



Silver Nanotechnology Working Group

A Program of The Silver Research Consortium LLC

1822 East NC Highway 54, Suite 120
Durham, NC 27713
Tel: (919) 361-4647
Fax: (919) 361-1957

Steven Bradbury Ph.D.
Acting Director
Office of Pesticide Programs
United States Environmental Protection
Agency
Washington D.C., 20460

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EPA Nanosilver Scientific Advisory Panel Report

Dear Dr. Bradbury,

With the recent release of the Science Advisory Panel (SAP) report on nanosilver and other nanometal oxide pesticide products, the Silver Nanotechnology Working Group (SNWG) would like to take this opportunity to provide the U.S. Environmental Protection Agency (EPA) with the SNWG's reactions to that report. As EPA itself has recognized, we believe it important that the Agency receive meaningful input from all stakeholders as EPA moves forward with decisions, policies and possible regulations impacting nanomaterials industries. In the spirit of transparency touted by the Administration, we provide this letter.

The SNWG is an industry effort intended to foster the collection of data on silver nanotechnology in order to advance the science and public understanding of the beneficial uses of silver nanoparticles in a wide-range of consumer and industrial products. The SNWG made a detailed presentation¹ to the SAP when it convened to discuss the topic "*Evaluation of Hazard and Exposure Associated with Nanosilver and Other Nanometal Oxide Pesticide Products*" (Arlington VA, November 3-6, 2009)². EPA

¹ SNWG "Evaluation of Hazard and Exposure Associated with Nanosilver and Other Nanometal Oxide Pesticide Products", Presentation to Scientific Advisory Panel (November 4th, 2009).
<http://www.regulations.gov/search/Regs/contentStreamer?objectId=0900006480a52512&disposition=attachment&contentType=pdf>

² EPA Scientific Advisory Panel meeting, Arlington VA (November 3 - 6, 2009),
<http://www.epa.gov/scipoly/sap/meetings/2009/november/110309aagenda.pdf>

recently published the SAP report³ (dated January 26th 2010), which provides a transcript of the SAP meeting together with SAP recommendations towards the various issues posed to the Panel by EPA.

The SNWG welcomed the opportunity to present to the SAP and has continued to monitor the evolution of this topic within EPA. In addition to our written comments submitted to the public docket directly following the SAP meeting⁴ we would like to take this opportunity to highlight a number of the statements and recommendations from the SAP report that we consider highly relevant for the shaping of EPA policy towards nanosilver materials.

Nanosilver is NOT a new material

The Panel correctly recognized that colloidal nanosilver particles have been registered and used in the market for decades - *“There has been considerable use of colloidal silver products with sizes ranging from approximately 2 nm up to perhaps 50 nm in a variety of products including pesticides, dietary supplements and those used in photography.”* (p.15, emphasis added). The Panel further noted that *“Multiple products in current use contain nanosilver.”* (p.37). The Panel encouraged EPA to *“Evaluate whether it is feasible to assess the fate of colloidal silver, which contains nanosilver, as it is currently available in products in the market to serve as a case-study relative to realistic use of the products.”* (p.34). During the SAP meeting the SNWG made a detailed presentation to the Panel that demonstrated that over 50% of all current EPA-registered silver products are in fact based on nanosilver materials. Furthermore, nanosilver materials have been regulated by EPA for decades with an established record of safe use. Common sense, as well as the Agency’s commitment to quality science, would suggest that EPA take this history of safe nanosilver use into account when considering the risk profile of nanosilver materials and as part of making rational regulatory choices. Nanosilver is NOT a new material.

Clarity needed on EPA concept of nano

The Panel notes that EPA is currently acting without a functional definition of nanotechnology. The Panel states that *“A critical issue that must be clarified is the use of the term ‘nano’. The common definition is one that often includes [size] <100 nm in one dimension and poses a unique property.”* (P.38. emphasis added). Currently EPA appears to be proceeding solely on the basis of size as a policy discriminator and even then is proceeding without reference to a defined size range. As such, current policy discrimination appears to be based predominantly on the use of the term “nano” independent of the properties of the underlying material. Nanoscale silver used in antimicrobial applications is typically embedded within polymer substrates where any antimicrobial functionality is achieved via release of silver ions (Ag⁺) – a mechanism

³ EPA Scientific Advisory Panel transcript,
<http://www.epa.gov/scipoly/sap/meetings/2009/november/110309ameetingminutes.pdf>

⁴ Letter from the Silver Nanotechnology Working Group following the FIFRA Scientific Advisory Panel
<http://www.regulations.gov/search/Regs/contentStreamer?objectId=0900006480a5af82&disposition=attachment&contentType=pdf>

entirely identical to all EPA-registered silver products including silver salts, silver glasses and silver zeolites. The functionality of nanosilver is NOT unique.

Real-life conditions are essential for realistic risk assessment

The Panel correctly recognized that testing under “*realistic environmental and physiological conditions*” (p.33) is essential for informing risk assessment activities because the risk profile of nanosilver is intimately related to the properties of the surrounding medium. The Panel further notes that “*nanoparticles [nanosilver] in aqueous media are colloidal material and will behave as such*” (p.32) and real-life conditions are therefore “*important factors for interpretation of in vitro testing.*” *The National Toxicology Program (NTP) has recognized this and decided not to utilize in vitro testing.*” (p.32). This statement is revealing in terms of relevance to an informed risk assessment policy for nanosilver – many of the calls for regulation of nanosilver cite *in vitro* (e.g. test tube) data obtained in idealized fluid conditions generally at extremely high dose concentrations – i.e. far away from real-life use conditions. This is particularly true for silver where under real environmental conditions silver has repeatedly been shown, including by EPA’s own scientists⁵, to be deactivated and rendered benign by ubiquitous environmental agents such as sulfur, dust, and organic matter⁶. While *in vitro* tests may be academically interesting, the relevance of *in vitro* tests on nanosilver as an instrument to inform risk assessment policy requires careful weighing of real-life relevance and the Panel correctly points out this fact. *In vivo* tests that adequately take into account conditions of real-life use provide a more appropriate context for assessing the real-life risk profile of nanosilver.

EPA policy must allow for sustainable technology development

The Panel correctly points out that “*future EPA data requirements for nanomaterial products should balance costs and benefits and allow for sustainable nanotechnology development.*” (p.23, emphasis added). This is not only an appropriate Panel recommendation, but the statutory standard under which pesticide registration decisions must be made in accordance with federal law (i.e., FIFRA). The Panel further notes that “*there are many beneficial applications of nanosilver products.*” (p.28). The Panel also reflects that “*silver is an effective pesticide with relatively low risk to humans. If it [nanosilver] is not used, other synthetic organic chemicals may be used instead.*” (p.20). As previously noted, the Panel correctly recognized a long history of use of nanosilver materials including many products that have been successfully registered by EPA for decades. The SNWG strongly urges EPA to take these cost/benefit and historical considerations into account in shaping any future policy towards nanosilver.

⁵ C.Impellitteri, T.Tolaymat, K.Scheckel, “The speciation of silver nanoparticles in antimicrobial fabric before and after exposure to a Hypochlorite/Detergent solution”, *Journal of Environmental Quality*, 38(4) (2009) pp1528-30.

⁶ O.Choi, Z.Hu, “Nitrification inhibition by silver nanoparticles”, *Water Science and Technology*, 59(9) (2009) pp1699-702.

Nano confusion

While the Panel provided a comprehensive overview of various nanosilver topics, the SAP frequently confounded general “nano”-related issues and uncertainties with issues specific to nanosilver. Simply because nanosilver has “nano” in the name does not automatically mean broader conceptions of nano risk apply. Nanosilver is an old material with a multi-decade history of safe use demonstrated by significant bodies of data and experience drawn from real-life use. Accordingly general conceptions of new “nano” risk should not be projected onto nanosilver simply because of nano nomenclature. The Panel at times recognized this – for example cautioning against “*extrapolations between nanomaterials based on different metals*” (p.8) yet the Panel unfortunately contradicted this correct basis by repeatedly referring to general properties of other nanomaterials as justification for stressing uncertainty with the specific material nanosilver.

A further issue where the assumptions of the SAP were at odds with history relates to the toxicity profile of nanosilver. The Panel incorrectly assumed that available silver toxicity data relates to bulk silver - “*Toxicity data for the bulk material might be used to assess the hazard of the nanoscale material*” (p.23). The SNWG presentation to the Panel revealed that a detailed inspection of the historical origins of the toxicological record for silver shows that the data is derived from colloidal nanosilver materials and not from bulk silver. Indeed, historical toxicological data for nanosilver has been used to inform hazard assumptions for bulk silver and not the other way around as is falsely assumed. It should be noted that EPA’s own analysis of the silver toxicology data record⁷ acknowledges the seminal data used for informing modern human toxicity limits of all EPA-registered silver materials derive from *in vivo* human exposure studies that employed colloidal nanosilver materials^{8,9}. Confirmation of this crucial relationship between historical colloidal nanosilver materials and modern toxicology limits for silver was posed as a direct question by an SAP panelist to EPA representatives during the SAP meeting yet is a notable omission in the SAP meeting transcript.

Nanosilver: Policy choices

EPA policy towards nanosilver stands at a critical crossroads. A choice to declare nanosilver as a new material despite decades of historical EPA-registered use in favor of imposing disproportionate and largely redundant data requirements on nanosilver simply to assuage broader generalized conceptions of “nano” will constitute a drastic action. Such a choice will be a major impediment to an industry that offers significant benefits to consumers and will severely impact an embryonic manufacturing industry that offers to employ a significant number of Americans. The multi-decade historical record of safe use specific to colloidal nanosilver materials together with costs AND benefits of policy actions must be taken into account. To do otherwise will be to deny history.

⁷ Ionic Silver: Toxicity and Weight of the Evidence
<http://www.regulations.gov/search/Regs/contentStreamer?objectId=09000064809d0cfb&disposition=attachment&contentType=pdf>

⁸ L.E.Gaul, A.H.Staud, “Clinical spectroscopy: seventy cases of generalized argyrosis following organic and colloidal silver medication, including a biospectrometric analysis of ten cases”, *Journal of the American Medical Association* 104(16), (1935) pp.1387-1390.

⁹ W.R.Hill and D.M.Pillsbury (1939) “Argyria: the pharmacology of silver”. Baltimore, MD: Williams & Wilkins Company.

The SNWG looks forward to our continued dialogue on this matter. In the meantime, if you have any questions or comments, please feel free to contact me.

Yours sincerely,



Rosalind Volpe D.PH.

Executive Director
Silver Nanotechnology Working Group (SNWG)
Tel: +1 (919) 361-4647 x3023
Email: rvolpe@caa.columbia.edu

cc. Stephen Owens
James J. Jones
Betsy Shaw
Vicki Dellarco
William Jordan
Margie Fehrenbach
Keith Matthews
Donald Brady
William Diamond
Jack Housenger
Tina Levine
JoanHarrigan-Farrelly
Lois Rossi
Richard Kelgwin
Dennis Edwards
Najm Shamim
Melba S. Morrow
Jenny Tao
Jessica Ryman-
Rasmussen
Tim Dole
Edward Oderkirchen
Enesta Jones
Douglas Parsons
Vanessa Vu

