are associated with higher rates of violent crime. Lest this seem absurd, we need to remember that chemicals DO affect behavior (which is why some 83 million Americans take Prozac and police try to arrest drunk drivers BEFORE accidents). Because lead lowers the effect of a neurotransmitter that controls impulsive behavior (dopamine), for example, exposure to lead pollution has greater effects on violent crime than on property crime (which takes planning and self-control).

SILICOFLUORIDES: My work with Myron Coplan on hydrofluorosilicic acid (H_2SiF_6) and sodium silicofluoride (Na_2SiF_6) has provided epidemiological evidence that these silicofluorides -- now used for over 90% of water fluoridation -- increase absorption of lead from the environment into children's blood (UNLIKE sodium fluoride, which doesn't have this effect). Given the evidence associating lead with loss of impulse control and violence, we've also studied and published evidence on the association between silicofluoride use and violent crime rates. This editorial reflects the experience of focusing these results on policy issues in several states.

VIOLENT CRIME: The average violent crime rate in U.S. counties with lead pollution but no silicofluoride use (168 per 100,000) is substantially below the rate in counties with BOTH silicofluoride treated water AND lead pollution (262 per 100,000). That is, considering all U.S. counties where lead pollution has been recorded by the EPA, rates of violent crime are about 56% higher if silicofluorides are used in water treatment. These differences are evident when comparing average rates of violent crime in all U.S. counties (Graphs Ia-b) and confirmed by more complex statistical analyses that "control" for other social factors associated with crime (Tables 1-2).

Putting criminals in jail is expensive for taxpayers. Recently, I testified before the Public Safety committee of the California State Assembly on manganese toxicity and violent crime, and realized that policy-makers need to know how much money taxpayers could save by stopping or preventing an environmental factor that increases crime rates. Because there's no way to calculate these costs for silicofluoride water treatment without numbers, this editorial presents statistics for a single county in Oregon where the issue was raised. Readers who find the statistics in the next two paragraphs difficult should skip them at first to see the resulting estimated costs for Deschutes County, Ore. With over a million dollars at stake in this one county, it will be more evident why the basic numbers show concretely that putting silicofluorides in a public water supply is likely to increase the net tax burdens of citizens.

Calls for mandatory fluoridation in Oregon provided the occasion to consider crime rates in a state where silicofluorides are not widely in use. Nationally, silicofluorides increase crime as much or more in counties without lead pollution as with it, but to estimate precisely the cost of adding silicofluorides in a specific county, this illustration focuses on U.S. counties listed on the EPA's toxic release inventory for lead pollution. Consistent with findings elsewhere, the average rate of violent crime for Oregon counties WITHOUT lead pollution was only 110 per 100,000 – 24% below the average for the state's counties WITH lead pollution. To provide data on the risks of adding silicofluorides to communities where lead pollution has been recorded, it's useful to focus on Deschutes County in Oregon, where the 1991 violent crime rate was 123 per 100,000 (as compared to the average of 136 per 100,000 for all Oregon counties with lead pollution).

Because no Oregon county used silicofluorides in 1991, the only way to estimate the effect of combining silicofluoride usage with the exposure to lead pollution in Deschutes County involves an estimation based on comparing national crime averages for counties with lead pollution where silicofluorides either are or are not used. To avoid errors based on the fact that rates of violent crime are higher in the U.S. as a whole than in Oregon (see Graph II), estimates of the cost of using silicofluorides in Deschutes County need to be based on this PERCENTAGE increase in violent crime not the raw rates.

While more precision might be possible with other methods, a calculation based on this estimated increase indicates that using silicofluorides throughout Deschutes County would probably be associated with about 57 additional violent crimes per year (based on 1991 crime rates). To calculate the money involved, the cost of incarcerating a violent offender is typically between $26,000 and $30,000 per year. Simply multiplying the number of convicted offenders by the cost that using silicofluorides throughout Deschutes County could cost the county's taxpayers somewhere between $1,482,000 and $1,710,000 for each year of incarceration of the added violent offenders from a single year.

TO PUT IT IN MORE GENERAL TERMS, IF A COUNTY OR STATE COULD REDUCE THE <u>NUMBER</u> OF VIOLENT CRIMES BY MERELY 50 IN A YEAR, THE SAVINGS PER YEAR WILL BE ABOVE $1,250,000 (50 TIMES $25,000). IT WILL COST NOTHING TO TEST THIS PREDICTION, SINCE A MORATORIUM ON THE USE OF SILICOFLUORIDES REQUIRES MERELY CHANGING WATER TREATMENT PROCEDURES.

These figures may seem high, but national data suggest that if anything they are likely to UNDERESTIMATE the total benefits of a moratorium on silicofluoride use, which is also associated with higher rates of learning disabilities and substance abuse. Since the EPA has no

data on the behavioral effects of chronic exposure to water treated with silicofluorides, these untested compounds should NOT be used until they have been scientifically demonstrated to be safe with the kind of extensive biological testing used for any new drug. Pending such testing for safety, which has never been done for silicofluorides, our data (published in peer reviewed scientific journals and not yet convincingly shown to be in error) remain the only basis of assessing the costs to taxpayers that result from this means of "fluoridating" public water supplies.

Because we do NOT find comparable harm where sodium fluoride is the chemical used to treat a public water supply, this approach concerns issues of chemistry, behavior, and public expenditures not considered during over the last 50 years of debate on "fluoridation" in the abstract. It's easy to illustrate the importance of focusing on the BIOLOGICAL side-effects of the imperfectly understood silicic acid residues remaining when silicofluorides are added to public water supplies. Imagine that if students in a local High School complained of a headache, the school nurse decided to give them cocaine instead of Ibuprofin. Parents would obviously protest this switch and ignore claims that cocaine made students' headaches go away. Since the untested switch from Sodium Fluoride to the silicofluorides has similar effects (such as higher rates of cocaine use by criminal offenders), it's no longer responsible to discuss "fluoridation" in the abstract without reference to side effects from using silicofluorides as the chemical compounds for this purpose. Whether or not "fluoridated" water cuts rates of tooth decay (and there is clearly evidence to the contrary), silicofluorides are associated with higher rates of crime and other behavioral problems that cost American taxpayers millions of dollars a year. It's time for a MORATORIUM on using these chemicals until they have been definitively shown to be safe in biological studies with appropriate controls.

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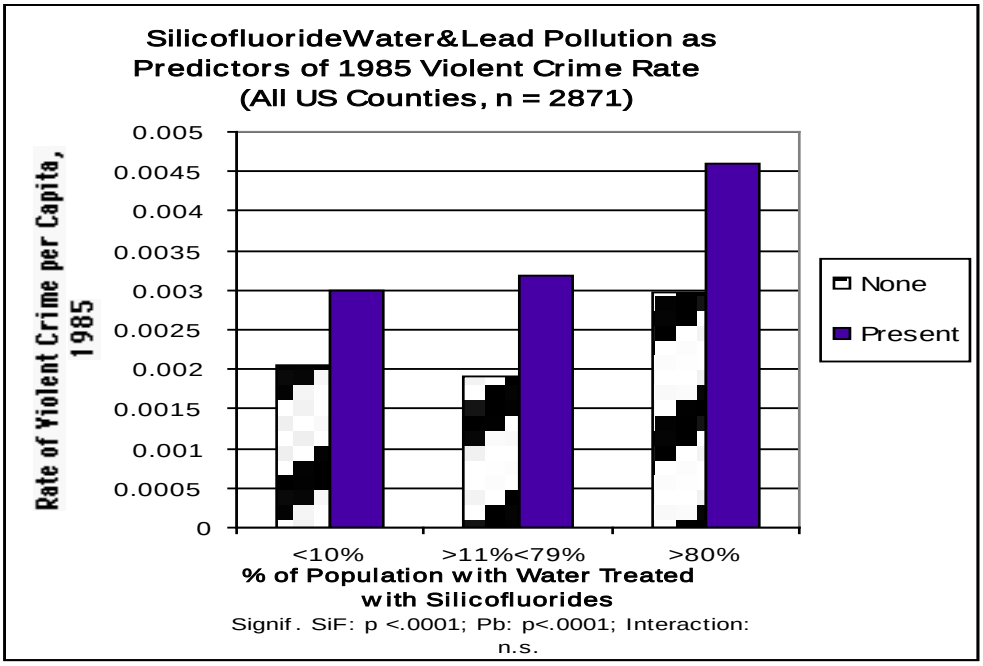
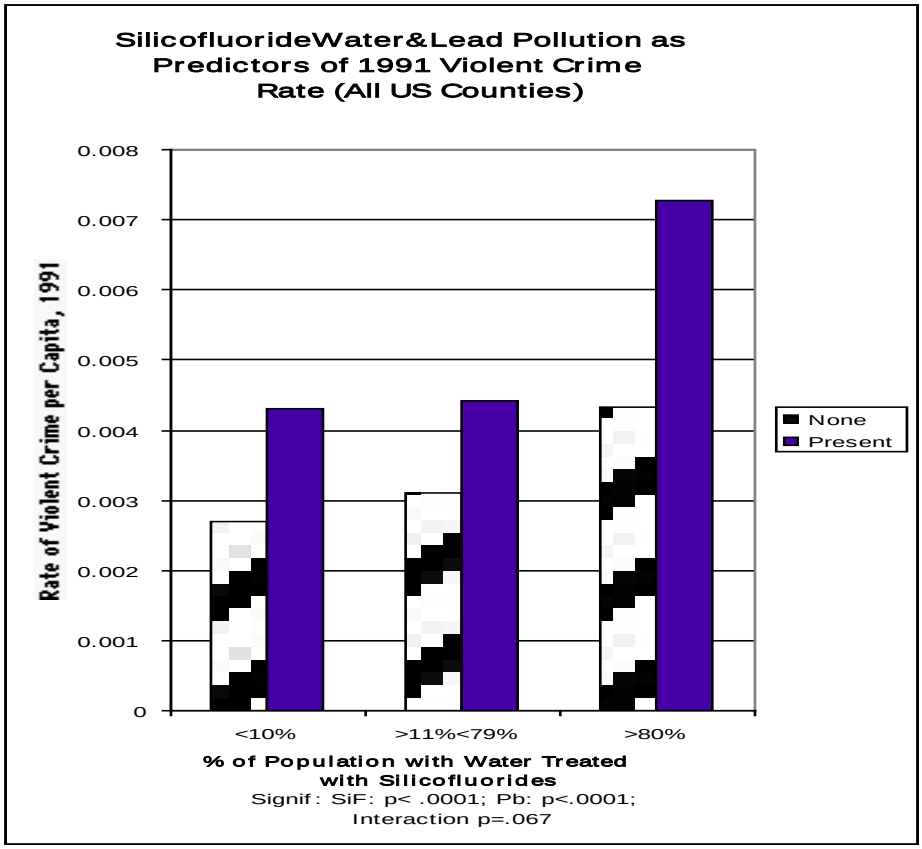
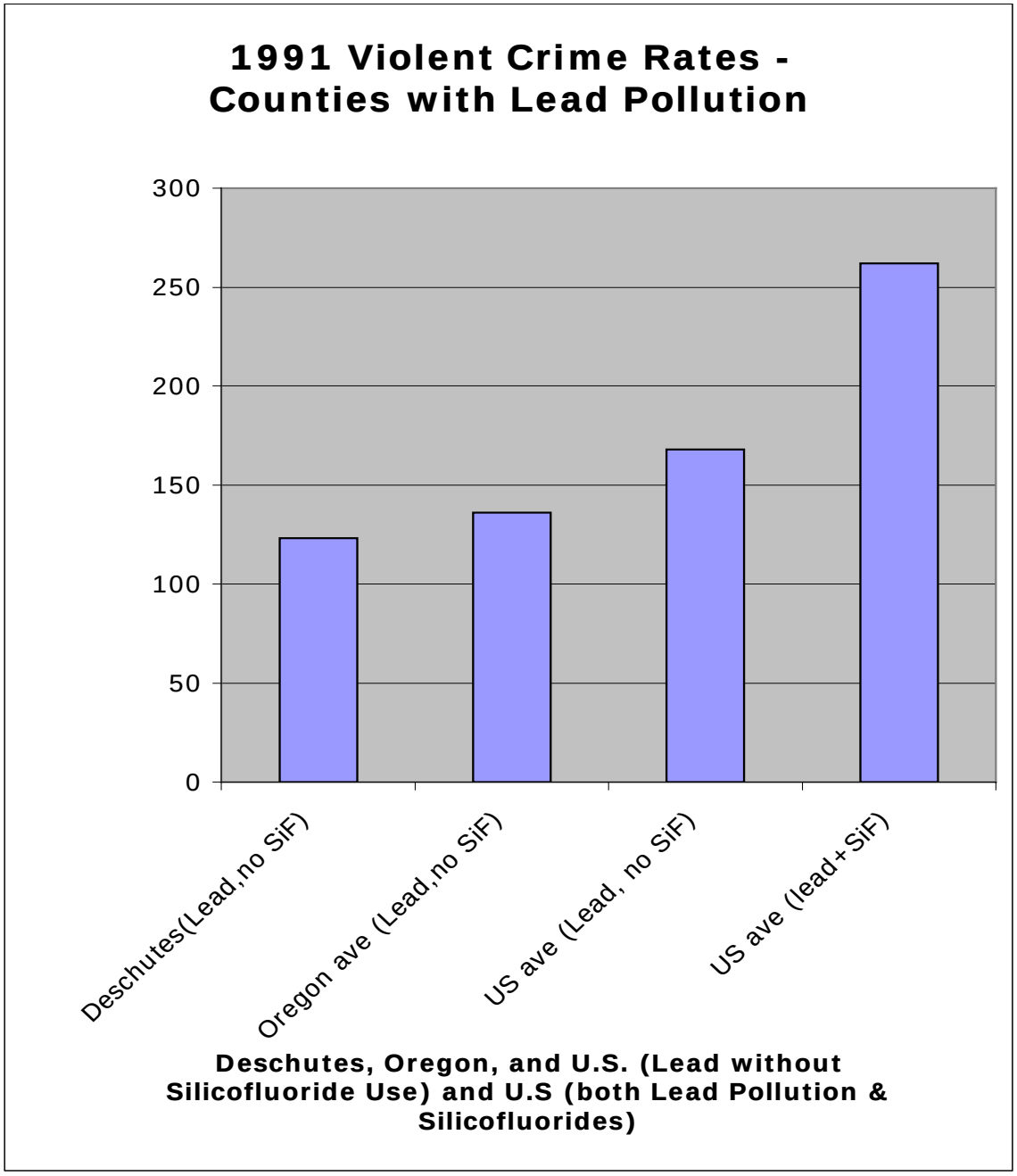
Graphs Ia-b


SilicofluorideWater&Lead Pollution as Predictors of 1985 Violent Crime Rate (All US Counties, n = 2871)
Rate of Violent Crime per Capita, 1985
0.005
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
<10%
>11%<79%
>80%
% of Population with Water Treated with Silicofluorides
Signif. SiF: p <.0001; Pb: p<.0001; Interaction: n.s.
None
Present


SilicofluorideWater&Lead Pollution as Predictors of 1991 Violent Crime Rate (All US Counties)
Rate of Violent Crime per Capita, 1991
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
<10%
>11%<79%
>80%
% of Population with Water Treated with Silicofluorides
Signif: SiF: p< .0001; Pb: p<.0001; Interaction p=.067
None
Present

Graph II



Deschutes, Oregon, and U.S. (Lead without Silicofluoride Use) and U.S (both Lead Pollution & Silicofluorides)

Table 1:

Factors Influencing U.S. Violent Crime Rate, 1985
Multiple Regression – 2880 US Counties
(Variables Listed in Order of Strength of Standardized Coefficient)

Variable	Standardized Coefficient	t-value	Probability
% Black	.2798	15.895	.0001
Poverty/Wealth Ratio	.2262	6.564	.0001
Population Density	.1956	9.383	.0001
% SiF	**.1150**	**6.191**	**.0001**
% HS Graduate	.0795	3.461	.0005
Per Capita Income	.0457	1.851	.0642
% Houses pre 1939	-.1071	5.091	.0001
Population	-.02587	0.823	n.s.
Lead Toxic Releases	.0042	0.262	n.s.
Manganese Toxic Releases	.0196	1.246	n.s.

DF 10, 2869;. R squared = .3238; F-test = 137.401; p = .;0001

Note that when both % of population on silicofluorides and toxic release inventory (TRI) of lead and manganese are included in the analysis, silicofluoride usage is a significant predictor of violent crime whereas heavy metal pollution ceases to have a significant additional effect. This probably explains the significance of the variable "public water supply per capita" in the 1991 multiple regression in Table 4, which was calculated before RDM knew of the issue of silicofluoride toxicity.

Table 2: Multiple Regression - Causal Factors associated with Rates of Violent Crime, All U.S. Counties, 1985

Variable:	Coefficient:	Std. Err.:	Std. Coeff.:	t-Value:	Probability:
INTERCEPT	-0.005056				
**%SiF	**0.000368**	**0.000133**	**0.044933**	**2.779132**	**0.0055**
UNEMPLOYMEN…	0.000076	0.000013	0.106014	5.988623	0.0001
PC INCOME BL…	-9.92E-09	5.69E-09	-0.028883	1.742151	0.0816
PC INCOME	9.53E-08	1.91E-08	0.115025	4.989345	0.0001
MEDIAN GRADE…	0.000205	0.000069	0.081833	2.971707	0.003
MEDIAN YEAR …	0.000003	0.000004	0.01226	0.719065	0.4722
% BLACK	0.00005	0.000003	0.313211	17.565442	0.0001
% GRADUATE …	-0.000022	0.000007	-0.096468	2.965084	0.0031
% RURAL	-0.000027	0.000001	-0.349944	18.728391	0.0001

CONFIDENCE INTERVALS Variable:	95% Lower:	95% Upper:	90% Lower:	90% Upper:	Partial F:
INTERCEPT					
**%SiF	0.000108	0.000628	0.00015	0.000587	7.723575
UNEMPLOYMEN…	0.000051	0.000101	0.000055	0.000097	35.863607
PC INCOME BL…	-2.11E-08	1.25E-09	-1.93E-08	-5.50E-10	3.035091
PC INCOME	5.78E-08	1.33E-07	6.39E-08	1.27E-07	24.893561
MEDIAN GRADE…	0.00007	0.00034	0.000091	0.000318	8.831041
MEDIAN YEAR …	-0.000005	0.000011	-0.000004	0.00001	0.517055
% BLACK	0.000044	0.000056	0.000045	0.000055	308.544769
% GRADUATE …	-0.000036	-0.000007	-0.000034	-0.00001	8.791723
% RURAL	-0.00003	-0.000024	-0.000029	-0.000024	350.752619

NOTE: Again, presence or absence of Silicofluorides is a significant predictor of Violent crime. Interestingly, in this group of nine predictive variables, only the median year of house construction is NOT significant.

Publications on Silicofluorides, Neurotoxicity, and Behavior

Roger D. Masters

I. Early Work by Other Authors

Kick C H, et al. (1935). *Fluorine in Animal Nutrition,* Bulletin 558 Wooster, OH: Ohio Experiment Station.

Bibby, B. G. (1946). "Topical Application of Fluorides as a Method of Combating Dental Caries," in Moulton FR, ed; *Symposium on Dental Caries and Fluorine*, Am Ass for the Adv of Sci.

McClure, F. J., "Availability of Fluorine in Sodium Fluoride vs. Sodium Fluosilicate." *U.S. Public Health Service Report 65* (1950), pp. 1175-1186; reprinted in *Fluoride Drinking Waters* (Washington: US Public Health Service, 1962), 825: 527-532.

> "In dilute aqueous solutions the hydrolysis of these two fluorine salts yielding fluoride ions is comparatively simple in the case of sodium fluoride, which is practically completely ionized, but quite complex and somewhat obscure in the case of sodium fluosilicate."[i] Following the specific chemical reactions "postulated" or suggested by chemists, McClure considers "the rate of retention and paths of excretion of fluorine" when ingested from these compounds, beginning by summarizing data in a 1935 study by Kick et al., who found that "there was no difference between sodium fluosilicate and sodium fluoride as regards the ultimate percent of fluorine retained in the rat's body, i.e., the percent fluorine balance in the above data. There were some differences, however, in the paths of excretion, i.e., in urine or feces." McClure's replication confirms data on percentage of fluorine retained but does not challenge Kick's finding of a difference in pathways of excretion (which is consistent with hypothesis of different biochemical side-effects from "residual species of silicate found by Westendorf).

Zipkin, I and McClure, F.J. (1950). "Complex Fluorides, Caries Reduction and Fluorine Retention in the Bones and Teeth of White Rats," *Public Health Reports* #66: 1523-1532.

Zipkin, I. and McClure, F.J., (1952). "Deposition of Fluorine in the Bones and Teeth of the Growing Rat," *J. Nutr.* 47: 611-620.

Weddle, D.A. and Muhler, J.C. (1957). The Metabolism of Different Fluorides in the Rat, *Journal of Dental Research.,* 36: 386-390.

Feldman, I, Morkin, D, and Hodge, HC. (1957) "The State of Fluoride in Drinking Water," *Journal of Dental Research,* 36 (2): 192-202.

> The first sentence of this article confirms that, at the time of their approval in 1950, the extent of dissociation of silicofluorides injected in a water supply was unknown: "The widespread use of sodium silicofluoride in fluoridating drinking water has made it important to determine the state of the fluoride in such water, specifically, how much is fluoride ion, how much, if any, is unchanged silicofluoride, how much

is fluoride bound to other ions. If all or nearly all of the fluoride is the ion F^-, the great body of information about the biologic effects of fluorides can be brought forward as a guarantee of safety. If considerable amounts of silicofluoride remain, a question can legitimately be raised since comparatively little work has been done on the biologic effects of silicofluorides." (192). Despite the authors' claim to present (in 1957) "experimental results," their analysis is essentially a theoretical extrapolation which does not provide a direct test of chemical and biochemical effects under conditions approximating actual usage. Moreover, the claim of safety is limited to the extent of dissociation of fluoride, ignoring issues of biological effects of "residual species" of silicates such as those found by Westendorf.

Colton, E.. (1958). "Fluosilicic Acid." *Jour. of Chem. Educ*. 35:562-563.

Frant, M. and Ross, J.W. (1966). Electrode for Sensing Fluoride Ion Activity in Solution. *Science*. 154:1553-55.

Crosby, N.T. (1969). ""Equilibria of Fluosilicate Solutions with Special Reference to the Fluoridation of Public Water Supplies," *J. Appl. Chem* 19: 100-102.

Silicofluorides are unlikely to dissociate completely under water plant conditions, producing only free fluoride and silicic acid without side reactions because the silicofluoride moiety $[SiF_6]^{2-}$ can react with $Al(OH)_3$ to produce a number of derivative compounds. Moreover, silicofluoride residues may reassociate either within the stomach or in food preparation.

Knappwost A, Westendorf J, (1974) "Hemmung von Cholinesterasen durch Fluorokomplexe des Siliciums und des Eisens [Inhibition of cholinesterasse by fluorocomplexes of silicon and iron]" *Naturwiswsenschaften* 61: 275.

First publication on research more fully reported in Westendorf, 1975.

Westendorf, Johannes (1975) . *Die Kinetik der Acetylcholinesterase Himmung und Die Beeinflussung der Permeabilitat von Erythrozytenmembranen durch Fluorid und Flurocomplex-Jonen;* Doctoral Dissertation, Hamburg: Universität Hamburg Fachbereich Chemie; available in English translation at: http//www.dartmouth.edu/~rmasters/ahabs.

Experimental evidence showing that the extent of SiF dissociation into its component elements is at odds with the assumption that SiF and NaF are equivalent sources of free fluoride when used for water fluoridation. While the "residual species" of silicate remaining in water is not precise identified, the thesis confirms potentially harmful biological effects (acetylcholinesterase inhibition). These demonstrations of biochemical differences between silicofluorides and sodium fluoride have never been challenged with experimental data.

Manocha, S.L et al, (1975). "Cytochemical Response of Kidney, Liver and Nervous System to Fluoride Ions in Drinking Water," *Histochemical Journal*, 5: 343-355.

Busey, R. HJ. (1980) "Fluosilicate Equilibria in Sodium Chloride Soluitons from 0 to 60° C" *Inorg. Chem* 19: 758-761.

Edelman, N. and Chow, L.C. (1991). "Effects of pH and Calcium on Hydrolysis of Na_2SiF_6 and Na_2SnF_6," *Caries Research*. 25: 101-107.

Whitford, G.M., Biles, E.D., Birdsong-Whitford. N.L. (1991). "A comparative study of fluoride pharmacokinetics in five species," *Journal of Dental Research*, 70: 948-51.

Whitford, G.M. (1994a). "Intake and metabolism of fluoride, " *Advances in Dental Reeearch*; 8:5-14.

Whitford, G. M.. (1994). "Effects of plasma fluoride and dietary calcium concentrations on GI absorption and secretion of fluoride in the rat," Calcif Tissue Int 54:421-5.

Reeves, T.G. (1994). *Water Fluoridation; A Manual for Water Plant Operators.*

Washington, DC: U.S. Public Health Service, Division of Oral Health.

Cory-Schlechta, D. A. (1995). "Relationships between Lead Induced Learning Impairments and Changes in Dopaminergic, Cholinergic, and Glutamatergic Neurotransmitter System Functioning." *Annual Review of Pharmacology and Toxicology* 35: 391-454.,

Skoog, West, and Holler . (1996). The Direct Potentiometric Determination of Fluoride Ion, *Fundamentals of Analytical Chemistry*, Saunders, 7th Ed., pp. 850-852

Colquhoun, J. (1997). "Why I changed my mind about water fluoridation," *Perspectives in Biology and Medicine.* 41:29-44.

He H., Ganapathy V., Isales C.M., Whitford G.M. (1998). "pH-dependent fluoride transport in intestinal brush border membrane vesicles," *Biochem Biophys Acta* 1372: 244-254.

Whitford, G.M.. (1999). "Fluoride metabolism and excretion in children;" *Journal of Public Health* Dentistry, 593:224-228.

Featherstone, J.D.B. (2000). "The Science and Practice of Caries Prevention." *Journal of the American Dental Associaton,* 131: 887-100.

Burt B.A., Keels M.A, Heller K.E. (2000). "The effects of a break in water fluoridation on the development of dental caries and fluorosis," *J Dent Res*.79:761-769.

Ballabriga, A. (2000). Morphological and physiological changes during growth: an update. *British Journal of Clinical Nutrition,* 54:S1-6.

Kunzel, W. and Fischer, T. (2000). "Caries prevalence after cessation of water fluoridation in La Salud, Cuba," *Caries Research*, 34:20-5.

Letter from Sally C. Gutierrez, Director, Water Supply and Water Resources Division, Office of Research and Development, National Risk Management Research Laboratory, U.S. EPA, Cincinnati to Roger Masters, March 15, 2001.

At a meeting in January 2001: "Several fluoride chemistry related research needs were identified including; (1) accurate and precise values for the stability constants of mixed fluorohydroxo complexes with aluminum (III), iron (III) and other metal cations likely to be found under drinking water conditions and (2) a kinetic model for the dissociation and hydroloysis (sic) of fluosilicates and stepwise equilibrium constants for the partial hydrolyisis products. As a result of these discussions, ORD is exploring options to initiate research in the identified research areas." (OFFICIAL CONFIRMATION THAT, WHEN APPROVED IN 1950, PRECISE CHEMISTRY AND BIOLOGICAL EFFECTS OF SILICOFLUORIDES WERE NOT FULLY KNOWN.)

Burgstahler, A.W., Freeman, R.F., Jacobs, P.N. (2002). "Early And Prolonged Toxic Effects of Silicofluoridated Water on Chinchillas, Caimans, Alligators, and Rats in Captivity," *Fluoride*. 35:259-260.

National Toxicology Program (2002), "NTP Nomination Of Silicofluorides For Study," *Federal Register* (June 12, 2002; Vol. 67, No. 113, p. 40329-33).

"Substances Nominated to the NTP for Toxicological Studies and Recommendations Made by the ICCEC on April 17, 2002. **"Table 1. -- Substances Recommended for Study Substance [CAS No.] …** Hexafluorosilicic acid [16961-83-4] and Sodium hexafluorosilicate [16893-85-9]. **Nominated by**: Private Individuals (multiple nominations). **Nominated for**: -Chemical characterization Toxicological characterization including chronic toxicity, carcinogenicity, neurotoxicity, and toxicokinetics. -Mechanistic studies related to cholinesterase inhibition and lead bioavailability. **Rationale for Nomination**: Primary agents used to fluoridate public drinking water systems; lack of toxicity information; assumed complete dissociation to free fluoride under normal conditions of use not supported by experimental evidence. **ICCEC Recommendations**: - Chemical characterization studies to assess chemical fate under aqueous conditions -Toxicological studies may be considered when results of chemical characterization studies are available for review." Source: Above "information about substances nominated to the NTP for toxicology and carcinogenesis studies and the ICCEC's recommendations was published in This notice is available on the web (http://ntp-server.niehs.nih.gov/htdocs/Liason/ICCECFinal02JuneFR.html) along with supporting documents for each nomination:(http://ntp-server.niehs.nih.gov/htdocs/liason/BkgrSum02June.html)…"
NO RESULTS FROM A STUDY FOLLOWING UP ON THIS NOMINATION HAVE BEEN REVEALED AS OF DECEMBER 2007. NOTE ALSO THAT THE POSSIBILITY THAT SILICIC ACID RESIDUES MIGHT BOND TO ALUMINUM MIGHT RELATE TO CONDITIONS LIKE AUTISM AND ALZHEIMER'S DISEASE (WHOSE APPARENT INCREASE IN FREQUENCY MIGHT BE DUE TO ALUMINUM NEUROTOXICITY).

Machalinski B, et al. (2003). "The influence of sodium fluoride and sodium hexafluorosilicate on human leukemic cell lines," *Fluoride,* 36: 231-40.

Seavey J. (2005). "Water fluoridation and crime in America," *Fluoride*: 38:11-22; & 38:174.

Cites work of Roger Masters and Myron Coplan, 1999a & 1999b.

II. Publications co-authored by Roger Masters & Myron Coplan et al.

Masters, R, Hone, B, and Doshi, A. (1998). "Environmental Pollution, Neurotoxicity, and Criminal Violence," in J. Rose, ed., *Environmental Toxicology: Current Developments* (London: Gordon and Breach, 1998), pp. 13-48.

Survey of evidence linking lead and manganese neurotoxicity to aggressive behavior and crime, presenting multivariate analysis correlating Toxic Release Inventory for lead and manganese with crime data for 1991 from all 3141 US counties Emphasizes effects of heavy metals on neurotransmitter function and behavior.

Masters, Roger D., with Baldwin Way, Brian T. Hone, David J. Grelotti, David Gonzalez, and David Jones (1998) "Neurotoxicity and Violence," *Vermont Law Review*, 22:358-382.

Legal implications of the evidence linking neurotoxicity and crime (including data from Toxic Release Inventory and crime for partial sample of US counties)

Masters, R. and Coplan, M. (1999a) "Water Treatment with Silicofluorides and Lead Toxicity," *International Journal of Environmental Studies*, 56: 435-49

First published analysis of data linking silicofluoride treatment of public water supplies with higher uptake of lead, using survey of children's blood lead in Massachusetts (by town).

Masters, R. and Coplan, M. (1999b) "A Dynamic, Multifactorial Model of Alcohol, Drug Abuse, and Crime: Linking Neuroscience and Behavior to Toxicology," *Social Science Information*, 38:591-624.

Articulation of the linkages between neurotoxicity, brain chemistry, environmental pollution, and behavior (with focus on substance abuse and crime), using data from National Institute of Justice study of drug use in over 30,000 criminal offenders at time of arrest). Data show that where silicofluorides are in use, criminals are more likely to consume alcohol, more likely to have used cocaine at time of arrest – and that communities have significantly higher crime rates.

Coplan, M.J. and Masters, R.D. (1999). "Is Silicofluoride Safe? Comments Re EPA Response to Rep. Calvert's Inquiry" Submission to Representative Kenneth Calvert, Subcommittee on Energy and Science, Committee on Science, U. S. House of Representatives (August 12, 1999).

Analysis and rejoinder to letter dated 12 June 1999 from J. Charles Fox, Assistant Administrator, EPA, to Hon.Kenneth Calvert, U. S. House of Representative, commenting on errors and omissions in a "Question and Answer" statement and "Fluorosilicate Fact Sheet" enclosed by Mr. Fox. This document contains a preliminary review of scientific data on the differences between sodium fluoride (NaF) and the silicofluorides (H_2SiF_6 and Na_2SiF_6), with an emphasis on the complex production process and chemical interactions of the latter compounds.

Masters, R. D. and Coplan, M. J., with Hone, B.T., Grelotti, D. J., Gonzalez, D. and Jones, D. (1999). "Brain Biochemistry and the Violence Epidemic: Toward a 'Win-Win' Strategy for

Reducing Crime," in Stuart Nagel, ed., *Super-Optimizing Examples Across Public Policy Problems* (NOVA Science Publishers)

Review of the evidence linking neurotoxicity and crime, using data from both county-level study (correlating EPA Toxic Release Inventory with FBI crime reports) and Massachusetts data on silicofluorides and lead uptake.

Wilson, Jim (1999). "The Chemistry of Violence," *Popular Mechanics*, (April), pp. 42-43.

Summary of findings from our project

Masters, R.D., Coplan, M. J., Hone, B.T., and Dykes, J.E. (2000)."Association of Silicofluoride Treated Water with Elevated Blood Lead," *Neurotoxicology* 21: 1091-1100.

Follow-up epidemiological study of the association between silicofluoride treated community water and enhanced child blood lead parameters. This statistical study of 151,225 venous blood lead (VBL) tests taken from children ages 0-6 inclusive, living in 105 communities with populations from 15,000 to 75,000 in New York state, shows for every age and racial group a significant association between silicofluoride treated community water and elevated blood lead.

Roger D. Masters (2001), "Biology and Politics: Linking Nature and Nurture" in Nelson W. Polsby, ed., *Annual Review of Political Science*, vol. 4, pp. 345-369.

A survey of the scope of the emerging subfield called "biopolitics," reflecting the activities of the membership of the Association for Politics and the Life Sciences. Four areas are discussed in some detail: 1). genetics and health; 2), toxins and behavior (including hyperactivity, depression, and violent crime), 3) the specific case of silicofluorides in water treatment and their effect in enhancing lead uptake; and 4) biopolitics and political theory.

Note: one-time e-print available at following URL:
http://polisci.annualreviews.org/cgi/content/full/4/1/345?ijkey=0K1GnNcUKf2Gg&keytype=ref&siteid=arjournals

Myron J. Coplan and Roger Masters. (2001). "Guest Editorial: Silicofluorides and fluoridation," *Fluoride Quarterly Journal of the International Society for Fluoride Research,* 34: 161-220.

Desireability of a moratorium on use of silicofluroides until such time as they are shown to be save

Masters, R.D. (2002). "MacLean's Evolutionary Neuroethology: Environmental Pollution, Brain Chemistry, and Violent Crime," Gerald A. Corey Jr. & Russell Gardner Jr., eds. *The Evolutionary Neuroethology of Paul MacLean* (Westport: Praeger), pp. 275-296 (Ch. 15).

Survey of research on neurotoxicity, brain chemistry and behavior, including evidence of the role of lead and other heavy metal pollution and crime (as demonstrated by individual data, neurochemistry, and both geographic and longitudinal data} as well as survey of data linking silicofluorides to enhanced lead uptake. First presentation of findings on the extremely high correlation (r = .90) between gallons of leaded gasoline sold and the crime rates sixteen years later, confirming special vulnerability of pregnant mothers and newborns to lead toxicity.

Masters, Roger D. (2003). "The Social Implications of Evolutionary Psychology: Linking Brain Biochemistry, Toxins, and Violent Crime," in Richard W. Bloom and Nancy K. Dess, eds., *Evolutionary Psychology and Violence: A Primer for Policymakers and Public Policy Advocates* (Westwood: Praeger), Ch. 2, pp. 23-56.

Analysis of evidence of neurotransmitter dysfunction due to toxins associated with increased rates of violent crime, with extensive discussion of silicofluoride neurotoxicity as an important instance.

Masters Roger D. (2005). "A Moritorium on Silicofluoride Usage will Save $$millions," *Fluoride*, 38(1):1-5; crn 38(2):174.

Estimation of rates of harmful effects of water treated with silicofluorides, based on national county-level data for violent crime and other statistics, and corresponding costs to taxpayers. Total financial benefits to taxpayers are in the Millions – and probably Billions – of dollars, with virtually no costs to the public.

Masters, Roger D. (2006). "Science, Bureaucracy, and Public Policy: Can Scientific Inquiry Prevail Over Entrenched Institutional Self-Interest?" *New England Journal of Political Science*, 1: 58-140.

Richard P. Maas, Steven C. Patch, Anna-Marie Christian, Myron J. Coplan, "Effects of fluoridation and disinfection agent combinations on lead leaching from leaded-brass parts," *Neurotoxicology* (September 2007), 38: 1023-31.

Disinfecton agents (chloramines as well as chlorine) have the effect of leaching lead from leaded-brass water fixtures, and this effect is significantly enhanced where fluoride compounds are also used to treat the water supply (with higher effects from long term combinations including fluorosilicic acid).

Myron J. Coplan, Steven C. Patch, Roger D. Masters, Marcia S. Bachman, "Confirmation of and Explanations for Elevated Blood Lead and Other Disorders in Children Exposed to Water Disinfection and Fluoridation Chemicals," *Neurotoxicology* (September, 2007), 38: 1032-1041.

Comprehensive survey of the chemical and biological factors underlying research showing association of silicofluoride water treatment with increased absorption of lead and other harmful effects on health and behavior.

Presentations to Scientific Conferences:

Masters, R.D. and Coplan, M.J. "Silicofluoride Usage and Lead Uptake," Presentation to XXIInd Conference of the International Society for Fluoride Research, Bellingham, Washington, August 24-27, 1998.

Report on findings of elevated blood lead associated with communities using silicofluoride, based on sample of over 250,000 children in Massachusetts (see Masters and Coplan, 1999a)

Masters, R. D. . "Poisoning the Well: Neurotoxic Metals, Water Treatment and Human Behavior," Plenary address to Annual Conference of the Association for Politics and the Life Sciences," Four Seasons Hotel, Atlanta, GA (September 2, 1999).

Review of evidence linking heavy metal pollution with substance abuse and crime, including presentation of data linking ban on sales of leaded gasoline with decline in crime 16 years later. Summary of geographical data analyses contradicting the "null hypothesis" that there is no difference in the effects of sodium fluoride and the silicofluorides.

Coplan, M. J., Masters, R. D., and Hone, B. (1999a) "Silicofluoride Usage, Tooth Decay and Children's Blood Lead," Poster presentation to Conference on "Environmental Influences on Children: Brain, Development and Behavior, New York Academy of Medicine, Mt. Sinai Hospital, New York, May 24-25, 1999.

Preliminary report on data from analysis of national sample of over 4,000 children in NHANES III, showing that while water fluoridation is associated with a significant increase in children's blood lead (with especially strong effects among minority children), data on tooth decay from the same survey show limited benefits that are no longer evident among those aged 15-17.

Coplan, M.J., Masters, R.D., and Hone, B. (1999b) "Association of Silicofluoride Treated Water with Elevated Blood Lead," Poster presentation to 17th International Nerotoxicology Conference, Little Rock, AR, October 17

Preliminary report on data from analysis of sample of blood lead testing of over 150,000 children in New York State communities of 15,000 to 75,000 population. Once again, average blood lead levels were significantly higher ($p < .0001$) in communities using silicofluorides in water treatment than in those with unfluoridated water. The effect was found independently in every age group for three ethnic subsamples

Roger D. Masters (2002) "Science, Bureaucracy, and Public Policy: Can Scientific Inquiry Prevail Over Entrenched Institutional Self-Interest?" presentation at the annual meeting of the Association for Politics and the Life Sciences, Montreal, Que. (August 19-23, 2002).

Analysis of bureaucratic opposition to reconsideration of public policy decisions challenged by new data on silicofluoride chemistry and its effects on human biology and behavior.

Roger D. Masters (2002). "Toxins and Behavior: Implications of 'Toxicogenomics' for Public Policy," Paper presented to XXth International Neurotoxicology Conference, Little Rock, ARK, Nov. 19, 2002.

Roger D. Masters, "The Hidden Handicap: Lead, Brain Chemistry, and Educational Failure," Paper presented to 2004 Annual Meeting of the American Political Science Association, Chicago, IL., Sept. 3, 2004.
