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VIA FEDEX

National Institute for Occupational Safety and Health
NIOSH Mailstop: C-34
Robert A. Taft Lab.
4676 Columbia Parkway
Cincinnati, Ohio 45226

Re: Comments on *Skin Notation Profile for Metallic Chromium & Other Substances Containing Hexavalent Chromium*

Dear NIOSH:

On behalf of the Specialty Steel Industry of North America ("SSINA"), we are writing to express concern with the National Institute for Occupational Safety and Health's ("NIOSH's") proposed *Skin Notation Profile for Metallic Chromium and Other Substances Containing Hexavalent Chromium* ("*Skin Notation Profile*"). Generally, SSINA is concerned that health hazards associated with hexavalent chromium ("Cr(VI)") are being improperly linked to other forms of chromium, including metallic and trivalent chromium ("Cr(III)").

SSINA is a national trade association comprised of producers of specialty steel products including stainless, electric, tool magnetic, and other alloy steels. SSINA members account for over 90 percent of the specialty steel manufactured in the United States. As the major producers of stainless steel and other alloys that contain chromium, SSINA members are keenly interested in ensuring the proper characterization of risks associated with the various forms of chromium.

I. Issues with the *Skin Notation Profile*

a. "Substances Containing Hexavalent Chromium"

Fundamentally, SSINA is most concerned about NIOSH's improper conflation of metallic and trivalent chromium with other species of chromium, particularly Cr(VI). Chromium is present in stainless steel in both the elemental/metallic and trivalent forms. Primarily,

chromium in stainless steel is in the metallic (zero valence) form. When that chromium metal is exposed to the air, a thin film of chromic oxide (Cr_2O_3), a Cr(III) compound, forms at the surface. Chromic oxide is essentially inert and does not react further with most other chemicals, thereby making stainless steel "stainless." When scratched, a new film of chromic oxide is created thus preserving the stainless character of the material. When stainless steel is exposed to very high temperatures, and the chromium is subjected to strong oxidizing conditions, Cr(VI) compounds can be generated.

Critically, in all aspects, including chemical composition and risk, metallic chromium, Cr(III), and Cr(VI) are different substances.[1] While Cr(VI) is a known carcinogen, Cr(III) is a stable compound that is an essential component of the human diet and metallic chromium is largely inert and typically present only within the stainless steel alloy. Therefore, the risk properties of Cr(VI) should not be imputed to trivalent or metallic chromium.

Further, it is important to clarify that metallic chromium does not "contain" Cr(VI). Cr(VI) can be created from metallic chromium, but it is not "contained" in metallic chromium. In a metallurgical context, Cr(VI) can be generated as a result of the oxidation of metallic or trivalent chromium when "hot processes" such as melting, cutting, or welding are applied to metals containing chromium. These processes create Cr(VI). Cr(VI) is not a component of chromium that becomes released during hot processes – it is an entirely new compound.

This distinction is important because consumers and regulators should not be mislead to believe there are risks associated with stainless steel based on concerns regarding exposure to Cr(VI). Nor should the industry bear the attendant consequences of potential product deselection as a result of confusion over the toxicological properties of various forms of chromium. Indeed, it is the properties imparted by metallic and trivalent chromium which make stainless steel favored for hospitals, kitchens, surgical implants, and other sterile applications. Given the numerous high-performance and sensitive uses of stainless steel, it is critical that consumers are not given the misperception that components of stainless steel contain known carcinogens such as Cr(VI). As such, SSINA believes that NIOSH should change all references to chromium "containing" Cr(VI), including in the title of the *Skin Notation Profile*. Further, NIOSH should delete the portions of Section 1.1 that identify chromium and Cr(VI) as synonyms.

b. "Carcinogenic Designations for Cr by Numerous Governmental and Nongovernmental Organizations"

On pages 13 and 14 of the *Skin Notation Profile*, NIOSH purports to identify five organizations which identify "chromium" as a human carcinogen or a potential human

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[1] Contrary to the representation in Section 1.1 General Substance Information, chromium and Cr(VI) are not synonyms.

carcinogen. In fact, none of these organizations make any such finding with respect to "chromium." Specifically, NIOSH stated that the National Toxicology Program ("NTP"), the U.S. Environmental Protection Agency ("EPA"), and the American Conference of Governmental Industrial Hygienists ("ACGIH") each identified chromium as a "known human carcinogen." However, neither NTP, EPA, nor ACGIH made such a finding. Rather, these organizations' findings concerned Cr(VI). In fact, in 1998, for the reasons noted above, NTP changed its listing in the *Report on Carcinogens* from "Chromium and Certain Chromium Compounds" to read "Chromium Hexavalent Compounds." Similarly, NIOSH improperly classified as "chromium findings" the International Agency for Research on Cancer's ("IARC's") determinations on acrylamide and its own findings on Cr(VI) and Cr(III). Indeed, the only study which NIOSH accurately portrayed was a European Commission Joint Research Institute for Health and Consumer Protection study which provided no designation for "chromium."

It would be entirely improper for NIOSH to attempt to justify a *Skin Notation Profile* for "chromium" by relying on completely unrelated carcinogenic designations for Cr(VI). We strongly urge NIOSH to remove all references to these organizations which have not designated "chromium" as a known or potential human carcinogen.

c. Improper Citation of Non-Chromium Studies

Throughout the *Skin Notation Profile*, NIOSH references a number of studies which allegedly demonstrate the properties of, and risks associated with, chromium. These studies are used to show that chromium may be absorbed through the dermis, may cause ulcers or sensitization, or may be carcinogenic or toxic. However, in most instances, the cited studies refer to Cr(VI) or other valence states of chromium – but not metallic or trivalent chromium. After an initial, but by no means exhaustive review, of the cited studies, it was immediately evident that the following studies did not cover metallic or trivalent chromium:

> Allenby CF, Goodwin BF (1983). Influence Of Detergent Washing Powders On Minimal Eliciting Patch Test Concentrations Of Nickel And Chromium. Contact Dermatitis 9(6):491-499.
>
> Baranowska-Dutkiewicz B (1981). Absorption Of Hexavalent Chromium By Skin In Man. Arch. Toxicol. 47(1):47-50.
>
> Fowler JF Jr., Kauffman CL, Marks JG Jr., Proctor DM, Fredrick MM, Otani JM, Finley BL, Paustenbach DJ, Nethercott Jr. (1999). An Environmental Hazard Assessment Of Low-level Dermal Exposure To Hexavalent Chromium In Solution Among Chromium-sensitized Volunteers. J Occup. Environ. Med. 41(3):150-160.

Gad SC 1988. A Scheme For The Prediction And Ranking Of Relative Potencies Of Dermal Sensitizers Based On Data From Several Systems. J. Appl. Toxicol. 8(5):361-8.

Gad SC 1989. Acute And Chronic Chromium Toxicity. Sci. Total Environ. 86(1-2):149-157.

Gammelgaard B, Fullerton A, Avnstorp C, Menne T (1992). Permeation of chromium salts through human skin in vitro. Contact Dermatitis 27(5):302-310.

Gross PR, Katz SA, Samitz MH (1968). Sensitization Of Guinea Pigs To Chromium Salts. J. Invest. Dermatol. 50(5):424-427.

Hansen MB, Johansen JD, Menne T (2003) Chromium Allergy: Significance Of Both Cr(III) And Cr(VI). Contact Dermatitis 49(4):206-212.

Klein Kosann M, Brancaccio RR, Shupack JL, Franks AG, Cohen DE (1998). Six-hour Versus 48-hour Patch Testing With Varying Concentrations Of Potassium Dichromate. Am. J. Contact Dermat. 9(2):92-95.

Lin CC, Wu ML, Yang CC, Ger J, Tsai WJ, Deng JF (2009). Acute Severe Chromium Poisoning After Dermal Exposure To Hexavalent Chromium. J Chin Med. Assoc. 72(4):219-221

Mali JW, Malten K, van Neer FCJ (1966). Allergy To Chromium. Arch. Dermatol. 93(1):41-44.

Matey P, Allison KP, Sheehan TMT, Gowar JP (2000). Chronic Acid Burns; Early Aggressive Excision Is The Best Method To Prevent Systemic Toxicity. J. Burn Care Rehabil. 21:241-245.

Peltonen L, Fraki J (1983). Prevalence Of Dichromate Sensitivity. Contact Dermatitis 9(3):190-194).

Wahlberg JE (1970. Percutaneous Absorption Of Trivalent And Hexavalent Chromium (51Cr) Through Excised Human And Guinea Pig Skin. Dermatologica. 141(4):288-296.

Wahlberg JE, Skog E (1965). Percutaneous Absorption Of Trivalent And Hexavalent Chromium: A Comparative Investigation In The Guinea Pig By Means Of 51Cr. Arch. Dermatol. 92(3):315-318.

As explained above, NIOSH provides no scientific basis for extrapolating the properties and risks of Cr(VI) to chromium generally. We urge NIOSH to remove all citations to studies that do not specifically cover metallic or trivalent chromium. Inclusion of extraneous studies without some explanation as to their importance merely confuses the science and calls into question all of NIOSH's conclusions.

II. Conclusion

SSINA appreciates the opportunity to review and comment on the *Skin Notation Profile*. For the reasons noted above, we are concerned that NIOSH is attempting improperly to impart the properties and risks of Cr(VI) to metallic and trivalent chromium. Fundamentally, metallic and trivalent chromium and Cr(VI) are entirely different substances with different properties and different risks. Conflating the science on these substances is not scientifically justifiable and, additionally, could have a negative impact on the stainless steel industry. Metallic and trivalent chromium are safe and essential components of stainless steel that is used in thousands of consumer products. Improperly imparting Cr(VI) risks to metallic and trivalent chromium and, by extension, stainless steel, may lead to unwarranted consumer de-selection and the misdirection of regulatory resources.

Please do not hesitate to contact us if you have any questions or would like additional information.

Sincerely,

John L. Wittenborn
Joseph J. Green
Wayne D'Angelo
Counsel to the Specialty Steel Industry of North America