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Mr. Juan (Pepe) Menendez
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Dear Mr. Menendez:

This letter is in response to your request for information on fluoride containing water treatment chemicals that NSF has tested and certified. As you know, an NSF lead consortium developed ANSI/NSF Standard 60: Drinking Water Treatment Chemicals – Health Effects at the request of the US EPA Office of Water in 1988. NSF also developed a testing and certification program for these chemicals, so that individual U.S. states and waterworks facilities would have a mechanism to determine which products were safe to use. The scope of the standard covers the potential health risks associated with the consumption of treated drinking water and does not address worker safety issues related to the production, shipment and storage of treatment chemicals.

The certification program that was started in 1988 has succeeded in meeting its objectives. More than 43 states now have regulations, rules, or legislation requiring public water suppliers to only use products that have been certified by nationally accredited certification organizations. The program has yielded many benefits, including elimination of many redundancies, and the increased public health protection that results from implementing a "preventative measure" such as certification requirement. NSF's comprehensive formulation review, plant audit and sample collection, product testing and toxicology evaluation has resulted in a high degree of confidence in the NSF certification program and Mark.

On the issue of fluoride, there are three basic chemicals that NSF certifies in this category.
1. Hydrofluosilicic and Fluosilicic acid
2. Sodium Fluoride
3. Sodium Silicofluoride

These products are addressed in Section 7 of ANSI/NSF Standard 60. These products are Listed by NSF (hardcopy and at www.nsf.org) to result in a maximum use level of 1.2 mg/L fluoride ion in water. The NSF standard requires that the chemicals added to drinking water, as well as any impurities in the chemicals, be supported by toxicological evaluation. This review explains the rationale for 1) fluoride, and 2) contaminants.

Fluoride
The rationale that follows is a brief summary of the body of toxicology data that supports human exposure to fluoride. More information is available from U.S. EPA and from NSF Toxicology Services.

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The EPA MCL for fluoride is 4.0mg/L. This is based on a level of 4.0mg/L being protective of Crippling Skeletal Fluorosis, and 2.0mg/L being protective of Dental Fluorosis. The level of 1.2mg/L fluoride ion emanates from the National Academy of Science's Water Chemicals Codex A long term cancer study on fluoride (December 1990 NTP study of sodium fluoride, Technical Report No.393) yielded negative results when dosed at up to 100 ppm in rodents. This data supports safe human exposure to fluoride ion at or below the stated 1.2mg/L addition rate according to ANSI/NSF Standard 60 requirements.

Contaminants

Silica and silicates, which make up a portion of the fluoridation chemicals mentioned above, are addressed by the certification of sodium silicates to a level of 16mg/L under ANSI/NSF Standard 60.

The NSF toxicology review and testing of fluorosilicate compounds looks for potential trace contaminants such as heavy metals and radionuclides. Contaminants in the finished drinking water are not permitted to exceed one-tenth of the EPA's regulated MCL (Maximum Contaminant Level) when the product is added to drinking water at its Maximum Use Level.

We have compiled test results for fluoride containing products that we have tested and certified since 1992. There are 77 facilities that either produce or repackage fluoride containing treatment chemicals. Each plant receives regular unannounced inspections, as well as product sampling and retesting to verify continued compliance with the standard and with NSF Certification policies.

For the purpose of this report, NSF searched its files to determine the level of contaminants found in these fluoridation products. The exact number of laboratory tests performed is not readily available, but these products have been tested more than 100 times in our laboratories. We maintain accurate records on the tests where contaminants are detected. The table below summarizes our findings for the 3 fluoridation chemicals mentioned above.

The results in Table 1 indicate that the most common contaminant detected in these products is Arsenic, but at levels below Arsenic's Maximum Allowable Level (MAL) if the product is added to drinking water at its Listed Maximum Use Level. The MAL, as defined in ANSI/NSF Standard 60, is one tenth of the EPA's MCL. The U.S. EPA MCL for Arsenic is 50 ppb, whereas the Canadian MAC is 25 ppb. ANSI/NSF utilizes the lower of the two, 25 ppb as the MCL, resulting in an MAL of 2.5 ppb Arsenic. We believe that fluoridation chemical addition rates are typically below the 1.2 mg/L, as Fluoride. When the samples without detected Arsenic are factored into the calculation, the average concentration of Arsenic resulting from product use drops from 0.44 ppb to less than 0.1ppb. The U.S. EPA recently proposed lowering the Arsenic MCL from 50ppb to 5 ppb. This change will result in a lowering of the MAL from 2.5 ppb to 0.5 ppb Arsenic. The end result is that future tests of fluoridation chemicals may result in increased product failures when the lower Arsenic MCL of 5ppb is promulgated.

The other significant contaminant found, and on a much less frequent basis, is Lead. The average concentration in those samples where Lead was detected was 0.40 ppb. Likewise, when the samples without detected Lead are factored into the calculation, the average concentration of Lead resulting from product use drops from 0.40 ppb to less than 0.1ppb.

The only instance of a product failure to date, in the fluoridation chemical category, resulted from the detection of Beryllium in a single sample in excess of the MAL, but below the EPA's MCL. Follow-up testing of samples did not find Beryllium in excess of one-tenth of the EPA's MCL.

Radionuclides

Beginning in early 1998, NSF began testing fluoridation chemicals for the presence of radionuclides (alpha and beta emitters) based on requests from environmental groups concerned about the source of fluoride compounds. Over the last two years, we have tested for radionuclides in fluoridation chemicals utilizing EPA Test Method 900.0, as specified in Annex B of ANSI/NSF Standard 60. We have not found a sample with a positive (detected) result, with detection limits of 4 pCi/liter and 3 pCi/liter for gross alpha and gross beta, respectively.

Table 1

	Number of Tested Samples in which the Contaminant was Detected	Average Contaminant Concentration in Samples with Positive Test Results* (ppb)	Maximum Contaminant Concentration in Samples with Contaminants (ppb)	ANSI/NSF Standard 60 Maximum Allowable Level (MAL) (ppb)	US EPA / Health Canada Maximum Contaminant Level per Standard 60 (MCL) (ppb)
Antimony	0	NA	NA	0.6	6
Arsenic	39	.43	1.66	2.5	25
Barium	1	.19	0.17	200	2000
Beryllium	5	.24	0.6	0.4	4
Cadmium	3	.06	0.1	0.5	5
Chromium	3	0.14	0.2	10	100
Copper	8	.49	0.55	130	1300
Lead	7	0.4	1.1	1.5	15
Mercury	5	.013	0.015	0.2	2
Radionuclides-α	0	NA	NA	NA	NA
Radionuclides-β	1	.60	0.6	5	50
Selenium	6	.03	0.05	0.2	2
Thallium	0	NA	NA	-	-

**Only those samples where a contaminant was detected contribute to the average. The average contaminant concentration for all samples tested is significantly lower, and is affected by detection limits and number of detections.*

In summary, use of fluoridation products as a class, based on NSF test results, do not represent a significant source of heavy metals or radionuclide contamination to drinking water.

I hope this letter provides the information you requested. Please contact me if there are additional questions.

Sincerely,

Stan Hazan
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