

QUICKSILVER CAUCUS

Status Report on Select Products, Processes and Technologies Utilizing Mercury

August 2013



Environmental Council of the States

The Quicksilver Caucus (QSC) is a coalition of state environmental association leaders working to reduce mercury in the environment.

Association members of the Quicksilver Caucus are:

- The Environmental Council of the States (ECOS)
- The Association of Clean Water Agencies (ACWA)
- The Association of State Drinking Water Administrators (ASDWA)
- The Association of State and Territorial Solid Waste Management Officials (ASTSWMO)
- The National Association of Clean Air Agencies (NACAA)
- The National Pollution Prevention Roundtable (NPPR)

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This report has been published under the auspices of ECOS, the national non-profit, non-partisan association of state and territorial environmental agency directors. ECOS is the flagship and founding association member of the Quicksilver Caucus and provides staff services for the group. The following ECOS staff provided support to the development of this paper:

- Beth Graves
- Edin Ferreira
- Matthew C. Jones

The recommendations contained in this report were developed by Quicksilver Caucus members and are offered for the consideration of ECOS members and other state and federal policy-makers. In some cases, the recommendations in this report offer new suggestions for addressing mercury pollution, but may not exactly mirror the officially-adopted policy positions of ECOS or its sister associations.

More information about ECOS and the Quicksilver Caucus is available at:
<http://www.ecos.org>

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Status Report on Select Products, Processes and Technologies Utilizing Mercury

I. Executive Summary/Key Findings

In November 2011, the United States Environmental Protection Agency (U.S. EPA) approved the Environmental Council of the States (ECOS) proposal to use grant funds to enable the Quicksilver Caucus (QSC) to pursue its interest in conducting an assessment of additional technologies, uses, processes and products where elemental mercury (Hg) is still present, integrated or generated, even if in very small quantities. The QSC recruited a workgroup comprised of several state environmental agency officials to conduct this assessment and then gained QSC approval of recommendations for future action.

This paper does not purport to be comprehensive, but rather provides an attempt to highlight findings and offer recommendations for further action for the consideration of state and federal environmental leaders. In this report, QSC workgroup members have researched mercury use in the following nine areas:

- A. Polyurethane elastomer production (catalyst use)
- B. Rotational balancing products
- C. Skin-lighteners, face creams and other cosmetics
- D. Tattoo inks
- E. Nanotechnology
- F. Photovoltaic products
- G. Veterinary vaccines
- H. Novelty products
- I. Biotechnology/genetics research laboratories

QSC members believe these uses need to be addressed for a variety of reasons. First, uses of mercury, such as in nanotechnology and biotechnology/genetics research, have emerged since the QSC began to evaluate mercury-added products a decade ago. Second, undocumented mercury uses, which may result in significant exposures and health effects, remain, such as in cosmetics and tattoo ink. Third, the amounts of mercury used in some products in the U.S. have not been well investigated, as is the case with polyurethane elastomer production, rotational balancing products, veterinary vaccines, and photovoltaic products. In addition, reducing mercury-added technologies, products or processes lowers the potential for exposures and releases of mercury into the environment, where it is readily converted into methylmercury, which then bioaccumulates in the food chain. Human consumption of fish is the route of exposure of primary concern.

In 2003, with active participation by the United States, the United Nations (UN) adopted the international voluntary Globally Harmonized System of Classification and Labeling of Chemicals (GHS). The GHS includes criteria for the classification of health, physical and environmental hazards, and specifies what information should be included on labels of hazardous

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chemicals as well as safety data sheets. All chemicals in products or formulations must be identified, even at the nanoparticle level.

As of this time, the U.S. has not fully implemented key aspects of GHS. This makes it difficult, if not impossible, to track which remaining or new products (whether fabricated abroad and imported to the U.S. or fabricated in the U.S.) may still involve the use or disposal of mercury. Therefore, international information and legal authorities have been used to assess whether additional work to eliminate unnecessary uses of mercury remain. For further information on GHS, see Appendix C.

With few exceptions, there are no U.S. federal labeling, disclosure or notification requirements in law or rule for the technologies, products and processes addressed in this report. Therefore, it is difficult to determine definitively if a number of the areas addressed in this paper, such as red tattoo pigments, currently contain mercury because, generally, there are no requirements for manufacturers to list ingredients on their labels.

National U.S. implementation of reporting under both existing and future laws, such as the GHS, and a comprehensive chemical reporting and surveillance system could greatly improve mercury use tracking and trend analysis and, ultimately, support efficient efforts to reduce mercury use, exposures and environmental contamination.

In addition to evaluating existing data and information on mercury use and disposal for each of these product /process sectors, this paper also suggests overall QSC priority recommendations. These include a number of areas where gaps exist in current knowledge and efforts to address mercury use in various products and processes. The QSC has identified the following four areas as priorities for further action at the national and state levels.

Overall Priority Recommendations:

1) Research and Data Collection on the Extent of Use, Exposure Potential and Environmental Releases Associated With Certain Key Product Classes

The QSC recommends that U.S. EPA take actions and support state efforts to improve data on these mercury uses with an initial focus on the following product categories, which are viewed as having the largest potential for significant use, exposure and/or environmental releases:

- a) **Polyurethane Products**
- b) **Rotational Balancing Products**
- c) **Cosmetics and Tattoo Inks**
- d) **Nanotechnology Manufacturing Processes and Applications**

2) Outreach and Education

To enhance sustainability, expanded efforts are needed to better share information about mercury use in products and processes; potential risks to public health, workers and the environment; and non-mercury alternatives, across federal and state programs. Because the states have much experience in these areas but lack necessary funds to implement such efforts, U.S. EPA support is imperative.

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3) Coordination and Communication across Federal and State Programs

Improved communication and coordination across federal and state programs would help to leverage existing efforts to reduce mercury use; enhance recycling; avoid duplicative efforts or ones that may be at cross purposes; and identify existing and needed tools to limit mercury uses, exposures and pollution.

4) Improved National and State Tools to Reduce Unnecessary Uses of Mercury and Better Assess Mercury Risks.

A number of states have enacted legislation and/or regulations that: restrict unnecessary uses of mercury; require mercury added products to be labeled; provide for mercury product sales data to be collected and assessed; require that consumers be provided information about mercury products, risks and alternatives; and, require recycling options for end-of-life products. National legislative requirements consistent with such state efforts would help ensure a level playing field; effectively reduce unnecessary uses and releases of mercury; improve information; and reduce public health and environmental costs to the states associated with mercury spill responses, exposure risks and appropriate end-of-life product disposal. Improved tools are also needed to assess risks attributable to mercury vapor exposures. Toward this end, U.S. EPA should work with the Agency for Toxic Substances and Disease Registry (ATSDR) to update and/or develop guidance for shorter-term exposures to elemental mercury in consultation with state environmental and public health agencies.

Specific Recommendations for Priority Product Categories.

Based on the assessments presented in this report, the following is a summary of key QSC recommendations for specific follow-up actions in four priority product categories.

Additional QSC recommendations are presented in each of the nine individual sections in this report and recommendations from each of the nine sections are summarized in Appendix A.

- 1) Polyurethane Elastomer Production (Catalyst Use)
 - i. U.S. EPA should conduct comprehensive research and tracking on manufacturing and on final/end use products made of mercury-catalyzed polyurethane made or sold in the U.S. making effective use of its sector specialists; its air, water, and waste permitting authorities; its information collection request (ICR) authorities; and through Toxic Substances Control Act (TSCA) or any other authorities.
 - ii. U.S. EPA should work with the ATSDR to elevate awareness of this issue so appropriate steps can be taken to minimize risks.
- 2) Rotational Balancing Products
 - i. U. S. EPA, working with the states and other federal agencies, should complete a national study on: the quantity and distribution of mercury based balancing devices manufactured in, imported to, and sold in the United States; sales of such products in states with mercury content or

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mercury wheel weight restrictions; disposal practices and reports of any rotational balancing product failures and related mercury releases and to seek report publication within 12-18 months.

- ii. U. S. EPA should facilitate information sharing between the states and federal agencies including the U.S. General Services Administration (GSA) to 1) promote awareness of and, as appropriate, further adoption of laws and practices such as sales and use restrictions enacted by Maine and Illinois, and 2) to ensure state and federal procurement specifications discourage or prevent unnecessary uses of mercury.

3) Cosmetics and Tattoo Inks

- i. The U.S. Food and Drug Administration (FDA) should confirm through legal opinion, court cases, or other appropriate mechanisms that tattoo inks are defined as cosmetics and are regulated under the U.S. Food, Drug, and Cosmetics Act (FD&C Act).
- ii. States and U. S. EPA should support FDA's request for registration oversight authority for cosmetics, including tattoo inks, as outlined in FDA testimony to the U.S. House on their FY2013 budget request, as described in the cosmetics and tattoo ink sections.

4) Nanotechnology

- i. The U.S. government should evaluate the use of nano-mercury and implement mechanisms to track uses and enact restrictions as appropriate. This activity can be coordinated and enhanced through the National Nanotechnology Initiative's (NNI) Nanotechnology Environment and Health Implications (NEHI) Working Group in formal consultation with the states through ECOS and Association of State and Territorial Health Officials (ASTHO).
- ii. ECOS, through Resolution Number 03-7, "The Need for Actions to Achieve Further Progress on Reducing Impacts to Water Quality from Atmospheric Mercury," fully supports the planned U.S. EPA and CPSC collaboration to assess health and environmental risks from nanomaterials, as announced in December 2012. ECOS formally requests this process be expedited and decisions be quickly implemented.
- iii. States and U.S. EPA should develop and implement guidelines for sustainable management of nano-mercury throughout its life cycle.

II. Introduction

State environmental agencies, individually and collectively, have recognized mercury as a significant source of risk to human health. The great sensitivity of the developing neurological system in the fetus and young children to mercury is of particular concern. States have recognized mercury as an impairment to the nation's environment due to its properties as a persistent, bio-accumulative toxic (PBT) substance. Fifty states have mercury-related fish consumption advisories. Methylmercury levels in fish and other living organisms routinely exceed thresholds considered potentially harmful to fish-eating people and wildlife throughout much of the U.S..

In May 2001, a coalition of state environmental association leaders led by ECOS formed the QSC to collaboratively develop holistic approaches for reducing mercury in the environment. Members include ECOS as the flagship association member along with the Association of State and Territorial Solid Waste Management Officials (ASTSWMO), the National Association of Clean Air Agencies (NACAA), the Association of Clean Water Administrators (ACWA), the Association of State Drinking Water Administrators (ASDWA), and the National Pollution Prevention Roundtable (NPPR). The QSC's long-term goal is that state, federal, and international actions result in net mercury reductions in the environment.

The QSC is working collaboratively and in partnership in three priority areas:

- Stewardship approaches for reducing mercury in the environment and managing safe, long-term storage of elemental mercury nationally and internationally.
- Multi-media approaches for mercury Total Maximum Daily Loads (TMDL) for jurisdictions throughout the United States integrating air and waste programs as well as state statutes and environmental programs to craft solutions that address all significant sources.
- Approaches to decrease the global supply and demand for mercury.

The QSC is a forum to share mercury-related technical and policy news and information with members, the U.S. EPA, and other groups. QSC work projects have included webinars, conference calls to share information, research reports, compendiums, case studies, and white papers. The QSC also provides recommendations regarding mercury policy issues to the ECOS Cross-Media Committee which has the discretion to use these recommendations to form the basis of proposed ECOS policy resolutions for consideration by state environmental agency directors.

ECOS has a number of current resolutions relating to mercury encompassing reduction, stewardship, retirement, monitoring, impacts to water quality from atmospheric mercury, and support for the national mercury switch recovery program for end-of-life vehicles. A list of mercury-related resolutions may be found under "General Resources" at the end of this document.

In November 2006, the QSC published the report, "Mercury-Added Product White Paper." The paper focused on several mercury-added product sectors where state and federal agencies could focus voluntary and regulatory efforts to reduce the use of mercury. Areas chosen were based on several criteria, the most important being those where efforts were already underway. The paper covered non-vehicle switches, relays and flame sensors; thermometers; dental amalgam; thermostats; lamps; switches in end-of-life vehicles; health care; and schools. A copy of this

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report may be found at: http://ecos.org/files/4494_file_Mercury_Added_Product_White_Paper_formatted_final_with_MS_changes.pdf
State environmental agencies have made much progress in reducing the sale and distribution of these and other mercury-added products. However states also recognize the need to address emerging and other additional uses, and their limited resources and authorities to do so.

In November 2011, the U.S. EPA approved ECOS' proposal to use grant funds to enable the QSC to pursue a mutual interest in conducting an assessment of additional technologies, uses, processes and products where elemental mercury (Hg) is still present, integrated or generated, even if in very small quantities. The QSC recruited a workgroup comprised of several state environmental agency officials to conduct this assessment and then gained QSC approval of recommendations for future action. In this report, QSC workgroup members have researched mercury use in the following nine areas:

- A. Polyurethane Elastomer Production (Catalyst Use)
- B. Rotational Balancing Products
- C. Skin-lighteners, Face Creams and Other Cosmetics
- D. Tattoo Inks
- E. Nanotechnology
- F. Photovoltaic Products
- G. Veterinary Vaccines
- H. Novelty Products
- I. Biotechnology/Genetics Research Laboratories

For each area assessment, information is presented in the following common format:

- Area (e.g. Nanotechnology)
1. Background
 1. a. Mercury Use in Product
 1. b. Purpose of Mercury in Product
 2. Regulatory Landscape
 2. a. Federal
 2. b. State
 3. Options to Avoid Using Mercury
 4. Recommendations for Further Action
 5. Resources

QSC members believe these uses need to be addressed for a variety of reasons. First, uses of mercury, such as in nanotechnology and biotechnology/genetics research, have emerged since the QSC began to evaluate mercury-added products a decade ago. Second, undocumented mercury uses remain, such as in cosmetics and tattoo ink, which may result in significant exposures and health effects. Third, the amounts of mercury used in some products in the U.S. have not been well investigated, as is the case with polyurethane elastomer production, rotational balancing products, veterinary vaccines, and photovoltaic products. In addition, reducing mercury-added technologies, products or processes reduces the potential for exposures and releases of mercury into the environment, where it is readily converted into methylmercury and bioaccumulates in the food chain. Human consumption of fish is the route of exposure of primary con-

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cern.

States recognize there may be other technologies, uses, processes, or products where the chemical mercury still may be present, such as in homeopathic medicines. However, due to resource and time constraints, as well as reasons listed above, only the nine areas above were chosen to be reviewed for this report.

This status report includes information gathered through a routine assessment of research literature, incident reports, patents, and international trade and transfer of products, compounds, and mixtures that may indicate the use and/or reuse of mercury. Information is also based on the knowledge and professional experience of the paper's authors as well as data from the Interstate Mercury Education and Reduction Clearinghouse (IMERC).

IMERC was launched in 2001 by the Northeast Waste Management Officials' Association (NEWMOA) to provide ongoing technical and programmatic assistance to states that have enacted mercury education and reduction legislation and to provide a single point of contact for industry and the public for information on mercury-added products and member states' mercury education and reduction programs. Currently, there are fifteen IMERC state members. IMERC's role is to collect and manage data submitted by manufacturers of mercury-added products and this provided a key source of information for this report.

In regards to data on mercury-added technologies, products, and processes, sources of quality data currently available include that generally provided to other countries through programs under the European Union's **R**egistration, **E**valuation, **A**uthorisation and **R**estriction of **C**hemical effort (REACH), IMERC, and the Center for European Policy Analysis (CEPA). QSC discussions with U.S. EPA indicated that neither REACH nor CEPA can provide useful information to the U.S., due to data release restrictions requested and obtained by national and international industry.

The states' ability to access existing data that is available under the federal TSCA and some state TSCA-like authorities is limited. In addition, available data are insufficient to evaluate risks. This is further compounded by a current lack of state funds to do special field inspections and detailed on-site materials science data review under national delegated programs such the Resource Conservation and Recovery Act (RCRA) and the Clean Water Act (CWA).

Despite these formidable limitations, state data from IMERC, international publications research, as well as patent office data review has provided useful although not comprehensive information.

It should be noted that, in 2003, the United Nations (UN), with active participation by the United States, adopted the GHS. The GHS includes criteria for the classification of health, physical and environmental hazards, as well as specifying what information should be included on labels of hazardous chemicals as well as safety data sheets. All chemicals in products or formulations must be identified, even at the nanoparticle level. The GHS itself is not a regulation or a standard. The GHS is a voluntary international system that imposes no binding treaty obligations on countries and has no international implementation schedule.

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As of this time, the U.S. has not fully implemented key aspects of GHS. This makes it difficult, if not impossible, to track which remaining or new products (whether fabricated abroad and imported to the U.S. or fabricated in the U.S.) may still involve the use or disposal of mercury. Therefore, international information and legal authorities have been used to assess whether additional work to eliminate unnecessary uses of mercury remain. For further information on GHS, see Appendix C.

In addition to the nine area assessments and individual recommendations therein, this report includes a recommendations section consisting of two parts. The first part includes overall priority recommendations where the QSC has identified areas where gaps exist in current knowledge and efforts to address mercury use in various products and processes. In the second part of the recommendations section, the QSC suggests key, priority recommendations for specific follow-up actions in four areas.

This paper does not purport to be comprehensive, but rather attempts to highlight findings and offer recommendations for further action for the consideration of state and federal environmental leaders.

III. Sections

III. A. Polyurethane Elastomer Production (Catalyst Use)

III. A. 1. Background

Mercury is used as a catalyst in some manufacturing processes and finished products. Depending on the process, the catalyst may or may not be consumed in the process. If the catalyst is not consumed in the process, it does not remain in the final product. In processes where the catalyst is added to give a batch or the final product certain necessary characteristics, the mercury remains in the final product.

Mercury catalysts used in polyurethane elastomer production are consumed in the process and remain in the final product. Mercury is released from the final product via off-gassing as the polymer structure is broken down over the life of the product or if the structure of the product is otherwise changed.

On September 19, 2012, the European Union published a ban on phenylmercury compounds, the form of compound used as a catalyst and the mercury source in polyurethane elastomers. The ban takes effect October 10, 2017.

III. A. 1. a. Mercury Use in Product

In December 2008, the European Commission Directorate-General Environment issued a report on options for reducing mercury use in products and applications. This report estimated that globally 300-350 metric tons of mercury are annually used as a catalyst to produce between 55,000 and 65,000 metric tons of polyurethane elastomers. Data on how much of this is produced in the U.S. is not readily available.

A brief Internet search for “phenylmercury MSDS” (material safety data sheet) revealed several companies manufacturing mercury-catalyzed polyurethane in the U.S. The companies are: BJB; Development Associates, Inc.; Era; Gibson-Homans; Huntsman; Puma Polymers; and So-Flex. None of these companies have reported to the IMERC as selling these products in states requiring notification of mercury-added product sales in those states and it is unclear whether they have ceased such production.

III. A. 1. b. Purpose of Mercury in Product

Phenylmercury-catalyzed polyurethanes are used in a variety of products including gaskets and seals, flooring, water resistant coatings and sealants, rollers on swivel chairs and roller skates, leather, adhesives, in shoe soles, and repair of conveyor belts. Phenylmercury compounds are used as catalysts to allow sufficient time to cast polyurethane elastomer products and rapidly cure the final product. Final products do not contain bubbles and are not sticky, which are desired characteristics.

An important legacy use of mercury-catalyzed polyurethanes is in mercury flooring and athletic cushioning and padding products commonly used in schools, where off-gassing of mercury vapor can pose a health risk under certain conditions. Because there is so little reliable information on current uses, it is possible that these products are still available and still being manufac-

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tured or installed, and continue to pose health risks. Other products may also pose health risks, but not enough is known about the products or their uses. There is currently an ATSDR-state workgroup investigating health exposure issues associated with mercury-catalyzed flooring. See Section III. A. 5. References for links to health information on mercury in flooring in schools.

III. A. 2. Regulatory Landscape

III. A. 2. a. Federal

There are no federal regulations regarding the use of mercury-catalyzed polyurethanes. Waste handling, water discharges, and air emissions from the manufacturing process may fall under federal laws.

III. A. 2. b. State

Waste handling, water discharges, and air emissions from the manufacturing process may also fall under state or local laws. Some states have requirements for notification, labeling and collection plans that manufacturers of mercury-added polyurethane or polyurethane products must comply with. Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont require manufacturers to submit notification forms indicating mercury content of many products. These states (except New Hampshire) as well as Washington and Minnesota require that manufacturers of mercury-added products label most of those products as containing mercury. Maine, Massachusetts, Minnesota, New York, Rhode Island, New Hampshire, Vermont, and Washington ban disposal of most or all mercury-added products. Massachusetts requires manufacturers selling many mercury-added products, excluding formulated products and some other product classes, to develop and implement a collection plan for proper handling of mercury-added products at the end of their useful life with a targeted collection rate of 75% or greater. Specifics of each state's laws may vary and laws may change over time; therefore manufacturers must review each state's rules and regulations to determine their requirements.

Three states ban the sale of formulated products (e.g., catalysts, polyurethane flooring, reagents) containing more than a specified concentration of mercury. Those three states, and their statutorily specified concentration limits, are:

Connecticut [Conn. Gen. Stat. § 22a-617(a)]	Formulated Products >50 ppm
Louisiana [LA Rev. Stat. § 2576(A)(3)]	Formulated Products >10 ppm
Rhode Island [RI General Statutes § 23-24.9-7(a)(3)]	Formulated Products >10 ppm

III. A. 3. Options to Avoid Using Mercury

Mercury-free alternatives are available for most polyurethane applications. Performance of some alternatives reportedly does not meet current industry standards. According to information from the European Union, acceptable alternatives for all uses are expected to be available

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by 2016. Dow Chemical announced August 15, 2012, successful replacement of all organo-mercury catalysts in its polyurethane elastomer products.

III. A. 4. Recommendations for Further Action

1. U.S. EPA should conduct comprehensive research and tracking on manufacturing and on final/end use products made of mercury-catalyzed polyurethane made or sold in the U.S. making effective use of its sector specialists; its air, water, and waste permitting authorities; its ICR authorities; and through TSCA or any other authorities.
2. U.S. EPA should work with the ATSDR to elevate awareness of this issue so appropriate steps can be taken to minimize risks.

III. A. 5. Resources

The China Council for International Cooperation on Environment and Development. **“Executive report: Special policy study on mercury management in China.”** November 2011.

European Commission Directorate-General Environment. **“Options for reducing mercury use in products and applications, and the fate of mercury already circulating in society,”** Final Report. December 2008, http://ec.europa.eu/environment/chemicals/mercury/pdf/study_summary2008.pdf

European Union Commission Regulation No. 848/2012. **“Amending Annex XVII to Regulation (EC) no 1907/2006 of the European Parliament of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) as regards phenylmercury compounds.”** September 19, 2012. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:253:0005:0007:EN:PDF>

European Chemicals Agency. **“Background document to the Opinions on the Annex XV dossier proposing restrictions on five phenylmercury compounds.”** September 15, 2011. <http://echa.europa.eu/documents/10162/4a71bea0-31f0-406d-8a85-59e4bf2409da>

Minnesota Department of Health. Mercury in schools web site. <http://www.health.state.mn.us/divs/eh/hazardous/topics/mercury/schools.html#flooring>. Last accessed November 26, 2012.

“Dow Proactively Replaces Mercury Catalyst for Superior Results,” August 15, 2012, <http://www.dow.com/news/all-news/article/?id=/company-news/dow-proactively-replaces-mercury-catalyst-superior-results>

III. B. Rotational Balancing Products

III. B. 1. Background

Rotational balancing products are an aftermarket product and are not required for operation of any products on which they are installed.

On November 1, 2011, the GSA issued Sun-Tech Innovations, LLC's Balance Masters Self Adjusting Wheel Balancers a no-bid MAS contract, reference contract GS-07F-0061Y. On September 2, 2012, the product was made available through GSA's online shopping site, GSA Advantage and through EBuy for special orders: <http://www.prlog.org/11969666-sun-tech-innovations-self-adjusting-wheel-balancers-now-available-on-gsaadvantage.html>

Several states specify the use of non-mercury alternatives in their state procurement system including Maine, Minnesota, Texas, and Alameda County, California. U.S. EPA through its "Environmentally Preferable Products (EPP) Database" provides information on alternative non-mercury products.

III. B. 1. a. Mercury Use in Product

Mercury balancers and wheel weights are manufactured and sold by two companies, Sun-Tech Innovations LLC in Canoga Park, California, (www.balancemasters.com/1/) and Centra Balance in Montreal, Quebec (www.centrabalance.com). Sun-Tech's products are sold under the brand name Balance Masters[®]. Both companies' products can be purchased over the internet or at distributors.

III. B. 1. b. Purpose of Mercury in Product

Balance Masters[®] and Centra Balance[™] products are marketed as self adjusting active balancing system for a variety of uses, including: wheels of motorcycles, motor homes, and trucks; clutches; flywheels; engines; fans; motors and pumps; and "anything that rotates." These balancing systems use centrifugal force to position fluid materials, in this case mercury, around wheels to balance the wheels.

In Balance Masters[®] products, mercury is placed inside a flexible tubing ring which is sealed with high heat. The outside is coated with an epoxy to prevent leakage. Mounting of the ring depends on the application. For use on axles, the tubing is placed on a round metal plate that is mounted on the axle. When used on flywheels a groove is machined into the flywheel and the flexible tubing is inserted in the groove. For drive shafts the ring is mounted on the drive shaft and secured with clamps. Graphics depicting the products and applications can be found on the Balance Masters Products website at: <http://www.balancemasters.com/1/order.html>. Balance Masters makes a private label engine balancer for Pittsburgh Power.

Specific information on construction of Centra Balance's products was not found. Graphics depicting the products and applications can be found on the Centra Balance's Products website at: <http://www.centrabalance.com/centra/products2.html>.

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III. B. 2. Regulatory Landscape

III. B. 2. a. Federal

There are no current U.S. federal regulations applicable to these products.

Currently, in Canada, there are proposed mercury-added products regulations that would prohibit the manufacture, sale and import, of most mercury-containing products including rotational balancing products. Publication of the final regulations is anticipated in spring 2013 with the regulations effective one year later.

Information on the proposed Regulations Respecting Products Containing Certain Substances Listed in Schedule 1 to the Canadian Environmental Protection Act, 1999, is available at: <http://www.gazette.gc.ca/rp-pr/p1/2011/2011-02-26/html/reg4-eng.html>.

III. B. 2. b. State

Waste handling, water discharges, and air emissions from the manufacturing process may also fall under state or local laws. Some states have requirements for notification, labeling and collection plans that manufacturers of mercury-added rotational balancing products must comply with. Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont require manufacturers to submit notification forms indicating mercury content of many products. These states (except New Hampshire) and Minnesota require that manufacturers of mercury-added products label most of those products as containing mercury. Maine, Massachusetts, Minnesota, New York, Rhode Island, New Hampshire, and Vermont ban disposal of most or all mercury-added products. Massachusetts requires manufacturers selling many mercury-added products, excluding formulated products and some other product classes, to develop and implement a collection plan for proper handling of mercury-added products at the end of their useful life with a target collection rate of 75% or greater. Specifics of each state's laws may vary and laws may change over time; therefore manufacturers must review each state's rules and regulations to determine their requirements.

Three states - Connecticut, Louisiana, and Rhode Island - ban sale and distribution of fabricated mercury products based on mercury content. Mercury balancers exceed the allowable limits in those states. A summary of laws in these three states follows.

Connecticut [Conn. Gen. Stat. § 22a-617(a)]	Fabricated Products >100 mg
Louisiana [LA Rev. Stat. § 2576(A)(3)]	Fabricated Products >10 mg
Rhode Island [RI General Statutes § 23-24.9-7(a)(3)]	Fabricated Products >10 mg

Maine (Revised Statutes Title 38 §1606-A) bans the use, sale and distribution of wheel weights or any other product containing mercury that is used to balance tires.

Illinois also bans use, sale and distribution of wheel weights or any other product containing mercury that is used to balance tires (415 Illinois Compiled Statutes Section 22.23c). Another

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law (415 Illinois Compiled Statutes Section 27(a)(12)) bans the sale or distribution of mercury rings in Illinois.

III. B. 3. Options to Avoid Using Mercury

Wheel weights made from aluminum, steel and zinc are readily available and can be bought at auto suppliers. Information on alternatives can be found at the Lead Free Wheels site at: <http://www.leadfreewheels.org/sources.shtml>.

III. B. 4. Recommendations for Further Action

1. U. S. EPA, working with the states and other federal agencies, should complete a national study on: the quantity and distribution of mercury based balancing devices manufactured in, imported to, and sold in the United States; sales of such products in states with mercury content or mercury wheel weight restrictions; disposal practices and reports of any rotational balancing product failures and related mercury releases and to seek report publication within 12-18 months.
2. U. S. EPA should facilitate information sharing between the states and federal agencies including the GSA to 1) promote awareness of and, as appropriate, further adoption of laws and practices such as sales and use restrictions enacted by Maine and Illinois, and 2) to ensure state and federal procurement specifications discourage or prevent unnecessary uses of mercury.
3. U.S. EPA and other federal agencies should take action and support states to assess current practices and work to educate state and federal procurement agencies about environmentally preferable rotational balancing technologies; add information about specific state bans or restrictions for balancing products and other mercury-added products on federal procurement listings alongside product listings; establish and institutionalize processes to identify and discourage/prohibit unnecessary use of products that use mercury and other PBTs; establish effective end-of-life recycling programs and provide information on safe cleanup approaches for inadvertent spills of these products.
4. U.S. EPA in consultation with states should work with federal and provincial authorities in Canada to evaluate options to address the manufacture, sale, and export of such products manufactured in Canada.

III. B. 5. Resources

The Centra Balance website at <http://www.centrabalance.com/centra/about.html> provides no location information other than a phone number. The Centra Balance phone number is the same as Prince Enterprises.

Prince Enterprises
103-5415 Pare St.
Montreal, QC Canada H4P 1P7
Tel: 514-233-8120, Fax: 514-341-1233
<http://www.centrabalance.com/centra/about.html>.

III. C. Skin-lighteners, Face Creams and Other Cosmetics

III. C. 1. Background

Over the past 15 to 20 years, there have been many reports in the U.S. of adverse health impacts from mercury-added cosmetics. The FDA and state and local health agencies have responded to many of these incidents, confiscating products and issuing health advisories to affected regions and communities.

The products in question are lotions, creams, and soaps that are marketed as or intended to be skin-lightening products. They are marketed to people, especially women, with "darker," i.e., not naturally white, skin as well as marketed to people with freckles, acne, eczema, etc. That is, they are marketed to people of African, Asian/Pacific Islander, Hispanic, and Middle Eastern heritage, and indigenous peoples around the world. In many cultures, lighter or white skin is seen as a sign of status and beauty. Two articles published in the Middle Eastern and Asian press in September 2006 touch on some of the cultural issues associated with mercury-added cosmetics and discuss the potential magnitude of the issue. While the links are no longer active, these articles may be found in Appendix D.

III. C. 1. a. Mercury Use in Product

In 1995-96, three people in Texas, New Mexico, and San Diego County, California were poisoned by a beauty cream "Manning Crema de Belleza" imported from Mexico. The product listed "calomel" as an ingredient and was 6% to 8% mercury by weight. The product was being used for acne and as a skin lightener. This was reported in the Centers for Disease Control and Prevention's Morbidity and Mortality Weekly Report (CDC MMWR) on May 17, 1996, with an update published on July 26, 1996 (<http://www.cdc.gov/mmwr/preview/mmwrhtml/00041544.htm> and <http://www.cdc.gov/mmwr/preview/mmwrhtml/00043182.htm>).

In 2004-2005, the New York City Department of Health and Mental Hygiene (NYCDH) investigated similar products and issued warnings about the use of labeled and unlabeled products that could contain mercury. The Health Department investigation found almost a dozen products made in the Dominican Republic, Hong Kong, and China that contained mercury. (NYCDH Press Release, January 27, 2005.)

Between 2006 and 2008, use of skin cream containing mercury in eastern and central Washington State became such a concern that local TV stations and the internet routinely showed a law firm's add offering help to obtain settlements from companies providing the product (http://www.klinespector.com/skin_cream_attorney.html?clid=CLfLy7OJILUCFc6DQgodJVcARQ).

In 2010, the Chicago Tribune conducted an investigation and analyzed 50 products. Six were found to contain mercury and five contained over 6% (6,000 ppm) (Chicago Tribune, May 18, 2010; Ellen Gabler and Sam Roe).

In 2010, there was a case of poisoning caused by cosmetics in Alameda County, California, which led to a study by several health agencies. In January 2012, this study was reported in the CDC MMWR (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6102a3.htm?s_cid=mm6102a3_x).

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In 2011, Ramsey County (MN) Department of Public Health initiated an investigation spurred by concerns among African and Asian immigrant communities. The MN Department of Health (MDH) and the Pollution Control Agency (MPCA) joined the investigation when MDH lab analysis showed that several product samples contained high levels of mercury. Search warrants were executed at several stores serving Asian and African communities. Numerous products made in Africa, Asia, and the Caribbean were seized and tested. Several of them contained mercury. A few of these products were labeled as mercury-added but those generally contained low levels consistent with the label. Unlabeled products contained much higher levels. MDH Website: <http://www.health.state.mn.us/topics/skin/>

The MPCA's authority for the search warrants and seizures rested in the state law cited below in III.D.2.b. that prohibits the sale of cosmetics containing mercury. Without this state law in effect, it would have been much more difficult or even impossible for the state environmental agency to obtain a search warrant or take any enforcement action.

As a result, the state department of health conducted an extensive outreach campaign to immigrant and ethnic communities, in cooperation with local health departments. MPCA worked with local household hazardous waste programs to accept mercury-added materials from households and businesses for disposal. However, as of October 2012, nothing has been brought in to the local programs for disposal.

The FDA website has a Consumer Update on this issue at the weblink below, and this page includes links to several state health department advisories on the issue: <http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm294849.htm>

III. C. 1. b. Purpose of Mercury in Product

Mercury acts on the skin cells that create melanin and suppresses their activity, so skin becomes lighter.

III. C. 2. Regulatory Landscape

III. C. 2. a. Federal

The FD&C Act prohibits the use of poisonous substances in cosmetics. "Adulterated" or "misbranded" cosmetics may not be imported or sold in the U.S. Pursuant to the Act, the FDA has issued rules stating that the FDA will regard as adulterated any cosmetic containing mercury except for a trace amount where "such trace amount is unavoidable under conditions of good manufacturing practice and is less than 1 part per million" or eye area cosmetics containing no more than 65 ppm as a preservative and "there is no effective and safe nonmercurial substitute preservative available for use in such cosmetic" [21 CFR 700.13]. However the FDA rules contain no provisions for manufacturer disclosure of or product labeling for mercury content of eye area cosmetics, or a mechanism for manufacturers to demonstrate to the FDA that there is no effective and safe nonmercurial substitute.

Under the FD&C Act, the FDA does not have recall authority. Instead, if manufacturers do not remove dangerous products from the market once a safety concern emerges, then the FDA can

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pursue enforcement actions in federal court to address products to prove harm and show violation of the law.

There are no labeling, disclosure or notification requirements in federal law or rule.

From FY 2004 to FY 2010, the FDA reported that the number of cosmetics imports had nearly doubled, growing from less than 1 million “import entry lines” in FY 2004 to more than 1.9 million import entry lines in FY 2010 (<http://www.fda.gov/NewEvents/Testimony/ucm297215.htm>). Regarding imports, the FDA and other state and federal agencies that may have jurisdiction over imports, health, or product safety cannot block all imports of mercury-added products and federal law does not require complete ingredient labeling as one tool to help with legitimate imports. As such, it will always be difficult to address mercury in cosmetics.

III. C. 2. b. State

Waste handling, water discharges, and air emissions from the manufacturing process may also fall under state or local laws. Some states have requirements for notification, labeling and collection plans that manufacturers of mercury-added skin lighteners, face creams and cosmetics must comply with. Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont require manufacturers to submit notification forms indicating mercury content of many products. These states (except New Hampshire) as well as Washington and Minnesota require that manufacturers of mercury-added products label most of those products as containing mercury. Maine, Massachusetts, Minnesota, New York, Rhode Island, New Hampshire, Vermont, and Washington ban disposal of most or all mercury-added products. Massachusetts requires manufacturers selling many mercury-added products, excluding formulated products and some other product classes, to develop and implement a collection plan for proper handling of mercury-added products at the end of their useful life with a targeted collection rate of 75% or greater. Specifics of each state’s laws may vary and laws may change over time; therefore manufacturers must review each state’s rules and regulations to determine their requirements.

With respect to cosmetics covered by the FD&C Act, Minnesota prohibits the sale of cosmetics, toiletries, and fragrances containing mercury [Minn. Stat. § 116.92 subd 8i] effective January 1, 2008. Illinois also bans the sale of mercury containing cosmetics, effective June 1, 2009 [410 Ill. Comp. Stat. § 46-22].

Three states ban the sale of formulated products (e.g., cosmetics) containing more than a specified concentration of mercury. Those three states, and their statutorily specified concentration limits, are:

Connecticut [Conn. Gen. Stat. § 22a-617(a)]	Formulated Products >50 ppm
Louisiana [LA Rev. Stat. § 2576(A)(3)]	Formulated Products >10 ppm
Rhode Island [RI General Statutes § 23-24.9-7(a)(3)]	Formulated Products >10 ppm

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While state sales bans send a signal out to industry and provide a valuable tool for environmental agency enforcement, there is still no really effective mechanism to prevent trade or identify what is in trade.

III. C. 3. Options to Avoid Using Mercury

With respect to the FD&C Act allowance for mercury in eye-area cosmetics, many manufacturers use no preservatives or non-mercury preservatives in these products. Alternatives are readily available.

Retinoic acid and steroids are also commonly used as skin-lightening products but they are not feasible alternatives because there are significant health concerns with these products as well.

III. C. 4. Recommendations for Further Action

1. The United States should advocate for restrictions/prohibitions on these uses in United Nations Environment Programme (UNEP) global mercury agreement negotiations.
2. The U.S. EPA, FDA, ATSDR, and states should pursue interagency collaborations to work with trade associations, pharmacies, and the health care sector to raise awareness and limit sales and use.
3. States and U.S. EPA should support FDA authority for cosmetics registration and oversight as outlined in FDA testimony to the U.S. House on their FY2013 budget request as specified below. This may include potential support for FDA authority for product recalls of adulterated or misbranded products, possibly those meeting certain risk or content criteria.
 - Establish and maintain a mandatory Cosmetic Registration Program;
 - Acquire, analyze, and apply scientific data and information from a variety of sources, including voluntary adverse event reporting, to set U.S. cosmetics safety standards;
 - Maintain a strong U.S. presence in international standard-setting efforts;
 - Provide education, outreach, and training to industry and consumers; and
 - Refine inspection and sampling of domestic and imported products and apply risk-based approaches to post-market monitoring of domestic and imported products and other enforcement activities.

III. C. 5. Resources

“Experts warn of dangers of ‘skin whitener’ cosmetics,” Wed Sep 27, 2006 7:35am ET, By Tan Ee Lyn (Additional reporting by Kim Yeon-hee in Seoul), HONG KONG (Reuters), http://today.reuters.com/news/articlenews.aspx?type=healthNews&storyID=2006-09-27T113546Z_01_SP136993_RTRUKOC_0_US-COSMETICS.xml (see full story in Appendix D)

“High Mercury Level in Beauty Items: Experts Sound Alarm,” Arab News - 24/09/2006, JEDDAH, 24 September 2006, http://www.menafn.com/qn_news_story_s.asp?StoryId=1093128251 (see full story in Appendix D)

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"California Investigates Skin-Lighteners for Dangerous Mercury," <http://newamericamedia.org/2012/01/state-health-officials-investigate-skin-lighteners-for-dangerous-mercury.php>. New America Media, News Report, Ngoc Nguyen, Posted: Jan 27, 2012

"Examining the Current State of Cosmetics," FDA testimony by Michael Landa, U.S. House of Representatives, March 27, 2012, <http://www.fda.gov/NewsEvents/Testimony/ucm297215.htm>

III. D. Tattoo Inks

III. D. 1. Background

Because of the increasing popularity of tattooing and the lack of government regulation and oversight, increasing attention has been brought upon the practice of tattooing and the content of tattoo inks. According to a number of websites, mercury has been used in red tattoo pigment, primarily in the form of cinnabar or vermilion (mercuric sulfide) for centuries. It is difficult to determine definitively if red tattoo pigments currently contain mercury because there is no requirement for manufacturers of tattoo pigment to list the ingredients on the label. Chinese ink manufacturers are currently gaining market share in the United States using cheaper materials and possibly mercury. There is also a concern in the industry about possible counterfeit inks from China that may be dangerous and contain heavy metals. Tattoo ink manufacturers are not required to list the contents of inks on the label and the FDA, by its own admission, has not “traditionally regulated tattoo inks or the pigments used in them.” More information is needed to determine if there is currently mercury in tattoo pigment considering it has in the past.

III. D. 1. a. Mercury Use in Product

A number of websites indicate that cinnabar or vermilion has been used in tattoo pigment. An article in [about.com](#) lists cinnabar as an ingredient in red pigment. An article written by Dr. Helen Suh Macintosh for Tree Hugger Magazine (<http://www.treehugger.com/culture/ask-treehugger-are-tattoo-inks-toxic.html>) also lists cinnabar as present in red pigment. According to that same article, tattoo pigments are proprietary and there is no requirement to list them on the label. These articles go back to 2007, so there may have been some changes in tattoo chemistry since then. But it is unclear whether or not cinnabar is still being used.

Steve Gabriel, a tattoo artist with Guide Line Tattoos in East Hartford, Connecticut indicated in his professional experience that cinnabar was used for red pigment years ago but was not aware if it had been fully eliminated, noting he does not use it in his shop but that other inks may contain cinnabar.

According to [about.com](#), “Manufacturers of inks and pigments are not required to reveal the contents.” The site lists Cinnabar (HgS) as an ingredient in red pigment.

The website [dermnetnz.org](#) also lists cinnabar (mercuric sulfide) as an ingredient in red ink and indicates some skin conditions related to reactions to red pigment but does not attribute them to mercury specifically.

Several MSDS for red tattoo ink were located but were inconclusive. For red pigments, the MSDS typically lists “pigment red 210” as the ingredient. Intenze is one of the leading ink manufacturers and their website also lists pigment red 210 on their MSDS sheets (http://www.intenzetattooink.com/media/pdfdir/100_Gold_Label_Bright_Red.pdf). Pigment red 210 does not contain mercury according to one website: (<http://www.xcolorpigment.com/pigment-red-210.html>).

Cinnabar is also known as “China Red.” A supplier of tattoo ink in California lists “Chinese Red” as an option.

III. D. 1. b. Purpose of Mercury in Product

Mercury sulfide is the chemical composition of the ore cinnabar also known as vermillion. Vermillion produces a vibrant red color used for pigment including tattoo pigment.

III. D. 2. Regulatory Landscape

III. D. 2. a. Federal

The FDA is responsible for the regulation of tattoo inks through the Office of Cosmetics and Colors. Although the FDA has the authority to regulate tattoo inks (<http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm048919.htm>), they have not done so. States have the ability to regulate the practice of tattooing but it is not clear that they have any authority over the content of pigments.

The FD&C Act passed in 1938 gave the FDA the authority to regulate cosmetics. The regulations for this act are found under Title 21 Chapter 700.13 of the Code of Federal Regulations (CFR). This section prohibits the use of mercury in cosmetics with certain exceptions. The FDA has stated that tattoo inks fit under the definition of a cosmetic and therefore it is illegal to put mercury in tattoo ink.

According to an August 2011 online article in Environmental Health News (<http://www.environmentalhealthnews.org/ehs/news/2011/tattoo-inks-face-scrutiny>), the FDA is not fully aware of the contents of tattoo pigments. "Because the dyes and inks used in tattoos have not been approved by FDA, we do not know the specific composition of what these inks and dyes may contain," an FDA spokesperson told Environmental Health News. "Therefore, we are unable to evaluate for chronic health concerns, such as cancer."

More from the FDA: "While state and local authorities oversee the practice of tattooing, ink and ink colorings (pigments) used in tattoos are subject to FDA regulation as cosmetics and color additives. However, because of other public health priorities and a previous lack of evidence of safety concerns, FDA has not traditionally regulated tattoo inks or the pigments used in them." (<http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm048919.htm>).

In March of 2012, the FDA, in testimony to a subcommittee of the House Committee of Energy and Commerce, requested the legal authority to require cosmetic manufacturers to register their products and pay a fee. This authority would be used to gain a better understanding of the ingredients of cosmetics (which by definition would include tattoo inks) and the fees would be used to conduct research among other things.

III. D. 2. b. State

A review of state laws concerning tattooing reveals that most states regulate the activity of tattooing but not the inks.

If tattoo pigments do in fact contain intentionally-added mercury, then some states have requirements for notification, labeling and collection plans that manufacturers of mercury-added tattoo inks or pigments must comply with. Connecticut, Louisiana, Maine, Massachusetts, New

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Hampshire, New York, Rhode Island, and Vermont require manufacturers to submit notification forms indicating mercury content of many products. These states (excluding New Hampshire) as well as Washington and Minnesota require that manufacturers of mercury-added products label most of those products as containing mercury. Maine, Massachusetts, Minnesota, New York, Rhode Island, New Hampshire, Vermont, and Washington ban disposal of most or all mercury-added products. Massachusetts requires manufacturers selling many mercury-added products, excluding formulated products and some other product classes, to develop and implement a collection plan for proper handling of mercury-added products at the end of their useful life with a target collection rate of 75% or greater. Specifics of each state's laws may vary and laws may change over time; therefore manufacturers must review each state's rules and regulations to determine their requirements. Waste handling, water discharges, and air emissions from the manufacturing process may also fall under state or local laws.

Proposition 65 in California requires warnings to individuals before they are exposed to hazardous chemicals. The American Environmental Safety Institute successfully sued tattoo ink manufacturers requiring them to place a warning on labels indicating that:

“WARNING: Tattoo inks and pigments contain many heavy metals, including Lead, Arsenic and others. All of these heavy metals have been scientifically determined by the State of California to cause cancer or birth defects and other reproductive harm. Pregnant women and women of childbearing age in particular should consult with their doctor before getting any tattoo. A person is exposed to tattoo inks and/or pigments when they get a tattoo because they are injected with tattoo ink under their skin or the tattoo ink is applied on their skin.”

(see “Tattoo inks and pigments contain many heavy metals, including Lead, Arsenic and others,” September 21, 2011, <http://www.alienlove.com/modules.php?name=News&file=print&sid=711>). Mercury is not specifically listed and the law does not require all specific toxins to be listed so it is still inconclusive.

III. D. 3. Options to Avoid Using Mercury

There are readily available tattoo inks that do not contain mercury. Some manufacturers offer “organic” or “vegan” inks. One of the leading manufacturers, Intenze, lists their MSDS on their website. Mercury free inks appear to be the standard and are readily available.

III. D. 4. Recommendations for Further Action

1. FDA should confirm through legal opinion, court case, or other appropriate mechanism that tattoo inks are defined as cosmetics and are regulated under the FD&C Act.
2. States and U. S. EPA should support FDA's request for registration oversight authority for cosmetics, including tattoo inks as outlined in FDA testimony to the U.S. House on their FY2013 budget request as specified below. This may include potential support for FDA authority for product recalls of adulterated or misbranded products, possibly those meeting certain risk or content criteria:
 - Establish and maintain a mandatory Cosmetic Registration Program;
 - Acquire, analyze, and apply scientific data and information from a variety of sources, including voluntary adverse event reporting, to set U.S. cosmetics safety standards;

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- Maintain a strong U.S. presence in international standard-setting efforts;
 - Provide education, outreach, and training to industry and consumers; and
 - Refine inspection and sampling of domestic and imported products and apply risk-based approaches to post-market monitoring of domestic and imported products and other enforcement activities.
3. States and U. S. EPA should petition FDA to include a specific analysis of tattoo inks with other cosmetics.
 4. FDA should evaluate the use of mercury in tattoo inks including imported inks.
 5. FDA should require that tattoo ingredients be listed and this information be provided to consumers.

III. D. 5. Resources

Mercury in red tattoo inks

<http://www.scientificamerican.com/article.cfm?id=tattoo-ink-mercury-and-other-toxins>

<http://emedicine.medscape.com/article/1124433-overview#a30>

http://en.wikipedia.org/wiki/Tattoo_medical_issues

Intenze Material Safety Data Sheet

<http://www.intenzetattooink.com/intenze-tattoo-ink-university/intenze-tattoo-ink-msds-sheets/>

Tattoo regulation by states

http://www.eqgroup.com/tattoo_regulation.htm

Food and Drug Administration Regulation of Tattoo Inks

<http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm048919.htm>

<http://www.fda.gov/Cosmetics/ProductandIngredientSafety/SelectedCosmeticIngredients/ucm127406.htm>

<http://www.fda.gov/NewsEvents/Testimony/ucm297215.htm>

III. E. Nanotechnology

III. E. 1. Background

Nanotechnology, or, as it is sometimes called, molecular manufacturing, is a branch of materials engineering that deals with the design and manufacture of extremely small materials and devices built at the molecular level of matter, legally defined in many countries as 100 nanometers or less, and generally an accepted definition in the U.S, as well. In a few cases, nanotechnology includes the use of engineered nanoparticles to sometimes replace, at a very small scale, the function(s) of its larger chemical form, thus reducing the quantity of chemicals in products, as well as water used and discharged. In most cases, however, it is used to obtain functions otherwise not achieved at the larger size of any chemical form. Many research and manufacturing facilities describe nanotechnology as the merging of "science and technology where dimensions and tolerances in the range of 0.1 nanometer (nm) to 100 nm play a critical role."

Most of us are familiar with molecular-sized chemistry when we consider that sampling and analyzing contaminants results are often reported at parts per trillion (ppt) or smaller. The behavior of engineered nanoparticles can, and often is, different than when found in natural systems, primarily because fabricated nanoparticles have been developed for a specific behavior and/or purpose, using quantum mechanics principles. Nano-mercury is consistent in its definition and uses with that of other engineered nanoparticles. Nano engineered products may result in unique or enhanced exposure potential, biological uptake and/or toxicity.

Don Tomalia, PhD and other researchers have proposed that the behavior of chemicals at the nanoscale level can be often predicted on the basis of their standing on the periodic table, with most elements behaving more like their neighbor to the left, and/or second to the left. Some nanoparticles have been documented to behave in such manner, including nano-zinc oxide and nano-titanium dioxide. However this has not been proven to be the case with nano-mercury. Therefore, funding additional research to confirm this theory in the case of nano-mercury may be a worthwhile effort. Research papers cited in the resources section provide more information on the now well-established nanoparticle fabrication and use, such as carbon nanotubes. However, much of the nano-mercury activity is still concentrated in research labs, an activity that is still legal in most states.

Limited access and knowledge of the use of emerging technology in products is creating a wide gap between the use of potentially dangerous materials and the ability by regulators to prevent exposure and impact to human health and the environment. This is particularly true of heavy metals nanoparticles, which even at the atomic level, may have unintended consequences that remain for decades, if not centuries. The mercury reduction initiatives developed over ten years ago did not take into account nanotechnology and its uses, requiring that we consider a more thorough, long term assessment and action plan for studying the impacts of engineered nanoparticles containing mercury (nano-mercury). The use of existing systems to track and restrict the use of nano-mercury is most likely the most challenging project the U.S. and state human and environmental health agencies may need to tackle. Given how new this technology is, it makes sense to begin assessing the use of nano-mercury in research and unregulated products. Preliminary assessment already indicates that the use of nano-mercury in research should be at least tracked.

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In mid-December 2012, U.S. EPA and the CPSC announced a collaboration on a worldwide research effort to assess any potential impacts of nanomaterials on people's health and the environment. This research is a part of the U.S. government's efforts to assess the potential risks of nanomaterials. These efforts are coordinated by the U.S. National Nanotechnology Initiative (NNI). NNI is a collaborative project comprised of 25 agencies, including U.S. EPA and CPSC.

III. E. 1. a. Mercury Use in Product

It is uncommon to find engineered mercury nanoparticles listed as an ingredient in products; however, from the information provided by research articles and the characteristics described in patents and articles, it is likely that certain types of new products contain, or definitely contain nano-mercury such as fabrication of highly crystalline metal sulfides, described in the following patent: <http://www.google.com/patents/US20050036938>. Another example is "turbobeads", manufactured and distributed internationally. (<http://www.turbobeads.com/index.php?id=8>) Note that it is hard to obtain pertinent information from a MSDS or labels. The detail of very small amounts or low concentrations of chemicals, "proprietary" or research information, let alone nano level of chemicals which only recently were identified by U.S. EPA under TSCA (see nano-silver and nano-titanium dioxide) can sometimes only be obtained through patent information. A MSDS is only required to identify substances present at 1% or greater, while patents require detailed physiochemical information, not only divulging whether nano-mercury is present, but also its physiochemical structure, which is critical to determine its behavior at the quantum level.

III. E. 1. b. Purpose of Mercury in Product

Like mercury, nano-mercury still maintains its ability to amalgamate and become a semi-metal, even in natural conditions such as those found in the mineral Tiemannite (HgSe). Therefore, nano-mercury is still used, and will probably continue to be used for some period of time, in both research labs and research manufacturing facilities. In the U.S., old steel plants used (and over the world continue to use) selenium filters to remove mercury from exhaust gases, and the solid product formed is mercury selenide. Mercury selenide is also used in semiconductors. Mercury selenide is now being managed at the nano level; therefore, nano-mercury selenide can be used in much smaller amounts and still manipulated as an ohmic contact for semiconductors such as nano-structured zinc oxide (nanoZnO₂).

More sophisticated nanoalloy formations using nano-mercury were documented in 2011 (by Mertens et al) in the Journal *Advanced Functional Materials*. This paper presents a detailed study of silver-mercury nanoalloys: <http://onlinelibrary.wiley.com/doi/10.1002/adfm.201100409/full>

It is important to remember that such uses can drastically reduce the overall volume of chemicals used and released in manufacturing processes. It can reduce the amount of water used and therefore the amount of wastewater released. Nevertheless, without good environmental and health impact assessment data, it is difficult to determine whether the reduction in volume of mercury use is overshadowed by the potential that nano-mercury may have more, or the same, impacts as mercury does. More field studies are needed to determine the behavior and impact of nano-mercury in the environment as it is released in new forms and new ways by both re-

search facilities and industrialized processes intending to reduce their use of water as well as release of wastewater.

III. E. 2. Regulatory Landscape

There are no specific laws or regulations at the international, federal, or state level currently that can thoroughly and effectively track and assess the impacts of even the most common emerging technologies, including nanotechnology. Because many regulatory agencies set a regulatory quantity limit to their authority, nano-mercury can easily bypass the strictest of current regulatory mandates.

The most effective systems for tracking so far are restricted to the European Union (EU) REACH data call in. “Data Call In” is a general term used by most international and national regulatory agencies requiring submittal of specific information regarding a product containing a chemical or chemicals, such as notification to a local or federal government by a company if a product containing mercury is sold/manufactured/exported/imported. The U.S. EPA TSCA program is an example of a “basic” data call-in program, while both the Canadian Environmental Protection Act and California’s Proposition 97 are more complex and detailed. That is the reason why California can identify a list of products containing engineered nanoparticles. U.S. EPA has considered using TSCA to obtain needed information, an initiative the states, through ECOS, have recommended include engineered nanoparticles in the update process.

States with product chemistry disclosure laws, like California, already have some direction and additional information on the companies that use and/or manufacture engineered nanoparticles. California’s report can be found at: <http://www.dtsc.ca.gov/TechnologyDevelopment/Nanotechnology/upload/Nanomaterial-Company-Visit-Report.pdf>

There is no requirement to submit complete ingredient labeling, other than purity, to research and production facilities who may want to use nano-mercury.

III. E. 2. a. Federal

Currently there are no federal regulations that address health and environmental concerns related to nano-mercury. In addition, there are no labeling, disclosure or notification requirements for nano-mercury in federal law or rule. Without adequate information, federal agencies are unable to restrict the use of nano-mercury in products, primarily because the typical quantity or concentration levels that trigger regulatory authority are far above the amount used in any nano-product.

With imports, until GHS is fully implemented in the U.S., no company, whether fabricating or researching products containing nano-mercury, is required to submit such documentation to the U.S. federal government. In 2007, two states (Washington State to U.S. EPA and Maine to the U.S. Department of Labor, see letters in Appendix C) submitted concerns regarding the delay of implementation of GHS updates in the U.S.

III. E. 2. b. State

California has an advanced program on nanotechnology oversight, including the authority for “data call in” on chemicals at the engineered nanoparticle level. The program falls under the

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state's toxics substances authority, and has gained considerable information in its few years of activity; however, there has been no activity regarding nano-mercury. For more information on the program, refer to: http://www.dtsc.ca.gov/pollutionprevention/chemical_call_in.cfm

No other state has a formal collection of data regarding engineered nanoparticles. This is primarily due to lack of funding, not interest. However, manufacturers selling mercury-added engineered nanoparticles in Connecticut, Louisiana, Maine, Massachusetts, Rhode Island, New Hampshire, New York, and Vermont are required to submit notification forms indicating mercury content.

There are no restrictions in creating nano-mercury in a lab, whether as research or an intermediate. Nano-mercury used for research purposes may be exempt from regulation even in states that regulate other uses of elemental mercury.

Waste handling, water discharges, and air emissions from the manufacturing process may also fall under state or local laws. Some states have requirements for notification, labeling and collection plans that manufacturers of mercury-added engineered nanoparticles or products containing them may need to comply with. Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont require manufacturers to submit notification forms indicating mercury content of many products. These states (except New Hampshire) as well as Washington and Minnesota require that manufacturers of mercury-added products label most of those products as containing mercury. Maine, Massachusetts, Minnesota, New York, Rhode Island, New Hampshire, Vermont, and Washington ban disposal of most or all mercury-added products. Massachusetts requires manufacturers selling many mercury-added products, excluding formulated products and some other product classes, to develop and implement a collection plan for proper handling of mercury-added products at the end of their useful life with a target collection rate of 75% or greater. Specifics of each state's laws may vary and laws may change over time; therefore manufacturers must review each state's rules and regulations to determine their requirements.

III. E. 3. Options to Avoid Using Mercury

It is not clear at this point whether current or potential uses of nano-mercury are significant since both product size and quantity cannot be tracked under current regulatory authorities. In light of the known toxicity, especially to the developing fetus and child, and persistence of mercury, precautionary principles should be applied to products and processes using nano-mercury that are being researched for commercial or other applications, particularly since other nanoparticles originally considered safe, such as carbon nanotubes, have now been shown to potentially have both human and environmental impacts.

It is also unclear whether the use in labs and industry of engineered nano-mercury will lead to an overall increase of the use of mercury. If nano-mercury properties are consistent with the current environmental response tests assessing other nanoparticles, such as nano-silver, nano-gold, and nano-titanium dioxide, it is likely that it should be added to the chemicals of concern, and "call ins" should be implemented. Using TSCA to address nano-mercury may be a wise strategy, since the program is already established and the research process instituted. It may

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also be necessary to develop a process similar to that established in Canada and the EU, where data is required from all importers and manufacturers.

Alternatives are already available to reduce industrial wastewater use and discharges, and amalgamation using nanotechnology is not needed if alternative chemicals allow the processes to achieve the same water use and wastewater discharge results. Ultimately, increasing the use of green chemistry and the precautionary principle will be the most economic option available, allowing for continued data collection and assessment of the true, complex impacts of nano-mercury use. Funding and policy development and implementation of green chemistry are still the best options available to achieve this goal.

III. E. 4. Recommendations for Further Action

1. The U.S. government should evaluate the use of nano-mercury and implement mechanisms to track uses and enact restrictions as appropriate. This activity can be coordinated and enhanced through the NNI's NEHI Working Group in formal consultation with the states through ECOS and ASTHO.
2. ECOS through Resolution Number 03-7, "The Need for Actions to Achieve Further Progress on Reducing Impacts to Water Quality from Atmospheric Mercury," fully supports the collaboration of U.S. EPA and CPSC announced in December 2012 to assess health and environmental risks from nanomaterials, and formally requests this process be expedited and decisions quickly implemented.
3. States and U.S. EPA should develop and implement guidelines for sustainable management of nano-mercury throughout its life cycle.
4. States and U.S. EPA should take every opportunity to propose research projects that would address these needs through the NNI.

III. E. 5. Resources

General

For more detailed information regarding nanotechnology and engineered nanoparticles, please refer to <http://www.nano4me.org/> then choose the "what is nanotechnology" link.

National Nanotechnology Initiative (NNI) at: <http://www.nano.gov/>

U.S. EPA's nanomaterials research at: <http://www.epa.gov/nanoscience/>

CPSC's nanomaterials research at: <http://www.nano.gov/node/139>

Frontiers in Nanomedicine:

<http://onlinelibrary.wiley.com/doi/10.1002/adfm.201100409/full>

Nanostructured Electrostrictive Systems: Electric Actuation of Nanostructured Thermoplastic Elastomer Gels with Ultralarge Electrostriction Coefficients (Adv. Funct. Mater. 17/2011): <http://onlinelibrary.wiley.com/doi/10.1002/adfm.v21.17/issuetoc>

Kentera SWNTs (dots): <http://www.hindawi.com/journals/ijhep/2011/676957/>

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Theory regarding how categorization can yield predictable nano-periodic property patterns in size, shape, surface chemistry, and self-assembly patterns, analogous to the way the classic periodic table yields predictions about characteristics of groups of atomic elements, including valences and reactivity, Don Tomalia, PhD, Journal of Nanoparticle Research 11 (1251-1310) 2009. His PowerPoint delineating the new model is available on the NSE 2009 meeting website at a link from the program agenda posted at: <http://www.nseresearch.org/2009/program.htm>

For more general information on engineered nanoparticles and responsible uses: <http://www.springerlink.com/content/7u011131g2614713/>

Specific information in the U.S.

<http://ohsonline.com/articles/2012/06/01/osha-adopts-ghs.aspx>

<http://www.google.es/url?q=http://nanotech.lawbc.com/2012/05/articles/united-states/us-delegation-may-present-nanotechnology-guidance-at-un-ghs-subcommittee-meeting/&sa=U&ei=6mdGUPNqk9GIAs2sgfAB&ved=0CBkQFjAC&usg=AFQjCNEjmq33juLnBqpfbVoxKgTYiMOKDw>

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Dr. Tomalia's paper, Journal of Nanoparticle Research 11 (1251-1310) 2009, PowerPoint delineating the new model is available on the NSE 2009 meeting website at a link from the program agenda posted at <http://www.nseresearch.org/2009/program.htm>

http://www.google.com/search?q=nanomercury+as+a+catalyst&rls=com.microsoft:*:IE-SearchBox&ie=UTF-8&oe=UTF-8&sourceid=ie7&rlz=II7RNRN_enUS438

Mertens, S. F. L., Gara, M., Sologubenko, A.S., Mayer, J., Szidat, S., Kraämer, K. W., Jacob, T., Schiffrin, D. J. and Wandlowski, T. "AuHg Nanoalloy Formation Through Direct Amalgamation: Structural, Spectroscopic, and Computational Evidence for Slow Nanoscale Diffusion." 2011. Adv. Funct. Mater., 21: 3259-3267. doi: 10.1002/adfm.201100409: <http://onlinelibrary.wiley.com/doi/10.1002/adfm.201100409/abstract>

III. F. Photovoltaic Products

III. F. 1. Background

Mercury is known to have been used in the silicon wafer manufacturing process of at least one company in the semiconductor and photovoltaics business. The manufacturing process was used for approximately three years or less at an Evergreen Solar facility in Midland, Michigan. Mercury was used as an electrode and seal in a process that put a silicon carbide coating on tungsten wire, known as “string.” The coated wires were then shipped to another facility (in Massachusetts), where they were used to create a silicon film (“ribbon”) between the wires, much like soap film on a soap bubble loop.

Evergreen Solar declared bankruptcy in August 2011 and some U.S.-based manufacturing of Evergreen Solar was moved to China after that date. At this time, it is not known if the mercury-based process is still in use in China or anywhere else. Evergreen Solar’s current website describes a manufacturing process like that used in the Massachusetts facility to create the silicon film but it does not describe the wire coating process.

In late 2010, it was reported that mercury may be in use in mercury cadmium telluride solar panel detectors in order to boost efficiency in comparison to cadmium telluride (CdTe) solar panel detectors: (<http://greentechmedia.com/articles/read/first-solar-news-and-rumors-cigs-hg-and-te/>). First Solar, Inc.'s patent application confirmed in 2012, "Photovoltaic Devices Including An Interfacial Layer," includes reference to a second semiconductor layer of cadmium telluride alloys wherein cadmium is at least partially replaced by zinc, mercury, magnesium or manganese: (<http://www.faqs.org/patents/app/20090078318#ixzz2CDVRhLd4>). Today, Teledyne Judson Technologies is manufacturing two types of solar detectors that contain mercury. See the link in "Resources" for further information.

III. F. 1. a. Mercury Use in Product

The Evergreen Solar manufacturing process was described in the Midland facility’s application for an air permit. Mercury releases, discharges, and transfers were reported to the Toxics Release Inventory (TRI) through calendar year 2011. The facility may have been subject to RCRA also.

TRI data for 2010 indicates that Evergreen had the following releases and transfers in pounds of mercury:

Fugitive:	0.000002 lb.
Stack:	0.19 lb.
Transfer for recycling:	51.0 lbs.

Projected transfers of mercury for 2011 and 2012 were 51 and 100 pounds, respectively. The Midland facility closed in August-September 2011. While preliminary TRI data was posted in September 2012, 2011 data is still “projected” based on the company’s 2010 filing so 2011 TRI data are not available at this time.

As noted above, Teledyne Judson is one manufacturer of mercury cadmium telluride solar detectors or panels. They filed product notification information with IMERC in 2007 for what ap-

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pear to be very small quantities of semiconductor sensors with infrared sensitivity. Total mercury content reported for 2007 is about 6 grams. However, there does not appear to be a more recent filing that would capture potentially more significant quantities of solar panels with this technology.

Teledyne Scientific and Imaging also filed product notification information in 2007 for a sensor for electromagnetic radiation but the mercury-added technology is not identified and it is not known if it is a technology used in the PV industry. Total mercury content reported is 5 grams.

III. F. 1. b. Purpose of Mercury in Product

For the “string” manufacturing process, the mercury acted as an electrode and seal in a “deposition chamber” that coated tungsten wire with silicon carbide.

For solar panels/detectors, the addition of mercury to cadmium telluride increases the efficiency or output of the solar panel.

III. F. 2. Regulatory Landscape

Photovoltaic panels are permanently excluded from the European Union's Restriction of Hazardous Substances (RoHS) (<http://export.gov/europeanunion/weeerohs/rohsinformation/index.asp>).

However, photovoltaic panels are subject to the European Union's Waste Electrical and Electronic Equipment Directive (WEEE 2). WEEE 2 establishes recycling obligations for PVs under Annex III Category Four (Consumer Equipment and Photovoltaic Panels) and Annex IV Category 5 (small equipment with integrated PV panels). See Official Journal of the European Union, 24 July 2012. Vol. 55, L. 197/39, 41, 46, 53, 55-56, 59: (<http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2012:197:SOM:EN:HTML>) and (<http://www.element14.com/community/community/legislation/europe/weee/blog/2012/07/05/weee-recycling-obligations-for-photovoltaics>).

III. F. 2. a. Federal

Use of mercury in manufacturing photovoltaics is regulated generally by applicable RCRA, Clean Air Act (CAA), CWA, and TRI requirements for releases and wastes from a manufacturing facility. The use of mercury in solar panels and finished PV products is not known to be subject to current federal laws or regulations.

III. F. 2. b. State

Waste handling, water discharges, and air emissions from the manufacturing process may also fall under state or local laws. Some states have requirements for notification, labeling and collection plans that manufacturers of mercury-added photovoltaic products must comply with. Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont require manufacturers to submit notification forms indicating mercury content of many products. These states (excluding New Hampshire) as well as Washington and Minnesota require that manufacturers of mercury-added products label most of those products as containing mercury. Maine, Massachusetts, Minnesota, New York, Rhode Island, New Hampshire, Vermont, and Washington ban disposal of most or all mercury-added products. Massachusetts

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requires manufacturers selling many mercury-added products to develop and implement a collection plan for proper handling of mercury-added products, excluding formulated products and some other product classes, at the end of their useful life with a target collection of 75% or greater. Specifics of each state's laws may vary and laws may change over time; therefore manufacturers must review each state's rules and regulations to determine their requirements.

Connecticut [Conn. Gen. Stat. § 22a-617(a)]	Formulated Products >50 ppm
Louisiana [LA Rev. Stat. § 2576(A)(3)]	Formulated Products >10 ppm
Rhode Island [RI General Statutes § 23-24.9-7(a)(3)]	Formulated Products >10 ppm

Manufacturers selling PV containing mercury-added components in Connecticut, Louisiana, Maine, Massachusetts, Rhode Island, New Hampshire, New York, and Vermont are required to submit notification forms indicating mercury content. Waste handling, water discharges, and air emissions from the manufacturing process may fall under state or local laws.

III. F. 3. Options to Avoid Using Mercury

For the coated tungsten wire manufacturing use of mercury, it is not known if there is an alternative process. The facility operated in the U.S. for a short period of time, and it is not known if the process is still being used elsewhere. The process may be unique to this manufacturer and their overall manufacturing process for silicon wafer material.

PV technology for mercury cadmium telluride detectors is a recent development and there are other non-mercury technologies including but not limited to cadmium telluride and copper indium gallium diselenide (CIGS).

III. F. 4. Recommendations for Further Action

1. U.S. EPA should survey PV manufacturers to determine if mercury continues to be used in semiconductors.
2. States may consider product disclosure/notification and labeling requirements.
3. U.S. EPA should evaluate the photovoltaic products recycling requirements of WEEE 2 for adoption in the United States and/or individual states.

III. F. 5. Resources

Teledyne Judson Technologies. This webpage has information on mercury cadmium telluride detectors: (http://judsontechnologies.com/mercadm_pc.html). At the end of the webpage is a link to a document pertaining to mercury cadmium telluride/indium antimony sandwich detectors, which are a separate technology and product line: (http://judsontechnologies.com/mercadm_pv.html).

III. G. Veterinary Vaccines

III. G. 1. Background

Currently, vaccine mercury content is not disclosed in product information accompanying vaccines so veterinarians, farmers, and owners of animals do not have ready access to this information when the product is being purchased or used.

III. G. 1. a. Mercury Use in Product

There is currently little or no information available on the use of mercury in veterinary vaccines. The MPCA has attempted to locate information in the past. In 1995-96, the MPCA developed a *Mercury in Products Report* with financial support from U.S. EPA Region V. At that time, MPCA corresponded by telephone with the U.S. Department of Agriculture (USDA) and the FDA Center for Veterinary Medicine and requested information about mercury use in veterinary vaccines. The MPCA was advised to submit a written Freedom of Information Act (FOIA) Request. The response to the FOIA Request was that the requested information could not be obtained from the databases and manufacturer notifications on file, so there was no obligation to respond.

The USDA annually publishes a list or directory of permittees and licensees for Veterinary Biologic Products. The current list (July 2012) can be found at:

http://www.aphis.usda.gov/animal_health/vet_biologics/publications/CurrentProdCodeBook.pdf

A national TRI search by Standard Industrial Classification/North American Industry Classification System (SIC/NAICS) code for veterinary biologics manufacturing facilities may provide information on the generation, transfer, release, and disposal of organic mercury wastes that may be associated with the production of vaccines and similar products.

On September 24, 2012, U.S. EPA issued a press release describing an enforcement action against and settlement with Boehringer Ingelheim Vetmedica, Inc., in St. Joseph, Missouri for hazardous waste violations related to mercury wastes from veterinary vaccine manufacturing. This enforcement case clearly shows that mercury is used in veterinary vaccine manufacture: (<http://yosemite.epa.gov/opa/admpress.nsf/d0cf6618525a9efb85257359003fb69d/efbee3de7fd92cab85257a830069d20f!OpenDocument>).

III. G. 1. b. Purpose of Mercury in Product

Mercury is used in vaccines for two purposes. One, thimerosal is used to kill certain disease vectors that are then used as the "active ingredients" in vaccines that stimulate an immune response. Two, thimerosal is used as a preservative in many multi-dose vaccines and certain types of single dose vaccines.

III. G. 2. Regulatory Landscape

III. G. 2. a. Federal

For human vaccines and biologics, FDA requires disclosure by the manufacturer and the disclosure must be included in the Product Insert, the legal prescribing information for the product.

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FDA's Center for Biologics Evaluation and Research has compiled and maintained a list of vaccines and mercury content on their website since around 2000. Apparently no similar requirements or public disclosure program are in place at USDA's Center for Veterinary Biologics (CVB).

III. G. 2. b. State

Waste handling, water discharges, and air emissions from the manufacturing process may also fall under state or local laws. Some states have requirements for notification, labeling and collection plans that manufacturers of mercury-added polyurethane or polyurethane products must comply with. Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont require manufacturers to submit notification forms indicating mercury content of many products. These states (except New Hampshire) as well as Washington and Minnesota require that manufacturers of mercury-added products label most of those products as containing mercury. Maine, Massachusetts, Minnesota, New York, Rhode Island, New Hampshire, Vermont, and Washington ban disposal of most or all mercury-added products. Massachusetts requires manufacturers selling many mercury-added products to develop and implement a collection plan for proper handling of mercury-added products, excluding formulated products and some other product classes, at the end of their useful life with a target collection rate of 75% or greater. Specifics of each state's laws may vary and laws may change over time; therefore manufacturers must review each state's rules and regulations to determine their requirements.

In 2007, mercury legislation was introduced in Minnesota. One provision in the initial proposal would have banned the sale of over the counter human and veterinary pharmaceuticals containing mercury:

MN Legislature 2007 SF1085-0

Minn. Stat. § 116.92, Subd. 8h. **Ban; mercury in over the counter pharmaceuticals.**
After January 1, 2008, a person may not sell, offer for sale, or distribute in the state for human or animal use an over the counter pharmaceutical product containing mercury.

This provision passed through three Senate Committees between 2/21/07 and 4/13/07. However, the reference to "animal" use was removed in the Senate Committee on Business, Industry, and Jobs on 4/13/07. A person representing an animal livestock association testified that veterinary vaccines were sold over the counter to farmers without prescription and this provision would affect the sale of animal vaccines. Committee members did not ask the person providing the testimony if there was information available about mercury use in animal vaccines. The issue had not been raised in previous committee hearings, the representative was not listed in advance on this committee schedule and there was no opportunity for further discussion in this hearing. The representative was contacted later and stated that the association had no information about the use of mercury in animal vaccines. The CVB in Ames, Iowa was identified as the only entity that may be able to provide information. MPCA inquiries to this entity in 2007 did not produce a reply or additional information on this subject.

In September 2012, the MPCA contacted CVB by telephone and was advised to submit a written request, which was done. As of January 31, 2013, CVB has not replied to the written request

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submitted by MPCA.

III. G. 3. Options to Avoid Using Mercury

Changes in manufacturing processes, changes in types of vaccines, changes from multidose to single dose products, and use of non-mercury preservatives are all effective methods for eliminating mercury use in manufacturing and as a preservative.

III. G. 4. Recommendations for Further Action

1. If the MPCA request to CVB in September 2012 does not provide information within six months, U.S. EPA should communicate with CVB and the facilities identified in the USDA list to define the scope of the issue and identify opportunities to eliminate mercury use in veterinary vaccine manufacturing.
2. USDA should establish a system for tracking and publicly disclosing mercury content of veterinary vaccines so that veterinarians, farmers, and owners of animals have ready access to the information when the product is being used.

III. G. 5. Resources

Several websites and publications provide information on veterinary vaccine protocols developed by veterinary health organizations. These protocols typically relate to companion animals and not livestock. One website [<http://dogaware.com/health/vaccinations.html>] notes that two manufacturers have three mercury-free rabies vaccine products:

Thimerosal (mercury) free vaccines

Thimerosal (also sometimes spelled thimersol, thimerosol or thiomersal) is a form of mercury used in most vaccines as a preservative. It is possible that thimerosal may contribute to adverse vaccine reactions. A few companies are making rabies vaccines that do not contain thimerosal. Merial makes a thimerosal-free rabies vaccine called IMRAB 3 TF (the 3 designates a 3-year vaccine, and TF stands for "thimerosal free"): (<http://www.drugs.com/vet/imrab-3-tf.html>). There is also a 1-year version, IMRAB 1 TF. Fort Dodge makes a thimerosal-free rabies vaccine called RABVAC 3 TF (while it is not listed on their web site, state author confirmed with the company that it is still available).

<http://www.aahanet.org/PublicDocuments/CanineVaccineGuidelines.pdf>

<http://healthypets.mercola.com/sites/healthypets/archive/2011/10/27/new-canine-vaccination-guidelines.aspx>

III. H. Novelty Products

III. H. 1. Background

Mercury-added novelty items are generally defined as products intended mainly for personal or household enjoyment or adornment, including items intended for use as practical jokes, figurines, adornments, toys, games, cards, ornaments, yard statues and figures, candles, jewelry, holiday decorations, and footwear and other items of apparel. The legal definition of a mercury-added novelty product may vary slightly among the states that regulate such products.

For this paper, mercury-added antique barometers, thermometers, and mirrors are not considered novelty products.

III. H. 1. a. Mercury Use in Product

It is well documented that mercury was historically used in items such as “light-up” sneakers, the mercury “maze game”, the “bowling green” game, children’s chemistry sets, necklaces from Mexico, and most recently the “johnny-light” toilet bowl night light. All of these products except for necklaces from Mexico, are considered to be “legacy” products, which are either no longer produced or now function with non-mercury components. These legacy products may, however, continue to be bought, sold and traded via avenues such as on-line auctions and used product websites. Unfortunately, due to resource limitations, it is very difficult for states to monitor and take action to limit web-based trafficking of mercury-added novelties and other products, so this will continue to be an issue.

Evidence suggests that necklaces containing an ampoule of mercury are still produced in Mexico and brought into the U.S. for sale or distribution. These necklaces often consist of a beaded chain, cord, or leather strand with a glass pendant or ampoule that contains elemental mercury. The mercury appears as a silvery clump of liquid that rolls around in the hollow glass pendant. The necklaces contain between three and five grams of elemental mercury. In addition to the mercury, the pendant may also be filled with brightly colored liquids (i.e., red, green, blue, yellow). The pendants can come in various shapes and designs, including hearts, bottles, balls, saber teeth, and chili peppers.

III. H. 1. b. Purpose of Mercury in Product

The purpose of the mercury varies by type of product. For example, the light up sneakers contained a mercury switch that activated when the child’s heel hit the ground, causing the shoe to light up, while elemental mercury in the maze game was presumably used because of the mercury’s tendency to break up into small particles and then re-form, providing a challenge to the game user.

III. H. 2. Regulatory Landscape

III. H. 2. a. Federal

There are no specific federal laws or regulations that restrict the sale of mercury-added novelty items.

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III. H. 2. b. State

Currently, fourteen states have prohibited the sale of mercury-added novelty items. Some of these states, including Illinois, Louisiana, New York, Ohio, Vermont, Washington, and Wisconsin prohibit the sale of most mercury-added novelty items, but include a blanket exemption for novelties in which the only mercury included is part of the button-cell battery. Connecticut, Indiana, and New Hampshire also include an exemption to their mercury novelty product sales ban but specify that the exemption applies to removable button-cell batteries only. See chart below for more information.

State	Compliance Date	Statutory/Regulatory Authority
California	January 1, 2003	Health and Safety Code, Division 20, Chapter 6.5; Mercury-Added Thermostats, Relays, Switches, and Measuring Devices (Sections 25214.8.1-25214.8.6). Ban on sale or distribution of certain mercury-added products.
Connecticut	July 1, 2003	Connecticut General Statutes 22a-616 - Ban on sale or distribution of mercury-added novelties, mercury fever thermometers, mercury dairy manometers. Restriction on use of mercury amalgam.
Illinois	July 1, 2004	410 Illinois Compiled Statutes 46 - Mercury-added Product Prohibition Act.
Indiana	July 1, 2003	Indiana Code IC 13-20-17.5 Prohibition of sale or distribution of mercury-added novelty.
Louisiana	July 1, 2007	<i>Louisiana Revised Statutes 30:2575 - Restrictions on the sale of certain mercury-added products.</i>
Minnesota	June 1, 2001	Minn. Stat. § 116.92 Mercury Emissions Reduction, Subd. 8. Ban; toys, games, and apparel.
New Hampshire	January 1, 2002	<i>New Hampshire Revised Statutes 149-M:53 - Restrictions On The Sale Of Certain Mercury-Added Products.</i>
New York	January 1, 2005	New York State Environmental Conservation Law (ECL) § 27-2101(8) Ban on mercury-added novelty products.
Rhode Island	January 1, 2003	<i>Rhode Island General Laws 23-24.9-6. Restrictions on the sale of certain mercury-added products.</i>
Ohio	April 6, 2008	Ohio House Bill 344 Section 3734.64 - Novelty products.
Oregon	January 1, 2006	Oregon House Bill 3007 Section 5 - Novelty items.
Vermont	July 1, 2006	<i>Vermont Statutes Title 10 Sec. 7105 - Restrictions on the sale and use of certain mercury-added products.</i>
Washington	January 1, 2006	Washington State Statutes Title 70 - 70.95M.050 - Prohibited sales -- Novelties, manometers, thermometers, thermostats, motor vehicles.
Wisconsin	November 1, 2010	Wisconsin Act 44 - Products Containing Mercury.

Note: Maine and possibly other states may indirectly address novelty products through restrictions on use of mercury-added button cell batteries.

Source: States and the Mercury Reduction Program, Northeast Waste Management Official's Association.

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Two states that regulate the sale of mercury products recently reported that they were contacted by someone representing a manufacturer or importer of mercury-added novelties. That person inquired about the section of state law that prohibits the sale of novelties and requires manufacturers to notify retailers about the prohibition and the retailer's responsibility to dispose of any remaining products according to state law. This suggests that mercury-added novelties may still be produced and sold in some areas of the country, warranting further action.

III. H. 3. Options to Avoid Using Mercury

In most cases, novelty items that contain liquid mercury or components with mercury have already switched to a liquid mercury-free substitute technology (e.g. "light-up sneakers now use a mercury-free switch, as do "Johnny Lights). In some cases, the alternative technology could be a button cell battery, which may or may not contain mercury, albeit a much smaller amount. The major U.S. battery manufacturers are continuing to work on phasing out the use of mercury in button cells partially in response to state laws in Maine and Connecticut. There are a number of mercury-free button cell batteries available.

III. H. 4. Recommendations for Further Action

1. U.S. EPA working with the states should develop a fact sheet for retailers/retailer trade associations to highlight state laws that 1) prohibit the sale of mercury-added novelty items and that 2) require manufacturers to notify retailers about the retailer's responsibility to dispose of any remaining products according to state law.
2. U.S. EPA in coordination with states should conduct outreach to online product "vendors/trader" to educate them on the dangers of mercury in commerce and proper disposal of products.

III. H. 5. Resources

For more information on individual mercury-added novelty products:

<http://www.newmoa.org/prevention/mercury/projects/legacy/novelty.cfm>

Article on "Johnny-lights" switch to non-mercury technology:

<http://www.prnewswire.com/news-releases/environmentalists-inspire-product-improvement-rbj-mfg-redesigns-popular-johnny-lighttm-76603412.html>

III. I. Biotechnology/Genetics Research Laboratories

III. I. 1. Background

Like nanotechnology, biotechnology and genetic engineering research continues to expand. Mercury uses in these settings are also not well characterized. Considerable efforts have been made to reduce mercury use in laboratories and research, in particular with respect to mercury-added products and equipment, such as thermometers. Use of mercury reagents and standards continue. Mercury compounds are also used in the research setting as a preservative. It is likely that these uses involve relatively small overall quantities of mercury.

Some biotechnology and genetics research laboratories are also working to modify bacteria and other organisms to bioremediate sites contaminated with metals, including mercury. An example of such research is represented in the following case: (http://www.nature.com/nbt/journal/v18/n1/abs/nbt0100_85.html). Mercury may be used in the development and testing of these organisms and there are questions about whether these remediation approaches would then release mercury in another form after biological capture.

III. I. 1. a. Mercury Use in Product

Mercury uses in this area include a variety of laboratory devices and equipment, reagents, preservatives and chemical standards. Mercury may also be used in product development and testing.

III. I. 1. b. Purpose of Mercury in Product

Mercury may be used as a preservative, a chemical reagent, a chemical catalyst, or a standard; to assess the effectiveness of bioremediation; or in devices and equipment.

III. I. 2. Regulatory Landscape

Currently there are no specific national guidelines to prevent the use of mercury in biotechnology or genetic research. Even California's regulatory outreach under Proposition 97 does not cover mercury use in biotechnology labs:

(http://www.dtsc.ca.gov/pollutionprevention/chemical_call_in.cfm).

III. I. 2. a. Federal

There seems to be no regulatory oversight of the purchase or use of mercury to test biotechnological remediation technologies.

III. I. 2. b. State

Most states allow the use of mercury at research facilities, but may direct or restrict the maximum quantity allowed in the laboratory, or purchased. None specifically address biotechnology labs: (<http://www.newmoa.org/prevention/mercury/imerc/legislation-2008.htm>). Some states and municipalities regulate the discharge of mercury in wastewater from research facilities.

Waste handling, water discharges, and air emissions from the manufacturing process may also fall under state or local laws. Some states have requirements for notification, labeling and collection plans that manufacturers of mercury-added polyurethane or polyurethane products must

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comply with. Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont require manufacturers to submit notification forms indicating mercury content of many products. These states (except New Hampshire) as well as Washington and Minnesota require that manufacturers of mercury-added products label most of those products as containing mercury. Maine, Massachusetts, Minnesota, New York, Rhode Island, New Hampshire, Vermont, and Washington ban disposal of most or all mercury-added products. Massachusetts requires manufacturers selling many mercury-added products, excluding formulated products and some other product classes, to develop and implement a collection plan for proper handling of mercury-added products at the end of their useful life with a target collection rate of 75% or greater. Specifics of each state's laws may vary and laws may change over time; therefore manufacturers must review each state's rules and regulations to determine their requirements.

Three states ban the sale of formulated products (e.g., catalysts, reagents) containing more than a specified concentration of mercury. Those three states, and their statutorily specified concentration limits, are:

Connecticut [Conn. Gen. Stat. § 22a-617(a)]	Formulated Products >50 ppm
Louisiana [LA Rev. Stat. § 2576(A)(3)]	Formulated Products > 10 ppm
Rhode Island [RI General Statutes § 23-24.9-7(a)(3)]	Formulated Products >10 ppm

III. I. 3. Options to Avoid Using Mercury

Because of the range of potential uses of mercury in the research and laboratory settings, it is difficult to identify specific alternatives. Researchers and laboratories should be encouraged to use green chemistry and precautionary principles and seek out alternatives to mercury where possible. With respect to bioremediation of mercury, the life cycle of the captured mercury needs to be considered and alternatives considered as appropriate. One example is the Self-Assembled Monolayers on Mesoporous Support (SAMMS) technology, developed by the Pacific Northwest National Laboratory in Richland, WA, which adsorbs mercury at the molecular and bulk level with the subsequent need to dispose or recycle the SAMMS material:

<http://www.pnl.gov/news/release.aspx?id=159>).

III. I. 4. Recommendations for Further Action

1. U.S. EPA and FDA should survey biotechnology and genetic engineering research and labs regarding their use of mercury.
2. U.S. EPA, the National Institute for Occupational Safety and Health (NIOSH), and the National Science Foundation (NSF) should work together to seek from NNI further support and funding to promote expanded development and use of green chemistry practices, biochemistry under the precautionary principle, and adoption of Life Cycle Analysis (LCA) as the best and least expensive strategy available.

III. I. 5. Resources

Life Cycle Assessment (LCA) - U.S. Environmental Protection Agency:

(<http://www.epa.gov/nrmrl/std/lca/lca.html>). The National Risk Management Research Laboratory's Life Cycle Assessment (LCA) website. This site's purpose is to promote the use of LCA to make more informed decisions through a better understanding of the human health and environmental impacts of products, processes, and activities.

Life Cycle Assessment - Carnegie Mellon University:

(<http://www.ce.cmu.edu/greendesign/research/lca.html>). This website includes information on the life cycle assessment of products, processes, and services to analyze the impacts of a process, product, or system over the entire life cycle from raw materials extraction, parts manufacturing, use, and end-of-life. Much of the LCA work utilizes a free, internet-based economic input-output life cycle assessment tool (EIO-LCA, available at: <http://www.eiolca.net>), which allows general users to perform simple, quick, and free life cycle assessments.

NREL: U.S. Life Cycle Inventory Database - Related Links:

(http://www.nrel.gov/lci/related_links.html). The National Renewable Energy Laboratory website with links to life cycle inventory (LCI) databases, life cycle assessment (LCA) information, LCA tools, research institutes utilizing LCA, labeling initiatives and organizations, international LCA initiatives, and LCA online forums.

IV. Recommendations

IV. A. Overall Recommendations

Based on the assessments in this report, overall priority QSC recommendations are identified. These include a number of areas where gaps exist in current knowledge and efforts to address mercury use in various products and processes. The QSC has identified the following four areas as priorities for further action at the national and state levels.

1) Research and Data Collection on the Extent of Use, Exposure Potential and Environmental Releases Associated With Certain Key Product Classes.

No mechanism currently exists in many states or at the federal level to identify and track products and processes that use mercury. Although several states require manufacturers of mercury-added products to report their mercury use to IMERC, many states do not participate and available information suggests incomplete or non-existent reporting in some sector categories. Data on mercury use and content is sparse for all the product/use categories considered in this report, which limits efforts to track use and understand the potential for direct exposures and environmental releases. The QSC recommends that U.S. EPA take actions and support state efforts to improve data on these mercury uses with an initial focus on the following product categories, which are viewed as having the largest potential for significant use, exposure and/or environmental releases:

a) Polyurethane Products. Why? Mercury-based catalysts are known to have been extensively used in product manufacture with mercury being incorporated in some products. Documented exposures to children attributable to mercury releases from gym flooring and mats raise the level of concern. There is very limited data on overall use.

b) Rotational Balancing Products. Why? Although products are restricted in several states, sales continue. Individual units may contain a large amount of mercury and the nature of the application would appear to involve risks of product leakage/breakage. Little information exists as to overall sales, rates of leakage/breakage and disposal practices.

c) Cosmetics and Tattoo Inks. Why? While these uses are likely to lead to relatively small environmental releases, they involve direct exposures and thus warrant additional attention.

d) Nanotechnology Manufacturing Processes and Applications. Why? The rapid proliferation of these technologies warrants additional efforts to track and assess potential uses of mercury.

2) Outreach and Education.

To enhance sustainability, expanded efforts are needed to better share information about mercury use in products and processes; potential risks to public health, workers and the environment; and non-mercury alternatives, across federal and state programs. In addition, information exchange is needed among federal and state programs and key stakeholders engaged in product/process design, marketing, sales and end-of-life management. Implementation methods could include targeted webinars, development of fact sheets, direct outreach to trade associations and internet commerce organizations, presentations at trade shows etc. Because the states have much experience in these areas but lack necessary funds to implement such efforts, U.S. EPA support is imperative.

3) Coordination and Communication across Federal and State Programs.

Improved communication and coordination across federal and state programs would help to leverage existing efforts to reduce mercury use; enhance recycling; avoid duplicative efforts or ones that may be at cross purposes; and identify existing and needed tools to limit mercury uses, exposures and pollution. From a sustainability perspective, this applies not just to mercury but to other PBT chemicals as well.

4) Improved National and State Tools to Reduce Unnecessary Uses of Mercury and Better Assess Mercury Risks.

A number of states have enacted legislation and/or regulations that: restrict unnecessary uses of mercury; require mercury added products to be labeled; provide for mercury product sales data to be collected and assessed; require that consumers be provided information about mercury products, risks and alternatives; and, require recycling options for end-of-life products. National legislative requirements consistent with such state efforts would help ensure a level playing field; effectively reduce unnecessary uses and releases of mercury; improve information; and reduce public health and environmental costs to the states associated with mercury spill responses, exposure risks and appropriate end-of-life product disposal. Improved tools are also needed to assess risks attributable to mercury vapor exposures. Toward this end, U.S. EPA should work with ATSDR to update and/or develop guidance for shorter-term exposures to elemental mercury in consultation with state environmental and public health agencies.

IV. B. Specific Recommendations for Priority Product Categories

Based on the assessments presented in this report, the following presents a summary of key QSC recommendations for specific follow-up actions in four priority product categories.

Additional recommendations are presented in each of the nine individual sections in this report and recommendations from each of the nine sections are summarized in Appendix A.

1) Polyurethane Elastomer Production (Catalyst Use)

- i. U.S. EPA should conduct comprehensive research and tracking on manufacturing and on final/end use products made of mercury-catalyzed polyurethane made or sold in the U.S. making effective use of its sector specialists; its air, water, and waste permitting authorities; its ICR authorities; and through TSCA or any other authorities.
- ii. U.S. EPA should work with ATSDR to elevate awareness of this issue so appropriate steps can be taken to minimize risks.

2) Rotational Balancing Products

- i. U. S. EPA, working with the states and other federal agencies, should complete a national study on: the quantity and distribution of mercury based balancing devices manufactured in, imported to, and sold in the United States; sales of such products in states with mercury content or mercury wheel weight restrictions; disposal practices; and reports of any rotational balancing product failures and related mercury releases and to seek report publication within 12-18 months.

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- ii. U. S. EPA should facilitate information sharing between the states and federal agencies including the GSA to 1) promote awareness of and, as appropriate, further adoption of laws and practices such as sales and use restrictions enacted by Maine and Illinois, and 2) to ensure state and federal procurement specifications discourage or prevent unnecessary uses of mercury.

3) Cosmetics and Tattoo Inks

- i. FDA should confirm through legal opinion, court case, or other appropriate mechanisms that tattoo inks are defined as cosmetics and are regulated under the FD&C Act.
- ii. States and U. S. EPA should support FDA's request for registration oversight authority for cosmetics, including tattoo inks, as outlined in FDA testimony to the U.S. House on their FY2013 budget request, as described in the cosmetics and tattoo ink sections.

4) Nanotechnology

- i. The U.S. government should evaluate the use of nano-mercury and implement mechanisms to track uses and enact restrictions as appropriate. This activity can be coordinated and enhanced through the National Nanotechnology Initiative's (NNI) Nanotechnology Environment and Health Implications (NEHI) Working Group in formal consultation with the states through ECOS and Association of State and Territorial Health Officials (ASTHO).
- ii. ECOS through Resolution Number 03-7, "The Need for Actions to Achieve Further Progress on Reducing Impacts to Water Quality from Atmospheric Mercury," fully supports the collaboration of U.S. EPA and CPSC announced in December 2012 to assess health and environmental risks from nanomaterials, and formally requests this process be expedited and decisions quickly implemented.
- iii. States and U.S. EPA should develop and implement guidelines for sustainable management of nano-mercury throughout its life cycle.

V. Resources/Citations:

U.S. EPA's website for Global Harmonization System (GHS) for Pesticide Labels:

<http://www.epa.gov/oppfead1/international/globalharmon.htm>

Potential Export of Mercury Compounds from the United States for Conversion to Elemental Mercury, Report to Congress, October 14, 2009, U.S. EPA, Office of Pollution Prevention and Toxic Substances, 123 pgs.:

<http://www.epa.gov/hg/pdfs/mercury-rpt-to-congress.pdf>

EPA's Roadmap for Mercury, July 5, 2006. U.S. Environmental Protection Agency, 87 pgs.: (<http://www.epa.gov/hg/pdfs/FINAL-Mercury-Roadmap-6-29.pdf>) (describes U.S. EPA's progress as of 2006 in addressing mercury issues domestically and internationally, and outlines U.S. EPA's major ongoing and planned actions to address risks associated with mercury).

Interstate Mercury Education and Reduction Clearinghouse (IMERC):

(<http://www.newmoa.org/prevention/mercury/imerc.cfm>) (the IMERC state members include California, Connecticut, Illinois, Louisiana, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, North Carolina, Rhode Island, Vermont, and Washington).

Quicksilver Caucus:

http://www.ecos.org/section/committees/cross_media/quick_silver

ECOS Mercury Resolutions

- Resolution Number 03-7, The Need for Actions to Achieve Further Progress on Reducing Impacts to Water Quality from Atmospheric Mercury
- Resolution Number 07-1, Implementing a National Vision for Mercury
- Resolution 08-11, Supporting Work on Contaminated Site Response to Emerging Contaminants and Related Risk Communication Issues
- Resolution Number 09-2, Mercury Reduction, Stewardship, and Retirement
- Resolution Number 10-2, Comprehensive National Mercury Monitoring
- Resolution Number 12-8, Support for the National Mercury Switch Recovery Program to Reduce Mercury in the Environment and Provide Flexibility to the States

Resolutions are subject to change. All ECOS resolutions can be viewed at:

<http://www.ecos.org/section/policy/resolution>

Appendices

Appendix A: Aggregated Listing of All Section Recommendations

In this report, QSC workgroup members have researched mercury use in the following nine areas:

- A. Polyurethane Elastomer Production (Catalyst Use)
- B. Rotational Balancing Products
- C. Skin-lighteners, Face Creams and Other Cosmetics
- D. Tattoo Inks
- E. Nanotechnology
- F. Photovoltaic Products
- G. Veterinary Vaccines
- H. Novelty Products
- I. Biotech/Genetics Research Laboratories

Below is an aggregated listing of all section recommendations.

A. Polyurethane Elastomer Production (Catalyst Use)

III. A. 4. Recommendations for Further Action

1. U.S. EPA should conduct comprehensive research and tracking on manufacturing and on final/end use products made of mercury-catalyzed polyurethane made or sold in the U.S. making effective use of its sector specialists; its air, water, and waste permitting authorities; its ICR authorities; and through TSCA or any other authorities.
2. U.S. EPA should work with the ATSDR to elevate awareness of this issue so appropriate steps can be taken to minimize risks.

B. Rotational balancing products

III. B. 4. Recommendations for Further Action

1. U. S. EPA, working with the states and other federal agencies, should complete a national study on: the quantity and distribution of mercury based balancing devices manufactured in, imported to, and sold in the United States; sales of such products in states with mercury content or mercury wheel weight restrictions; disposal practices and reports of any rotational balancing product failures and related mercury releases and to seek report publication within 12-18 months.
2. U. S. EPA should facilitate information sharing between the states and federal agencies including the GSA to 1) promote awareness of and, as appropriate, further adoption of laws and practices such as sales and use restrictions enacted by Maine and Illinois, and 2) to ensure state and federal procurement specifications discourage or prevent unnecessary uses of mercury.
3. U.S. EPA and other federal agencies should take action and support states to assess current practices and work to educate state and federal procurement agencies about environmentally preferable rotational balancing technologies; add information about specific state bans or restrictions for balancing products and

other mercury-added products on federal procurement listings alongside product listings; establish and institutionalize processes to identify and discourage/prohibit unnecessary use of products that use mercury and other PBTs; establish effective end-of-life recycling programs and provide information on safe cleanup approaches for inadvertent spills of these products.

4. U.S. EPA in consultation with states should work with federal and provincial authorities in Canada to evaluate options to address the manufacture, sale, and export of such products manufactured in Canada.

C. Skin-lighteners, Face Creams and Other Cosmetics

III. C. 4. Recommendations for Further Action

1. The United States should advocate for restrictions/prohibitions on these uses in United Nations Environment Programme (UNEP) global mercury agreement negotiations.
2. The U.S. EPA, FDA, ATSDR, and states should pursue interagency collaborations to work with trade associations, pharmacies, and the health care sector to raise awareness and limit sales and use.
3. States and U.S. EPA should support FDA authority for cosmetics registration and oversight as outlined in FDA testimony to the U.S. House on their FY2013 budget request as specified below. This may include potential support for FDA authority for product recalls of adulterated or misbranded products, possibly those meeting certain risk or content criteria.
 - Establish and maintain a mandatory Cosmetic Registration Program;
 - Acquire, analyze, and apply scientific data and information from a variety of sources, including voluntary adverse event reporting, to set U.S. cosmetics safety standards;
 - Maintain a strong U.S. presence in international standard-setting efforts;
 - Provide education, outreach, and training to industry and consumers; and
 - Refine inspection and sampling of domestic and imported products and apply risk-based approaches to post-market monitoring of domestic and imported products and other enforcement activities.

D. Tattoo Inks

III. D. 4. Recommendations for Further Action

1. FDA should confirm through legal opinion, court case, or other appropriate mechanism that tattoo inks are defined as cosmetics and are regulated under the FD&C Act.
2. States and U. S. EPA should support FDA's request for registration oversight authority for cosmetics, including tattoo inks as outlined in FDA testimony to the U.S. House on their FY2013 budget request as specified below. This may include potential support for FDA authority for product recalls of adulterated or misbranded products, possibly those meeting certain risk or content criteria:
 - Establish and maintain a mandatory Cosmetic Registration Program;
 - Acquire, analyze, and apply scientific data and information from a variety of sources, including voluntary adverse event reporting, to set U.S. cosmetics safety standards;

- Maintain a strong U.S. presence in international standard-setting efforts;
 - Provide education, outreach, and training to industry and consumers; and
 - Refine inspection and sampling of domestic and imported products and apply risk-based approaches to post-market monitoring of domestic and imported products and other enforcement activities.
3. States and U. S. EPA should petition FDA to include a specific analysis of tattoo inks with other cosmetics.
 4. FDA should evaluate the use of mercury in tattoo inks including imported inks.
 5. FDA should require that tattoo ingredients be listed and this information be provided to consumers.

E. Nanotechnology

III. E. 4. Recommendations for Further Action

1. The U.S. government should evaluate the use of nano-mercury and implement mechanisms to track uses and enact restrictions as appropriate. This activity can be coordinated and enhanced through the NNI's NEHI Working Group in formal consultation with the states through ECOS and ASTHO.
2. ECOS through Resolution Number 03-7, "The Need for Actions to Achieve Further Progress on Reducing Impacts to Water Quality from Atmospheric Mercury," fully supports the collaboration of U.S. EPA and CPSC announced in December 2012 to assess health and environmental risks from nanomaterials, and formally requests this process be expedited and decisions quickly implemented.
3. States and U.S. EPA should develop and implement guidelines for sustainable management of nano-mercury throughout its life cycle.
4. States and U.S. EPA should take every opportunity to propose research projects that would address these needs through the NNI.

F. Photovoltaic Products

III. F. 4. Recommendations for Further Action

1. U.S. EPA should survey PV manufacturers to determine if mercury continues to be used in semiconductors.
2. States may consider product disclosure/notification and labeling requirements.
3. U.S. EPA should evaluate the photovoltaic products recycling requirements of WEEE 2 for adoption in the United States and/or individual states.

G. Veterinary Vaccines

III. G. 4. Recommendations for Further Action

1. If the MPCA request to CVB in September 2012 does not provide information within six months, U.S. EPA should communicate with CVB and the facilities identified in the USDA list to define the scope of the issue and identify opportunities to eliminate mercury use in veterinary vaccine manufacturing.
2. USDA should establish a system for tracking and publicly disclosing mercury content of veterinary vaccines so that veterinarians, farmers, and owners of animals have ready access to the information when the product is being used.

H. Novelty Products

III. H. 4. Recommendations for Further Action

1. U.S. EPA working with the states should develop a fact sheet for retailers/retailer trade associations to highlight state laws that 1) prohibit the sale of mercury-added novelty items and that 2) require manufacturers to notify retailers about the retailer's responsibility to dispose of any remaining products according to state law.
2. U.S. EPA in coordination with states should conduct outreach to online product "vendors/trader" to educate them on the dangers of mercury in commerce and proper disposal of products.

I. Biotech/Genetics Research Laboratories

III. I. 4. Recommendations for Further Action

1. U.S. EPA and FDA should survey biotechnology and genetic engineering research and labs regarding their use of mercury.
2. U.S. EPA, the National Institute for Occupational Safety and Health (NIOSH), and the National Science Foundation (NSF) should work together to seek from NNI further support and funding to promote expanded development and use of green chemistry practices, biochemistry under the precautionary principle, and adoption of Life Cycle Analysis (LCA) as the best and least expensive strategy available.

Appendix B: State Regulatory Landscape

In this report, QSC workgroup members have researched mercury use in the following nine areas:

- A. Polyurethane Elastomer Production (Catalyst Use)
- B. Rotational Balancing Products
- C. Skin-lighteners, Face Creams and Other Cosmetics
- D. Tattoo Inks
- E. Nanotechnology
- F. Photovoltaic Products
- G. Veterinary Vaccines
- H. Novelty Products
- I. Biotech/Genetics Research Laboratories

Below is an aggregated listing of the regulatory landscape in the states.

A. Polyurethane Elastomer Production (Catalyst Use)

III. A. 2. b. State

Waste handling, water discharges, and air emissions from the manufacturing process may also fall under state or local laws. Some states have requirements for notification, labeling and collection plans that manufacturers of mercury-added polyurethane or polyurethane products must comply with. Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont require manufacturers to submit notification forms indicating mercury content of many products. These states (except New Hampshire) as well as Washington and Minnesota require that manufacturers of mercury-added products label most of those products as containing mercury. Maine, Massachusetts, Minnesota, New York, Rhode Island, New Hampshire, Vermont, and Washington ban disposal of most or all mercury-added products. Massachusetts requires manufacturers selling many mercury-added products, excluding formulated products and some other product classes, to develop and implement a collection plan for proper handling of mercury-added products at the end of their useful life with a targeted collection rate of 75% or greater. Specifics of each state's laws may vary and laws may change over time; therefore manufacturers must review each state's rules and regulations to determine their requirements.

Three states ban the sale of formulated products (e.g., catalysts, polyurethane flooring, reagents) containing more than a specified concentration of mercury. Those three states, and their statutorily specified concentration limits, are:

Connecticut [Conn. Gen. Stat. § 22a-617(a)]	Formulated Products >50 ppm
Louisiana [LA Rev. Stat. § 2576(A)(3)]	Formulated Products >10 ppm
Rhode Island [RI General Statutes § 23-24.9-7(a)(3)]	Formulated Products >10 ppm

B. Rotational Balancing Products

III. B. 2. b. State

Waste handling, water discharges, and air emissions from the manufacturing process may also fall under state or local laws. Some states have requirements for notification, labeling and collection plans that manufacturers of mercury-added rotational balancing products must comply with. Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont require manufacturers to submit notification forms indicating mercury content of many products. These states (except New Hampshire) and Minnesota require that manufacturers of mercury-added products label most of those products as containing mercury.

Maine, Massachusetts, Minnesota, New York, Rhode Island, New Hampshire, and Vermont ban disposal of most or all mercury-added products. Massachusetts requires manufacturers selling many mercury-added products, excluding formulated products and some other product classes, to develop and implement a collection plan for proper handling of mercury-added products at the end of their useful life with a target collection rate of 75% or greater. Specifics of each state's laws may vary and laws may change over time; therefore manufacturers must review each state's rules and regulations to determine their requirements.

Three states - Connecticut, Louisiana, and Rhode Island - ban sale and distribution of fabricated mercury products based on mercury content. Mercury balancers exceed the allowable limits in those states. A summary of laws in these three states follows.

Connecticut [Conn. Gen. Stat. § 22a-617(a)]	Fabricated Products >100 mg
Louisiana [LA Rev. Stat. § 2576(A)(3)]	Fabricated Products >10 mg
Rhode Island [RI General Statutes § 23-24.9-7(a)(3)]	Fabricated Products >10 mg

Maine (Revised Statutes Title 38 §1606-A) bans the use, sale and distribution of wheel weights or any other product containing mercury that is used to balance tires.

Illinois also bans use, sale and distribution of wheel weights or any other product containing mercury that is used to balance tires (415 Illinois Compiled Statutes Section 22.23c). Another law (415 Illinois Compiled Statutes Section 27(a)(12)) bans the sale or distribution of mercury rings in Illinois.

C. Skin-lighteners, Face Creams and Other Cosmetics

Waste handling, water discharges, and air emissions from the manufacturing process may also fall under state or local laws. Some states have requirements for notification, labeling and collection plans that manufacturers of mercury-added skin lighteners, face creams and cosmetics must comply with. Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont require manufacturers to submit notification forms indicating mercury content of many products. These states (except New Hampshire) as well as Washington and Minnesota require that manufacturers of mercury-added products label most of those prod-

ucts as containing mercury. Maine, Massachusetts, Minnesota, New York, Rhode Island, New Hampshire, Vermont, and Washington ban disposal of most or all mercury-added products. Massachusetts requires manufacturers selling many mercury-added products, excluding formulated products and some other product classes, to develop and implement a collection plan for proper handling of mercury-added products at the end of their useful life with a targeted collection rate of 75% or greater. Specifics of each state’s laws may vary and laws may change over time; therefore manufacturers must review each state’s rules and regulations to determine their requirements.

With respect to cosmetics covered by the FD&C Act, Minnesota prohibits the sale of cosmetics, toiletries, and fragrances containing mercury [Minn. Stat. § 116.92 subd 8i] effective January 1, 2008. Illinois also bans the sale of mercury containing cosmetics, effective June 1, 2009 [410 Ill. Comp. Stat. § 46-22].

Three states ban the sale of formulated products (e.g., cosmetics) containing more than a specified concentration of mercury. Those three states, and their statutorily specified concentration limits, are:

Connecticut [Conn. Gen. Stat. § 22a-617(a)]	Formulated Products >50 ppm
Louisiana [LA Rev. Stat. § 2576(A)(3)]	Formulated Products >10 ppm
Rhode Island [RI General Statutes § 23-24.9-7(a)(3)]	Formulated Products >10 ppm

While state sales bans send a signal out to industry and provide a valuable tool for environmental agency enforcement, there is still no really effective mechanism to prevent trade or identify what is in trade.

D. Tattoo Inks

A review of state laws concerning tattooing reveals that most states regulate the activity of tattooing but not the inks.

If tattoo pigments do in fact contain intentionally-added mercury, then some states have requirements for notification, labeling and collection plans that manufacturers of mercury-added tattoo inks or pigments must comply with. Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont require manufacturers to submit notification forms indicating mercury content of many products. These states (excluding New Hampshire) as well as Washington and Minnesota require that manufacturers of mercury-added products label most of those products as containing mercury. Maine, Massachusetts, Minnesota, New York, Rhode Island, New Hampshire, Vermont, and Washington ban disposal of most or all mercury-added products. Massachusetts requires manufacturers selling many mercury-added products, excluding formulated products and some other product classes, to develop and implement a collection plan for proper handling of mercury-added products at the end of their useful

life with a target collection rate of 75% or greater. Specifics of each state's laws may vary and laws may change over time; therefore manufacturers must review each state's rules and regulations to determine their requirements. Waste handling, water discharges, and air emissions from the manufacturing process may also fall under state or local laws.

Proposition 65 in California requires warnings to individuals before they are exposed to hazardous chemicals. The American Environmental Safety Institute successfully sued tattoo ink manufacturers requiring them to place a warning on labels indicating that:

“WARNING: Tattoo inks and pigments contain many heavy metals, including Lead, Arsenic and others. All of these heavy metals have been scientifically determined by the State of California to cause cancer or birth defects and other reproductive harm. Pregnant women and women of childbearing age in particular should consult with their doctor before getting any tattoo. A person is exposed to tattoo inks and/or pigments when they get a tattoo because they are injected with tattoo ink under their skin or the tattoo ink is applied on their skin.”

(see “Tattoo inks and pigments contain many heavy metals, including Lead, Arsenic and others,” September 21, 2011: <http://www.alienlove.com/modules.php?name=News&file=print&sid=711>). Mercury is not specifically listed and the law does not require all specific toxins to be listed so it is still inconclusive.

E. Nanotechnology

III. E. 2. b. State

California has an advanced program on nanotechnology oversight, including the authority for “data call in” on chemicals at the engineered nanoparticle level. The program falls under the state's toxics substances authority, and has gained considerable information in its few years of activity; however, there has been no activity regarding nano-mercury. For more information on the program, refer to: http://www.dtsc.ca.gov/pollutionprevention/chemical_call_in.cfm

No other state has a formal collection of data regarding engineered nanoparticles. This is primarily due to lack of funding, not interest. However, manufacturers selling mercury-added engineered nanoparticles in Connecticut, Louisiana, Maine, Massachusetts, Rhode Island, New Hampshire, New York, and Vermont are required to submit notification forms indicating mercury content.

There are no restrictions in creating nano-mercury in a lab, whether as research or an intermediate. Nano-mercury used for research purposes may be exempt from regulation even in states that regulate other uses of elemental mercury.

Waste handling, water discharges, and air emissions from the manufacturing process may also fall under state or local laws. Some states have requirements for notification, labeling and collection plans that manufacturers of mercury-added engineered nanoparticles or products containing them may need to comply with. Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont require manufacturers to submit notification forms indicating mercury content of many products. These states (except New Hampshire) as well as Washington and Minnesota require that manufacturers of mercury-added products label most of those products as containing mercury. Maine, Massachusetts, Minnesota, New

York, Rhode Island, New Hampshire, Vermont, and Washington ban disposal of most or all mercury-added products. Massachusetts requires manufacturers selling many mercury-added products, excluding formulated products and some other product classes, to develop and implement a collection plan for proper handling of mercury-added products at the end of their useful life with a target collection rate of 75% or greater. Specifics of each state’s laws may vary and laws may change over time; therefore manufacturers must review each state’s rules and regulations to determine their requirements.

F. Photovoltaic Products

III. F. 2. b. State

Waste handling, water discharges, and air emissions from the manufacturing process may also fall under state or local laws. Some states have requirements for notification, labeling and collection plans that manufacturers of mercury-added photovoltaic products must comply with. Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont require manufacturers to submit notification forms indicating mercury content of many products. These states (excluding New Hampshire) as well as Washington and Minnesota require that manufacturers of mercury-added products label most of those products as containing mercury. Maine, Massachusetts, Minnesota, New York, Rhode Island, New Hampshire, Vermont, and Washington ban disposal of most or all mercury-added products. Massachusetts requires manufacturers selling many mercury-added products to develop and implement a collection plan for proper handling of mercury-added products, excluding formulated products and some other product classes, at the end of their useful life with a target collection of 75% or greater. Specifics of each state’s laws may vary and laws may change over time; therefore manufacturers must review each state’s rules and regulations to determine their requirements.

Connecticut [Conn. Gen. Stat. § 22a-617(a)]	Formulated Products >50 ppm
Louisiana [LA Rev. Stat. § 2576(A)(3)]	Formulated Products >10 ppm
Rhode Island [RI General Statutes § 23-24.9-7(a)(3)]	Formulated Products >10 ppm

Manufacturers selling PV containing mercury-added components in Connecticut, Louisiana, Maine, Massachusetts, Rhode Island, New Hampshire, New York, and Vermont are required to submit notification forms indicating mercury content. Waste handling, water discharges, and air emissions from the manufacturing process may fall under state or local laws.

G. Veterinary Vaccines

III. G. 2. b. State

Waste handling, water discharges, and air emissions from the manufacturing process may also fall under state or local laws. Some states have requirements for notification, labeling and collection plans that manufacturers of mercury-added polyurethane or polyurethane products must comply with. Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont require manufacturers to submit notification forms indicating mercury content of many products. These states (except New Hampshire) as well as Washington

and Minnesota require that manufacturers of mercury-added products label most of those products as containing mercury. Maine, Massachusetts, Minnesota, New York, Rhode Island, New Hampshire, Vermont, and Washington ban disposal of most or all mercury-added products. Massachusetts requires manufacturers selling many mercury-added products to develop and implement a collection plan for proper handling of mercury-added products, excluding formulated products and some other product classes, at the end of their useful life with a target collection rate of 75% or greater. Specifics of each state's laws may vary and laws may change over time; therefore manufacturers must review each state's rules and regulations to determine their requirements.

In 2007, mercury legislation was introduced in Minnesota. One provision in the initial proposal would have banned the sale of over the counter human and veterinary pharmaceuticals containing mercury:

MN Legislature 2007 SF1085-0

Minn. Stat. § 116.92, Subd. 8h. **Ban; mercury in over the counter pharmaceuticals.**

After January 1, 2008, a person may not sell, offer for sale, or distribute in the state for human or animal use an over the counter pharmaceutical product containing mercury.

This provision passed through three Senate Committees between 2/21/07 and 4/13/07. However, the reference to "animal" use was removed in the Senate Committee on Business, Industry, and Jobs on 4/13/07. A person representing an animal livestock association testified that veterinary vaccines were sold over the counter to farmers without prescription and this provision would affect the sale of animal vaccines. Committee members did not ask the person providing the testimony if there was information available about mercury use in animal vaccines. The issue had not been raised in previous committee hearings, the representative was not listed in advance on this committee schedule and there was no opportunity for further discussion in this hearing. The representative was contacted later and stated that the association had no information about the use of mercury in animal vaccines. The CVB in Ames, Iowa was identified as the only entity that may be able to provide information. MPCA inquiries to this entity in 2007 did not produce a reply or additional information on this subject.

In September 2012, the MPCA contacted CVB by telephone and was advised to submit a written request, which was done. As of January 31, 2013, CVB has not replied to the written request submitted by MPCA.

III. H. 2. b. State

Currently, fourteen states have prohibited the sale of mercury-added novelty items. Some of these states, including Illinois, Louisiana, New York, Ohio, Vermont, Washington, and Wisconsin prohibit the sale of most mercury-added novelty items, but include a blanket exemption for novelties in which the only mercury included is part of the button-cell battery. Connecticut, Indiana, and New Hampshire also include an exemption to their mercury novelty product sales ban but specify that the exemption applies to removable button-cell batteries only. See chart below for more information.

State	Compliance Date	Statutory/Regulatory Authority
California	January 1, 2003	Health and Safety Code, Division 20, Chapter 6.5; Mercury-Added Thermostats, Relays, Switches, and Measuring Devices (Sections 25214.8.1-25214.8.6). Ban on sale or distribution of certain mercury-added products.
Connecticut	July 1, 2003	Connecticut General Statutes 22a-616 - Ban on sale or distribution of mercury-added novelties, mercury fever thermometers, mercury dairy manometers. Restriction on use of mercury amalgam.
Illinois	July 1, 2004	410 Illinois Compiled Statutes 46 - Mercury-added Product Prohibition Act.
Indiana	July 1, 2003	Indiana Code IC 13-20-17.5 Prohibition of sale or distribution of mercury-added novelty.
Louisiana	July 1, 2007	<i>Louisiana Revised Statutes 30:2575 - Restrictions on the sale of certain mercury-added products.</i>
Minnesota	June 1, 2001	Minn. Stat. § 116.92 Mercury Emissions Reduction, Subd. 8. Ban; toys, games, and apparel.
New Hampshire	January 1, 2002	<i>New Hampshire Revised Statutes 149-M:53 - Restrictions On The Sale Of Certain Mercury-Added Products.</i>
New York	January 1, 2005	New York State Environmental Conservation Law (ECL) § 27-2101(8) Ban on mercury-added novelty products.
Rhode Island	January 1, 2003	<i>Rhode Island General Laws 23-24.9-6. Restrictions on the sale of certain mercury-added products.</i>
Ohio	April 6, 2008	Ohio House Bill 344 Section 3734.64 - Novelty products.
Oregon	January 1, 2006	Oregon House Bill 3007 Section 5 - Novelty items.
Vermont	July 1, 2006	<i>Vermont Statutes Title 10 Sec. 7105 - Restrictions on the sale and use of certain mercury-added products.</i>
Washington	January 1, 2006	Washington State Statutes Title 70 - 70.95M.050 - Prohibited sales -- Novelties, manometers, thermometers, thermostats, motor vehicles.
Wisconsin	November 1, 2010	Wisconsin Act 44 - Products Containing Mercury.

Note: Maine and possibly other states may indirectly address novelty products through restrictions on use of mercury-added button cell batteries.

Source: States and the Mercury Reduction Program, Northeast Waste Management Official's Association

Two states that regulate the sale of mercury products recently reported that they were contacted by someone representing a manufacturer or importer of mercury-added novelties. That person inquired about the section of state law that prohibits the sale of novelties and requires manufacturers to notify retailers about the prohibition and the retailer's responsibility to dispose of any remaining products according to state law. This suggests that mercury-added novelties may still be produced and sold in some areas of the country, warranting further action.

III. I. 2. b. State

Most states allow the use of mercury at research facilities, but may direct or restrict the maximum quantity allowed in the laboratory, or purchased. None specifically address biotechnology labs: (<http://www.newmoa.org/prevention/mercury/imerc/legislation-2008.htm>). Some states and municipalities regulate the discharge of mercury in wastewater from research facilities.

Waste handling, water discharges, and air emissions from the manufacturing process may also fall under state or local laws. Some states have requirements for notification, labeling and collection plans that manufacturers of mercury-added polyurethane or polyurethane products must comply with. Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont require manufacturers to submit notification forms indicating mercury content of many products. These states (except New Hampshire) as well as Washington and Minnesota require that manufacturers of mercury-added products label most of those products as containing mercury. Maine, Massachusetts, Minnesota, New York, Rhode Island, New Hampshire, Vermont, and Washington ban disposal of most or all mercury-added products. Massachusetts requires manufacturers selling many mercury-added products, excluding formulated products and some other product classes, to develop and implement a collection plan for proper handling of mercury-added products at the end of their useful life with a target collection rate of 75% or greater. Specifics of each state's laws may vary and laws may change over time; therefore manufacturers must review each state's rules and regulations to determine their requirements.

Three states ban the sale of formulated products (e.g., catalysts, reagents) containing more than a specified concentration of mercury. Those three states, and their statutorily specified concentration limits, are:

Connecticut [Conn. Gen. Stat. § 22a-617(a)]	Formulated Products >50 ppm
Louisiana [LA Rev. Stat. § 2576(A)(3)]	Formulated Products > 10 ppm
Rhode Island [RI General Statutes § 23-24.9-7(a)(3)]	Formulated Products >10 ppm

Appendix C: Additional Information on the Globally Harmonized System

This appendix supplies additional information on the Globally Harmonized System (GHS) to supplement information in the report provided in the Introduction. This is not meant to be an exhaustive overview. Also, letters related to this subject are included as follows:

- 1. Letter from Maine Departments of Environmental Protection and Labor, May 18, 2007**
- 2. Letter from Washington State Department of Ecology, October 16, 2007**

Additional Information:

The GHS itself is not a regulation or a standard. The GHS is a voluntary international system that imposes no binding treaty obligations on countries and has no international implementation schedule. While the United States had an existing safety data sheet (SDS) system prior to adoption of the GHS (Material Safety Data Sheet or MSDS), all countries with existing hazard communication systems were expected to modify them to be consistent with the harmonized elements of the GHS.

In regards to timing, in 2002, countries at the World Summit on Sustainable Development including the United States set a goal for GHS implementation to the extent possible by 2008. Four key federal U.S. agencies have regulations affected by the adoption of GHS including the Department of Labor (DOL), the Department of Transportation (DOT), the Consumer Product Safety Commission (CPSC), and U.S. EPA.

In late 2006, DOT's Occupational Safety and Health Administration (OSHA) published an advanced notice of proposed rulemaking. In September 2009, OSHA published a proposed rulemaking to align OSHA's hazard communication standard (HCS) with the GHS. In March 2012, the Hazard Communication Standard (HCS or Haz Com 2012) was revised to align with the GHS. By June 2016, employers must be in full compliance with the revised HCS including employee training and GHS styled labels from manufacturers and distributors.

The U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) has incorporated within the U.S. Hazardous Materials Regulations (HMR; 49 CFR Parts 100-180) elements of the GHS in various rulemakings except for aquatic toxicity. These elements include the aspects of the GHS that directly affect the transport sector such as changes to the hazard classification criteria for toxic materials and flammable liquids.

In 2006, the CPSC notes that it anticipated it would need to issue guidance, revise existing regulations, and/or in some instances, seek statutory revision.

In 2004, U.S. EPA's Office of Pesticide Programs solicited public comment on a white paper regarding application of GHS to pesticides labeling. U.S. EPA's rule on hazard classification and labeling requirements is contained in Title 40 of the Code of Federal Regulations Part 156 (40 CFR 156). U.S. EPA has not initiated rule-making activities or included GHS in the EPA regulatory agenda to date. U.S. EPA has worked with OSHA on a "common position" on coverage of chemicals subject to the hazard communication requirements under the significant new use rules (SNUR) of TSCA section 5.

1. Letter from Maine Departments of Environmental Protection and Labor, May 18, 2007



JOHN E. BALDACCI
GOVERNOR

May 18, 2007

Ms. Maureen O'Donnell, Industrial Hygienist
Directorate of Standards & Guidance
Room N3718, US Department of Labor
200 Constitution Ave., N.W.
Washington, DC 20210

Re: Docket No. H-022K, Global Harmonization System ANPRM

Dear Ms. O'Donnell:

These comments are submitted on behalf of the State of Maine's Governor's Task Force to Promote Safer Chemicals in Consumer Products, the Maine Department of Labor and the Maine Department of Environmental Protection.

While we recognize that the comment period of the September 12, 2006 Advance Notice of Proposed Rulemaking (ANPRM) has expired, we have communicated on the subject of this comment with Attorney Ian Moar, of the DOL Office of the Solicitor, and were encouraged to bring our thoughts to your attention earlier rather than later. These comments are responsive to the question to the public in the ANPRM regarding whether there are "any health or physical hazards that aren't covered in either the HCS or the GHS that should be added." (ANPRM, p. 17)

Our Task Force was established by Executive Order dated February 22, 2006, to investigate the adequacy of existing federal and state laws and regulations regarding chemical safety, and to recommend state action to improve the safety of chemicals in consumer products. For background, you may review the Executive Order at www.maine.gov/tools/whatsnew/index.php?topic=Gov_Executive_Orders&id=21193&v=Article and our Interim Report at www.maine.gov/dep/oc/saferchemintrpt.htm. You will note that the Interim Report addresses many inadequacies of the federal Toxic Substances Control Act, and comments on some weaknesses of existing MSDS disclosure requirements. A focus of the Executive Order is concern regarding persistent bioaccumulative toxics (PBTs), such as mercury, and brominated flame retardants.

Our concern is related to the assumption made in the September 12, 2006 ANPRM that proposed revisions of OSHA regulations in response to the Global Harmonization System (GHS) would NOT incorporate ecological or environmental fate disclosures, such as persistence and bioaccumulative potential, in the Hazard Communication Standard (MSDS). The comparison chart at Appendix A to OSHA's Guide to The Globally Harmonized System of Classification and Labeling of Chemicals makes it clear that while the GHS, as well as the ISO Safety Data Sheet for Chemical Products, and the ANSI MSDS Preparation z400.0-2004, all require disclosure of "ecological information" including persistence and bioaccumulative potential, the OSHA HCS has "no present requirements" for such disclosure. The ANPRM acknowledges this discrepancy, and does not propose to redress it in proposed rulemaking: "...the GHS safety data sheet format includes a section that addresses environmental information. OSHA would not require inclusion of environmental information for SDSs used in workplaces." (ANPRM p. 9). The ANPRM goes on to note (p. 16) that "OSHA does not

preclude such [environmental] information being on a safety data sheet, but will not review or enforce such provisions," for the purported reason that such disclosures are "outside OSHA's jurisdiction to regulate."

In connection with your agency's work on proposed rulemaking to conform OSHA HCS regulations to GHS regulations, we urge you to carefully reexamine the legal conclusion that OSHA does not have jurisdiction to require disclosure of scientific evidence that a chemical persists and bioaccumulates. We suggest that this conclusion be reassessed in view of the ample evidence developed in studies conducted by the Centers of Disease Control, the Environmental Working Group, and others, that certain chemicals are present in the blood, tissue, hair, and cord blood, of human beings, including, of course, workers. These chemicals are a result of a variety of environmental exposures including workplace exposures; they persist for long periods of time in human beings, and are passed on to fetuses in the uterus, with potentially serious toxicological effects. We believe that the fact that many workers carry with them an existing "body burden" of these chemicals is highly material information when assessing the risks of workplace exposures of these same chemicals. The fact that a chemical bioconcentrates implies a long half-life in the body, including the body of workers. That could have implications for the way in which the chemical is handled in the workplace. Given the toxicological perspective that the "dose makes the poison," the fact that workers may already have a body burden of PBTs that they are handling, or of related chemicals with similar toxicological endpoints, may well put the worker at greater health risk. Because PBTs have been found in high quantities in breast milk and to pass through the placenta to affect fetal development, they are of particular concern to female workers and the health of future generations of America's workers. Finally, both male and female workers need to be concerned about bringing these persistent chemicals back to their vehicles and homes on their shoes, clothing, hair and bodies.

The perspective that environmental fate has no relevance to workplace exposures ignores the best of current science; it also defeats the admirable goal of consistency in international and national worker safety and environmental requirements, a goal that OSHA has been a leader in advocating.

Sincerely,

/s/

David P. Littell, Commissioner
Dept. of Environmental Protection

/s/

Laura A. Fortman, Commissioner
Department of Labor

cc: Karin Tilberg, Office of the Governor, State of Maine
Ian Moar, DOL Office of the Solicitor
Ginger Jordan-Hillier, MeDEP

2. Letter from Washington State Department of Ecology, October 16, 2007



October 16, 2007

James B. Gulliford, Assistant Administrator
Office of Prevention, Pesticides, and Toxic Substances
United States Environmental Protection Agency Headquarters
Ariel Rios Building
1200 Pennsylvania Avenue, N. W.
Mail Code: 7101M
Washington, DC 20460

Dear Mr. Gulliford:

Enclosed you will find a copy of comments submitted on behalf of the Washington State Departments of Health and Ecology regarding the United States Occupational Safety and Health Administration (US OSHA) advance notice of proposed rulemaking to update Material Safety Data Sheets (MSDSs) consistent with the Global Harmonization System (GHS).

It is our hope that by bringing these comments to your attention, we can encourage the United States Environmental Protection Agency (US EPA) to remain active in this process and to work with US OSHA to improve information about chemical hazards included on MSDSs, in particular including information on persistence and bioaccumulation. It is also our hope that US EPA considers dovetailing into the US OSHA process revisions that update rules regarding MSDS information for pesticides and other chemicals under US EPA's responsibilities.

As mentioned in our letter to US OSHA, Washington State has an active strategy and new regulation around Persistent and Bioaccumulative Toxic (PBT) chemicals. Based on our ongoing concern about the environmental and human health risks associated with PBTs, we urge US EPA to actively pursue rule revisions to include information on persistence and bioaccumulation on MSDSs.

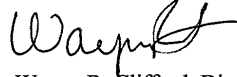
James B. Gulliford
October 16, 2007
Page 2

Please contact Maria Victoria Peeler at the Washington State Department of Ecology at 360-407-6704 with any questions about these comments.

Sincerely,



Darin Rice, Manager
Hazardous Waste & Toxics
Reduction Program
Department of Ecology



Wayne R. Clifford, Director
Office of Environmental Health Assessments
Department of Health

cc: Scott Downey, Pesticides and Toxics Unit Manager, Office of
Compliance and Enforcement, USEPA
Keith Phillips, Office of the Governor, State of Washington
John Furman, Occupational Health & Safety, Labor & Industries

Appendix D: Additional Background

1. Experts Warn of Dangers of "Skin Whitener" Cosmetics, by Tan Ee Lyn, Wed Sep 27, 2006 7:35am ET

2. High Mercury Level in Beauty Items: Experts Sound Alarm, (<http://www.arabnews.com>)
– September 24, 2006

3. California Investigates Skin-Lighteners for Dangerous Mercury, New America Media, News Report, Ngoc Nguyen, Posted: Jan 27, 2012

1. Experts warn of dangers of "skin whitener" cosmetics

Wed Sep 27, 2006 7:35am ET

By Tan Ee Lyn

HONG KONG (Reuters) - Liza Ng, a public relations executive living in Hong Kong, has no time or inclination to cultivate the sporty, tanned look.

Instead, she spends hundreds of dollars every month on face masks, scrubs and creams to whiten her complexion.

"I love to be pearly white because that is more beautiful," the 38-year-old said.

Ng is not alone.

Women across Asia pay exorbitant prices for cosmetics that promise to whiten their skin and give them a fair, frail look which for centuries has been considered a sign of beauty in women in China and across much of the region.

But the demand for skin-whitening cosmetics -- which can cost as much as \$385 for a 50-ml bottle -- has more than a monetary cost.

Health experts say that mercury -- a potentially deadly substance that helps to keep skin white -- has been found in a number of skin-whitening cosmetics.

"In Hong Kong, there are no strict rules for product labeling and you can buy cream that says it is mercury-free, but when we examine it, it is full of mercury," said Christopher Lam, a professor of chemical pathology at the Chinese University.

Lam, who also works at the Prince of Wales Hospital, said there have been isolated cases of mercury poisoning seen in women who used such creams.

"There may also be cases going to other doctors, not exclusively us," he added.

Mercury blocks an enzyme that is required for the formation of melanin, the dark pigment in our skin. But constant, heavy exposure to mercury is dangerous. It attacks the central nervous system and can result in brain and kidney damage.

TOXIC COSMETICS?

Questions about the safety of cosmetics came into focus last week when Chinese regulators said they found two toxic metals, chromium and neodymium, in nine SK-II products, a brand owned by Procter & Gamble. Three of the products purport to whiten skin.

The two metals are banned for use in cosmetics in China. Chromium is carcinogenic and can cause eczema, while neodymium, which is used in magnets, can cause eye and skin irritation.

SK-II has said it does not add chromium, neodymium or other heavy metals into its products and was very concerned about the Chinese findings.

But it added that heavy metals exist in the environment, such as in the water and air. The company also said it would investigate if "minimal trace levels of these heavy metals may be presented in the SK-II production process".

Nevertheless, Procter & Gamble took its products off the shelves in China last Friday pending a probe by a Chinese health and safety watchdog to check whether its products carried possibly harmful metals.

While drugs are regulated and need to pass trials proving their efficacy and safety before they are sold, there is little governance over cosmetics even in more advanced places in Asia.

"There are no regulations requiring manufacturers to prove their cosmetics are effective, so you can claim anything you want," said Allen Chan, chemical pathology assistant professor at Chinese University.

In a study of 38 skin whitening creams in 2000, Lam and his colleagues found that eight of them contained excessive mercury. One exceeded limits used in the United States by 65,000 times. Five were made in China and three in Taiwan.

"When we did an x-ray of the offending cream, it didn't allow the x-ray to go through. It was radio-opaque," said pathologist Michael Chan at the Prince of Wales Hospital.

The experts called on consumers to be more skeptical about cosmetic company promises to whiten their skin.

"We do not know of any ingredient (used in cosmetics) that is effective and that has proven long-lasting effect in whitening the skin," said Lam. "There is not much cosmetics can do to improve (whiten) the complexion."

They called on consumers to use brands produced in countries with strict product labeling and which have good manufacturing practices, and to buy from reliable shops.

Governments must do their part, they said.

"We should have import restrictions. Imports without good, certified labels should not be allowed in," Lam said.

With manufactured skin-care products now under the microscope for traces of dangerous metals, women in Asia might find themselves turning to an age-old home remedy to temporarily whiten skin - yoghurt.

(US\$1 = HK\$7.8)

(Additional reporting by Kim Yeon-hee in Seoul)

http://today.reuters.com/news/articlenews.aspx?type=healthNews&storyID=2006-09-27T113546Z_01_SP136993_RTRUKOC_0_US-COSMETICS.xml

2. High Mercury Level in Beauty Items: Experts Sound Alarm

Arab News (<http://www.arabnews.com>) - 24/09/2006

JEDDAH, 24 September 2006 — Scientists at a Health Ministry laboratory have expressed concern about a skin whitening beauty product from Europe that has been shown to have elements of mercury inside — something which according to medical experts makes people susceptible to skin cancer.

The beauty products are being sold in the Kingdom contrary to Saudi government regulations, which ban the selling and import of beauty and skin products that include mercury.

A source within the Health Ministry told Arab News that the ingredients written on the product does not mention the inclusion of mercury.

Tests have also revealed that the product includes mercury and does not contain anything that would potentially whiten skin. The source also added that the name of the product would not be revealed until the full Health Ministry report is published.

"The beauty product entered the Kingdom through an illusionary company that is not registered or authorized to import such products. The buying and selling of this product is illegal because the company has not been registered and the product has not been approved by the Health Ministry to be sold in the Kingdom," the source said.

In order to stop the product entering the Kingdom, the Medical License Department at the Health Ministry has also issued directives to officials at sea, land and air entry-points.

The Ministry of Commerce is also presently in the process of warning companies and medical agencies in the Kingdom from using public advertising without coordinating with the relevant government departments.

The warning comes following news that the beauty product may have been advertised nationally. Most under scrutiny are herbal remedies and medical formulas that are unregistered and sold in pharmacies and herbal remedy shops.

Dr. Alawai Attas, plastic surgeon and consultant at King Fahd Hospital in Jeddah, said mercury in skin products is lethal.

"It can lead to kidney failure. The international percentage of mercury included in products is a fraction of ten in a thousand, which is known locally and internationally. Mercury in small amounts is used to integrate the basic ingredients in beauty products. If used in high levels it can make the skin become fair quickly but has serious side effects on other parts of the body."

Statistics shows that Middle Eastern women spend more than SR8 billion — of which SR4.2 billion by Gulf women alone — on make-up products, beauty products and beauty operations annually.

http://www.menafn.com/qn_news_story_s.asp?StoryId=1093128251

3. California Investigates Skin-Lighteners for Dangerous Mercury

New America Media, News Report, Ngoc Nguyen, Posted: Jan 27, 2012

<http://newamericamedia.org/2012/01/state-health-officials-investigate-skin-lighteners-for-dangerous-mercury.php>

[Image: Texas health officials linked several mercury poisoning cases to Crema Aguamary, a cosmetic produced in Mexico].

SAN FRANCISCO-- There could be a dark side to skin-lightening creams often found in stores that cater to ethnic communities.

Starting next week, California health officials will collect and test a sampling of skin-lightening products in the Bay Area for possible mercury contamination. Health officials launched the investigation in response to a spate of mercury poisoning cases linked to the tainted face creams that are made outside the United States.

A handful of cases emerged in the mid '90s, but it was a 2010 case involving a 39-year-old Latina and her family in Alameda County that spurred the state to action.

Coordinators of a health study found the East Bay resident with dangerously-high mercury levels, and notified state health officials.

An investigation traced the source of her mercury poisoning to an unlabeled jar of face cream, which relatives from Virginia had brought back from Mexico and given to her.

State health officials, working with their Virginia counterparts, identified in total 22 people who were exposed to mercury through similar face creams, including extended family and friends. The case was highlighted last week in the Center for Disease Control and Prevention's Morbidity and Mortality Weekly Report (MMWR).

"This is one of the first investigations of the problem within California," said Dr. Rupali Das, chief of Exposure Assessment and Environmental Health Branch of the state Department of Public Health and co-author of the MMWR report. "Why [we're focusing] attention on the issue now -- these cases have come to our attention here, we think it's enough of a problem to address it."

Last year, the state documented a dozen cases of mercury poisoning from tainted skin lighteners, Das says, and have anecdotal reports of at least another four cases.

Health problems from mercury exposure include "mental and neurological" symptoms, according to Dr. Mark Miller, director of the Pediatric Environmental Health Specialty Unit at UCSF and co-author of the MMWR report, which noted that some of those who were exposed to mercury experienced "numbness, tingling, dizziness, forgetfulness, headaches, and depression." Encountering high enough levels or chronic exposure can also harm the kidneys, Miller says.

The people profiled in the MMWR report said they used the face cream for “skin-lightening, fading freckles, and treating acne.” Mercury, a metal, is a highly effective skin lightener, because it blocks melanin, which gives hair and skin pigmentation.

“It’s effective. It’s just dangerous for you,” said Miller, adding that the FDA does not allow any mercury in products sold in the United States. He said all the products with dangerous mercury levels are here “illegally.”

Nationwide, state health departments are coming across scores of cases of mercury poisoning through skin-lightening products brought into the country from someplace else. Health officials in Texas, New York, and Minnesota have recently carried out investigations of skin-lighteners, and alerted the public about possible mercury contamination.

In 2010, the Chicago Tribune carried out an investigation of skin-lighteners sold in local stores and on the Internet, and found that out of 50 face creams, six contained “mercury levels banned by federal law.” The six products were made in “Lebanon, China, India, Pakistan and Taiwan.”

California health officials will begin to collect and test a sampling of skin-lightening products from store shelves in San Francisco, Oakland, and San Jose, said Lori Copan with the state health department. She says they will target ethnic stores and swap meets, catering to three “priority groups,” including Chinese, Filipino, and Latino.

In the cases documented last year by California health officials, most involved products that were brought into the state through people’s “personal luggage,” Copan said. The extended family profiled in the MMWR report brought the skin-lightening cream back from Mexico, while two other households bought them in local stores. The products were also made in Mexico.

Copan says the state health department issued alerts about mercury-laced skin-lighteners in 2010, and will be working with a statewide network of “promotoras” -- peer health educators -- to get information into hard-to-reach communities.

“It is very important. Ladies using the cream not only put it in her face, but using in [sic] her whole body,” said Vicky Avila, health educator with Vision y Compromiso in Redwood City, Calif. “They put the cream on babies...it’s a big problem for them.”

The case that prompted California health officials to issue a health alert in 2010 involved unlabeled products in white jars. Other state health departments have issued alerts about products made in Mexico with dangerous levels of mercury, including Crema de Belleza–Manning and Crema AguaMary.

Last year, researchers from UC Berkeley and UCSF, conducting a health study in collaboration with state health officials, found a Latina in San Francisco with high mercury levels, the source of which was eventually traced to her face cream. In that case, the cream was a U.S. brand name product that was purchased and likely adulterated in Mexico.

"It is not likely that U.S. brand name products for skin lightening would contain mercury. Though there is no real oversight by FDA," Copan said, adding that any skin-lightening product purchased abroad could be tainted.

California's health department advised consumers to avoid buying products that list "mercury," "mercurio," or "calomel" (mercurous chloride) on the label as well as unlabeled beauty products.

Health worker Avila says many of the women she sees prefer to buy products they are familiar with from their home countries, especially new immigrants who want to feel connected to their "roots" and culture.

Avila says the women load up on products when they travel to Tijuana or they may shop for the mat local Latino stores in California. Often times, the products may not be displayed on shelves, but carried in a backroom, so they must ask for them specifically.

"Women don't like to talk about it," Avila said. "They don't like to say where they bought it."

Signs of Mercury Poisoning

In adults

- Nervousness and irritability, difficulty with concentration, headache, tremors, memory loss, depression, insomnia, weight loss, fatigue, numbness or tingling in hands, feet, or around the lips.
- Mercury exposure can also affect the kidneys.

In children

- Symptoms include acrodynia (pain in extremities), irritability, anorexia, and poor muscle tone.

If you believe you are affected, contact: Poison Control Center 1-800-222-1222

Dispose of mercury-tainted products at local household hazardous waste facilities.

<http://www.dtsc.ca.gov/HazardousWaste/UniversalWaste/HHW.cfm>

Source: CA Dept. of Public Health

The Quicksilver Caucus is a coalition of state environmental association leaders working to reduce mercury in the environment.

More information on the Quicksilver Caucus can be found here:

http://ecos.org/section/committees/cross_media/quick_silver

The Quicksilver Caucus developed this report with grant support provided by U.S. EPA under Cooperative Agreement X5-83395401-3(-4).