Online Ethics Center
FOR ENGINEERING AND SCIENCE

Readings and References

Author(s)

Anonymous

Description

Readings and references for the Nanosilver Linings Case and Workshop.

Body

(Download bibliography as Word Document)

Additional References and Suggested Readings, Background/All Characters

(**Note to Instructors:** Green highlighted texts are lead candidates for distribution to all participants one week prior to workshop.)

Nanosilver and Society

Landsdown, A.B.G. (2006) Silver in health care: antimicrobial effects in safety and use. Current Problems in Dermatology 33:17-34.

Seltenrich, N. (2013) Nanosilver: Weighing the Risks and Benefits. *Environmental Health Perspectives* 121(7):A220-A225

Nanosilver and Life Cycle Assessment

Walser, T., Demou, E., Lang, D.J., and Hellweg, S. (2011) Prospective Environmental Life Cycle Assessment of Nanosilver T-Shirts. *Envrionmental Science and Technology* 45:4570-4578.

Nanosilver and Food Packaging

Echegoyen, Y. and Nerin, C. (2013) Nanoparticle release from nano-silver antimicrobial food containers. *Food and Chemical Toxicology* 62:16-22.

Background: Relevant News

Wines, M. (2014) E.P.A. Unveils Second Phase of Plan to Reverse Great Lakes Damage. *New York Times*, September 24. http://www.nytimes.com/2014/09/25/us/epa-unveils-plan-to-restore-great-lakes.html

Additional References and Suggested Readings, by Character

(Note: Highlighted texts are lead candidates for distribution to individual characters in packets distributed upon character assignment.)

Hansen

Hansen reads periodicals avidly, such as *The Wall Street Journal, Forbes, Bloomberg,* and *Fortune.*

Buzby, J.C. (2010) Nanotechnology for Food Applications: More Questions than Answers. *The Journal of Consumer Affairs* 44(3):528-545.

Enis, M. (2012) Small Change: Nanotechnology in Food Packaging. *Supermarket News*, January 23.

Sozer, N. and Kokini, J.L. (2010) Applications of Nanotechnology in the Food Industry. Food Engineering & Ingredients, 35(1):12-15.

Whitefoot, K.S. and Valdivia, W.D. (2015) Innovation and Manufacturing Labor: A Value-Chain Perspective, Paper of the Center for Technology Innovation at Brookings

A Little Risky Business—The Risk in Nanotechnology. *The Economist* (US), November 24, 2007.

Map of manufacturing data by state and year recommended for Hansen, Jones, and Thompson; available online at http://trade.gov/manufactureamerica/facts/tg_mana_003019.asp Prepared by: Office of Trade and Industry Information, International Trade Administration, Source: Bureau of Economic Analysis, U.S. Department of Commerce

Thompson

Sargent, J.F. (2013) *Nanotechnology: A Policy Primer*. Congressional Research Service Report for Congress.

One of Thompson's advisors from the university sent this article:

Kearnes, M. and Wynne, B. (2007) On Nanotechnology and Ambivalence: The Politics of Enthusiasm. *NanoEthics* 1:131-142.

Map of manufacturing data by state and year recommended for Hansen, Jones, and Thompson; available online at http://trade.gov/manufactureamerica/facts/tg_mana_003019.asp Prepared by: Office of Trade and Industry Information, International Trade Administration, Source: Bureau of Economic Analysis, U.S. Department of Commerce

On the internet, the Mayor has been reading about Bisphenol A on the advice of the scientific advisory board with an eye on policy and regulatory issues at http://www.epa.gov/oppt/existingchemicals/pubs/actionplans/bpa.html. The mayor is looking at the tax abatement incentives other cities are offering at http://www.houstontx.gov/ecodev/abatements.html, http://www.indy.gov/eGov/City/DMD/ED/New_Expanding/Tax_Abatement/Pages/home.aspx , and https://www.stlouis-mo.gov/government/departments/sldc/economic-development/financing/real-estate-tax-abatement.cfm, among others. What the mayor knows about nanotechnology came from http://nano.gov/.

Brown

Professor Brown has been reading articles in the peer-reviewed academic literature, as listed above (e.g. Artiaga et al 2015, Handford et al 2014, Walser et al 2011, Kumar et al 2014, Echegoyen and Nerin 2013), and others:

Browning, L.M., Lee, K.J., Nallathamby, P.D., and Xu, X-H.N. (2013) Silver Nanoparticles Incite Size- and Dose-Dependent Developmental Phenotypes and Nanotoxicity in Zebrafish Embryos. *Chemical Research in Toxicology* 26:1503-1513.

Sections 1 and 3 of Duncan 2011 (above)

McShan al. 2014 (above)

Brown has also seen Luoma 2008:

Luoma, S.N. (2008) *Silver Nanotechnologies and the Environment: Old Problems or New Challenges?*, Report of Woodrow Wilson International Center for Scholars Project on Emerging Nanotechnologies

Green

Green has been reading NGO reports:

Behar, A., Fugere, D., and Passoff, M. (2013) *Slipping Through the Cracks: An Issue Brief on Nanomaterials in Food*, Report of As You Sow.

Illuminato, I. (2014) *Tiny Ingredients Big Risks: Nanomaterials Rapidly Entering Food and Farming*, Report of Friends of the Earth United States.

Senjen, R. and Illuminato, I. (2009) *Nano and Biocidal Silver*. Report of Friends of the Earth Australia and Friends of the Earth United States

Green has also seen Luoma 2008 (above)

Jones

International Trade Administration, United States Department of Commerce. (2010)The State of Manufacturing in the United States, http://trade.gov/manufactureamerica/facts/tg_mana_003019.asp

Tomczyk, M. (2014) *NanoInnovation: What Every Manager Needs to Know (2nd Edition)*. Weinheim:Wiley, pages 1-54.

Map of manufacturing data by state and year recommended for Hansen, Jones, and Thompson; available online at http://trade.gov/manufactureamerica/facts/tg_mana_003019.asp Prepared by: Office of Trade and Industry Information, International Trade Administration, Source:

Bureau of Economic Analysis, U.S. Department of Commerce

Reed

Seltenrich 2013 (above)

Behar, A., Fugere, D., and Passoff, M. (2013) *Slipping Through the Cracks: An Issue Brief on Nanomaterials in Food*, Report of As You Sow.

Luoma 2008 (above)

NIOSH publications about nanotechnology: http://www.cdc.gov/niosh/topics/nanotech/

A Little Risky Business—The Risk in Nanotechnology. *The Economist* (US), November 24, 2007.

Wines, M. (2014) E.P.A. Unveils Second Phase of Plan to Reverse Great Lakes Damage. *New York Times*, September 24. http://www.nytimes.com/2014/09/25/us/epa-unveils-plan-to-restore-great-lakes.html

Carlson

National Education Association (2003) *Protecting Public Education from Tax Giveaways to Corporations*, Research Working Paper of National Education Association

Senjen, R. and Illuminato, I. (2009) *Nano and Biocidal Silver*. Report of Friends of the Earth Australia and Friends of the Earth United States

On the internet, Carlson has been reading about tax abatements and schools at http://www.goodjobsfirst.org/accountable-development/key-reforms-protecting-schools. On sunscreens, one of resources that makes the most sense to Carlson is a video: http://youtu.be/VV0cCg4clMw. One of Carlson's friends from a cancer support group sent a link about food packaging and cancer: http://www.dailymail.co.uk/health/article-2684256/Dangerous-chemicals-food-packaging-linked-cancer-fertility-birth-defects-study-finds.html.

(Note: Yellow highlighting indicates distribution in character folders in the initial offerings of the workshop.)

Note to Instructors: If the *Nanosilver Linings* role play experience is being incorporated into a course rather than as a stand-alone workshop, additional readings approaching the topic of nanosilver in food packaging from around the product life cycle may benefit student learning. Suggestions for life cycle stage-based readings are included below.

Additional References and Suggested Readings, by Life Cycle Stage

Life Cycle Stages: Supply and Manufacture (Occupational Health)

Bachand, G.D., Allen, A., Bachand, M., Achyuthan, K.E., Seagrave, J.C., Brozik, S.M. (2012) Cytotoxicity and inflammation in human alveolar epithelial cells following exposure to occupational levels of gold and silver nanoparticles. *Journal of Nanoparticle Research* 14:1212.

Chaudhry, Q., Scotter, M., Blackburn, J., Ross, B., Boxall, A., Castle, L., Aitken, R., and Watkins, R. (2008) Applications and Implications of Nanotechnologies for the Food Sector. Food Additives and Contaminants 25(3):241-258.

Map of manufacturing data by state and year recommended for Hansen, Jones, and Thompson; available online at http://trade.gov/manufactureamerica/facts/tg_mana_003019.asp Prepared by: Office of Trade and Industry Information, International Trade Administration, Source: Bureau of Economic Analysis, U.S. Department of Commerce

Life Cycle Stage: Storage, Package, Distribution (Product Behavior, Shelf Life, and Transportation)

Artiaga, G., Ramos, K., Cámara, C., Gómez-Gómez, M. (2015) Migration and characterization of nanosilver from food containers by AF4-ICP-MS. *Food Chemistry* 166(1):76-85.

Duncan, T.V. (2011) Applications of nanotechnology in food packaging and food safety: Barrier materials, antimicrobials and sensors. *Journal of Colloid and Interface Science* 363(1):1-24.

Echegoyen and Nerin 2013 (above)

Handford, C.E., Dean, M., Henchion, M., Spence, M., Elliot, C.T., and Campbell, K. (2014) Implications of Nanotechnology for the Argri-Food Industry: Opportunities, Benefits, and Risks. *Trends in Food Science & Technology* 40:226-241.

Motlagh, N.V., Mosavian, M.T.H., Mortazavi, S.A., and Tamizi, A. (2012) Beneficial Effects of Polyethylene Packages Containing Micrometer-Sized Silver Particles on the Quality and Shelf Life of Dried Barberry (*Berberis vulgaris*) *Journal of Food Science* 71(1):E2-E9.

Life Cycle Stage: Customer Use (Human Health)

McShan, D., Ray, P.C., and Yu, H. (2014) Molecular toxicity mechanism of nanosilver. *Journal of Food and Drug Analysis* 22:116-127.

Pratsinis, A., Hervella, P., Leroux, J-C., Pratsinis, S.E., and Sotiriou, G.A. (2013) Toxicity of Silver Nanoparticles in Macrophages. *Small* 9(15):2576-2584.

Rogers, K.R., Bradham, K., Tolaymat, T., Thomea, D.J., Hartmann, T., Ma, L.Z., and Williams, A. (2012) Alterations in physical state of silver nanoparticles exposed to synthetic stomach fluid. *Science of the Total Environment* 420:334-339.

Verano-Braga, T., Miethling-Graff, R., Wojdyla, K., Rorowska-Wrzesinska, A., Brewer, J.R., Erdmann, H., and Kjeldsen. (2014) Insights into the Cellular Response Triggered by Silver Nanoparticles Using Quantitative Proteomics. *ACS Nano* 8(3):2161-2175.

Life Cycle Stage: Disposal and Recycling (Environment)

Kim, B., Park, C-S., Murayama, M., and Hochella, M.F. (2010) Discovery and Characterization of Silver Sulfide Nanoparticles in Final Sewage Sludge Products. *Environmental Science and Technology* 44:7509-7514.

Kumar, N., Palmer, G.R., Shah, V., and Walker, V.K. (2014) The Effect of Silver Nanoparticles on Seasonal Change in Arctic Tundra Bacterial and Fungal Assemblages. *PLoS ONE* 9(6):e99953.

Poynton, H.C., Lazorchak, J.M., Impellitteri, C.A., Blalock, B.J., Rogers, K., Allen, H.J., Loguinov, A., Heckman, J.L., and Govindasmawy, S. (2012) Toxicogenomic Responses of Nanotoxicity in *Daphnia magna* Exposed to Silver Nitrate and Coated

Silver Nanoparticles. *Environmental Science and Technology* 46:6288-6296.

Tsyusko, O.V., Harda, S.S., Shoults-Wilson, W.A., Starnes, C.P., Joice, G., Butterfield, D.A., Unrine, J.M. (2012) Short-term molecular-level effects of silver nanoparticle exposure on the earthworm, *Eisenia fetida. Environmental Pollution* 171:249-255.

Next: Workshop Assessment

Rights

Resource Type

Case Study / Scenario

Topics

Case Study Method
Public Health and Safety
Environmental Justice
Sustainability

Discipline(s)

Nanoscience and Nanotechnology