The ABCs of Mercury Reduction

A how-to manual for designing, implementing and monitoring mercury reduction in your hospital
The ABCs of Mercury Reduction:
A how-to manual for designing, implementing and monitoring mercury reduction in your hospital

This workbook is a collaborative effort of
The University of Massachusetts Lowell, USA
The Institute for Development of Production and the Work Environment (IFA), Quito, Ecuador
The University of Sonora, Hermosillo, Mexico

Welcome!

This workbook can be found online at http://www.sustainableproduction.org/MercuryProject.resources.php

Thank you for visiting our Program’s website and its mercury reduction resources. These materials are being developed with funding from the U.S. EPA, over the period of June 2009 to May 2011. The workbook is one element of a package of materials available on this website to support international mercury reduction efforts. This document is a work in progress - coming soon are additional educational materials and support tools. Please check back often. Comments may be sent to Catherine_Galligan@uml.edu.

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Acknowledgements

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The workbook is modeled on the U.S. Centers for Disease Control and Prevention (CDC) workbook for occupational injury prevention, Workbook for Designing, Implementing, and Evaluating a Sharps Injury Prevention Program, 2008. We thank the CDC for their well-developed and high caliber workbook, which streamlined our efforts and allowed development of this EPA-funded mercury workbook in a timely and efficient manner. The CDC workbook is available online http://www.cdc.gov/sharpssafety/.

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Introduction & Overview

Introduction

Mercury is a persistent, bioaccumulative and toxic material (PBT). Exposure to elemental mercury in hospitals from spills or broken equipment, such as mercury-containing fever thermometers and blood pressure cuffs, is a serious problem for employees, patients and visitors. Waste mercury is also a concern for the global environment, as it can easily escape through the air, water and solid waste streams. Exposure to mercury is preventable through the careful choice of non-mercury medical products and through the methodical control of equipment or devices where mercury cannot be easily eliminated.

Another important aspect is that in many countries and regions, mercury is regulated by occupational and environmental policies including national laws, standards, rules and norms. Even if your location does not have mercury regulations at present, it is likely to in the future as international mercury reduction efforts expand further.

This workbook will guide you through a systematic, hospital-wide approach for education, assessment, and improvement of mercury-containing products and the practices related to mercury in your institution. It is based on a model of continuous improvement so that the workbook is appropriate for healthcare institutions at all different levels of experience in their mercury reduction efforts.

Methodology

The workbook uses a participatory strategy for mercury reduction and alternatives assessment that integrates environmental and human safety and health. What “participatory” means is that it actively engages all groups that are affected by a change.

The strategy recognizes that a rigid focus on one aspect of a problem, such as addressing only the environmental characteristic of a mercury product or practice, will not generate solutions that are sustainable over the long term. Instead, a successful mercury reduction program will consider how all the pieces come together: the hospital’s policies and practices, environmental characteristics of products, and how products are selected, used, maintained and disposed of in the hospital. The procurers and users of mercury devices are key players, to ensure that the necessary functions and pertinent characteristics are satisfied with any replacement products.

Pia: Move to section IV: For example, it is unrealistic to think that a $0.30 mercury fever thermometer that might go home with a patient can be replaced with a $10.00 digital thermometer, no matter how “perfect” the digital thermometer might be. It is equally unrealistic to think that an inaccurate but low cost digital thermometer is a viable alternative. Solutions need to consider many real-world aspects, including: how the products are used, what characteristics are critical, what alternative products are available locally, and the benefits and shortcomings of each of the alternative products.

The workbook will take you through the following series of logical steps. Tools and resources found in the Appendices will provide additional guidance.

- Developing organizational capacity to conduct mercury reduction
- Conducting a baseline assessment of mercury policies and practices
- Quantifying mercury use in the hospital
- Prioritizing and developing action plans
- Implementing action plans
Conducting a post-implementation assessment

How to Use the Workbook

The workbook contains a step-by-step plan to help you develop safe practices related to mercury, systematically remove mercury-containing products from your facility, carefully manage mercury devices that cannot be immediately replaced, and monitor the progress of the effort. The information in the workbook sections can be used to:

- Plan, launch and maintain a new mercury reduction program
- Enhance or build upon current activities in an ongoing program

The principles may also be applied to other pollution prevention or safety & health activities in your facility.

For those responsible for a hospital-wide mercury reduction effort, the workbook lays out a comprehensive strategy for the program. For teams working on a specific element of the hospital’s program, each workbook section is designed so that it can be used as a stand-alone unit. The tools and factsheets included in the appendices complement the workbook sections and provide guidance.

Target Audience

The audience for this information includes hospital administrators, department managers, clinicians, hospital staff, members of hospital committees and work teams, and individuals who are involved in mercury handling. Different sections of the workbook will be useful to different members of the hospital team, and sample forms and worksheets may be adapted to your specific needs.

Organizational Steps

The following sections describe organizational steps that comprise an effective mercury reduction program:

I. Develop organizational capacity: guidance to training and implementation
II. Baseline assessment
III. Quantifying mercury use
IV. Prioritizing and developing action plans
V. Implementing action plans
VI. Post-implementation assessment
I. Developing organizational capacity: guidance to training and implementation

Key points
- Establish a multidisciplinary leadership team for mercury reduction
- Launch the project within the hospital
- Create an institution-wide program
- Involve senior-level management

Toolkit resources for this Activity
- Matrix of training and review meetings for mercury reduction (Appendix I-1)
- Guidance notes for mercury reduction training – government and non-government stakeholders (Appendix I-2)
- Guidance notes for mercury reduction training – hospital staff (Appendix I-3)
- Sample PowerPoint presentation #1 (Appendix I-4)
- Sample PowerPoint presentation #2 (Appendix I-5)
- Link to video: Bowling Green State University Mercury Vapor Experiment (Appendix I-6)

What is organizational capacity? It is the infrastructure or the basic, underlying framework needed to carry out the mercury reduction program in your institution. This section provides the guidance for commencing the program.

The proposed model is an institution-wide program in which the responsibility is held jointly by members of a leadership team focused on mercury reduction. Representation of staff from across disciplines ensures that needed resources, expertise and perspectives are involved. The responsibility and authority for program coordination should be assigned to an individual with appropriate organizational and leadership skills. Representation from senior-level management is important to provide visible leadership and demonstrate the administration’s commitment to the program. The team should also include persons from clinical and laboratory department who use mercury devices, as well as staff members with expertise in infection control, employee training, environmental services, procurement/materials management, and waste handling.

Launch the Project

One of the first steps in a mercury reduction effort is to launch the project within the hospital. This is typically one or several meetings with hospital employees to communicate the hospital’s commitment to mercury reduction. In some cases, it will be combined with a broader commitment to mercury reduction and will include speakers from outside the hospital, such as a regional or international program.
The launch meeting will convey the following points:
- Welcome
- Overview of the meeting’s purpose and agenda
- The problem with mercury
- The hospital’s commitment to mercury reduction
- Endorsement of the project by speakers within and/or external to the hospital
- Next steps

After the launch meeting has taken place, the management-endorsed Mercury Reduction Leadership Team will be formed and will take responsibility for the mercury reduction project.

**Setting up a Mercury Reduction Working Group**

A mercury reduction working group is comprised of individuals from different areas of the hospital working together to eliminate mercury and to foster a culture of continuous improvement. The team leader should be someone with management responsibility who can ensure that the project is fully implemented. The team should include representation from all relevant departments and people who have a passion for and understanding of the focus on mercury reduction. This team is responsible for managing the mercury reduction project within the hospital by overseeing the execution of Steps II-VI in this manual.

Why is a diverse team beneficial?
- A facility-wide team that is looking at the whole picture can spot opportunities and can anticipate and provide effective solutions to obstacles.
- Diverse perspectives of members from different departments can challenge current practices and promote innovative solutions. A team can work together to create pilot projects.
- If each department is part of the process, there will be greater buy-in to changes in practices and products.
- A dedicated team can motivate the purchasing and other departments to implement new products and practices.

**Examples of Potential Participants in a Mercury Reduction Working Group**

<table>
<thead>
<tr>
<th>Potential Representatives</th>
<th>Contributions/Strengths</th>
</tr>
</thead>
</table>
| Administration/Senior Management *(Mandatory)* | - Communicate the organization’s commitment to elimination of mercury  
- Ensure personnel and fiscal resources are available to meet program goals |
| Clinical staff and Laboratory services staff | - Provide insight into current practices and use of mercury  
- Participate in pilot evaluations of proposed products and offer feedback on implications of new products or practices  
- Identify key product criteria  
- Serve as conduit between the team and clinicians/lab staff to facilitate communication, ensure buy-in and assist with training staff on new products/practices |
| Financial services | - Assist with financial justification for alternative products and practices |
| Purchasing/procurement, Materials management | - Help identify alternative products and manufacturers  
- Provide cost data for making informed decisions. |
| Housekeeping, waste management | - Provide insight into and ensure safe control of waste mercury  
- Assist with evaluation and implications of alternative products/practices |
<table>
<thead>
<tr>
<th>Department</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Services</td>
<td>• Provide insight into and ensure safe control of waste mercury&lt;br&gt;• Assess the environmental implications of proposed products</td>
</tr>
<tr>
<td>Operations (Physical plant, security, maintenance, operations)</td>
<td>• Provide insight into non-medical mercury use in the physical plant&lt;br&gt;• Assist with proper management of mercury in the plant</td>
</tr>
<tr>
<td>Infection control</td>
<td>• Ensure that alternative products/practices meet infection control needs</td>
</tr>
<tr>
<td>Food services, Laundry</td>
<td>• Participate in controlling mercury in equipment (e.g. freezer thermometers, candy thermometers, flame or temperature sensors in ovens, tilt/position switches in freezers or laundry washers &amp; dryers)</td>
</tr>
<tr>
<td>Communications/Public relations</td>
<td>• Communicate to employees, patients, visitors, and local community about the hospital’s commitment to a healthy environment through the reduction of mercury&lt;br&gt;• Promote successes&lt;br&gt;• Assist with educational outreach</td>
</tr>
</tbody>
</table>

Although the leadership team will include a core group, staff from additional areas might be invited to participate in a particular discussion or as part of a subgroup working on a specific task.
II. Baseline assessment of policies and practices

Key points
- Conduct a baseline assessment of policies and practices related to mercury
- Assess the hospital resources related to mercury or other areas where there might be synergies (e.g. glutaraldehyde elimination, integrated pest management, etc.)
- Consider policies, practices, spill response procedures, green teams, safety committees, EPP efforts, et cetera
- Identify roles in handling & managing mercury

Toolkit resource for this Activity
- Worksheet: Walk-through interviews and assessment (Appendix II-1)
- Sample mercury policies for hospitals (Appendix II-2)
- Sample summary report (Appendix II-4) – to be added
- Sample database record (Appendix II-5) – to be added
- List of national and local regulations and policies - Ecuador (Appendix II-6) – to be added
- List of national and local regulations and policies - Mexico (Appendix II-7) – to be added

The “baseline assessment” examines and records the policies or practices in your facility related to mercury at this point in time. It can include, for example, purchasing policies, spill clean-up procedures, what mercury products are used in each department and how they are used, whether mercury devices are sent home with patients, and whether alternative mercury-free products have been tried or are in use.

The baseline assessment serves multiple purposes:
- identifies existing policies/practices that can be built upon
- establishes a ground level from which subsequent progress (or non-progress) can be tracked
- facilitates periodic assessment of the effectiveness of the improvement activities
- provides for positive feedback when new levels are achieved
- shows whether the issues identified in the original baseline still exist
- allows one to see if new issues have emerged that need to be addressed
- allows self-assessment of progress

How to conduct the assessment

The assessment is done by interviewing people in the hospital who are knowledgeable about policies and practices related to mercury. Policies and practices may be written down or they may be informal, such as
verbal training on how to clean up a broken thermometer. Appendix II includes sample written policies from other hospitals; these samples can help an interviewer know what to look for as they are starting out. It may be more difficult to tease out the unwritten practices, which become so natural that a worker may not think of them when you ask. General questions are likely to reveal the practices, such as:

- Do you use any products that contain mercury? How do these products get selected and procured?
- Do the mercury products ever break? How are the pieces cleaned up?
- Do you have spill kits?
- What is done with the waste mercury from the broken device? Is it wrapped up or put in a container? Can you show me? Who is it given to for disposal?
- Does the same procedure get followed if something breaks at night or during the weekend (off-shift)?
- Who else cleans up or handles mercury? Do they do it the same way?
- Is there anyone else I should talk to about mercury handling in this department?

A key element of the interviews is that the interviewee and his/her department is not blamed or punished for what they say about how mercury is handled. The answers may reveal an urgent need for improving the practices and that is part of the process. It is important to remember that the assessment provides the baseline for improvement and a trusting relationship is essential for an effective and sustainable mercury reduction effort.

In addition to interviewing administrators, this evaluation will include interviews of procurement staff, front line workers, custodians, and others who have a direct link to the use of mercury. Members of the Mercury Reduction Leadership Team can help identify key interviewees and if appropriate, help with scheduling interviews. The tool “Walk-Through Interviews and Assessment” (Appendix II-1) is designed to capture the information from an interview that asks about written or informal procedures/practices, mercury-containing equipment, and mercury in labs and non-clinical areas.

There are several points worth noting:

- Typically, one worksheet is used for a single department or interviewee.
- The most important step is getting into the working areas of the hospital (clinical areas, labs, procurement office, environmental services, maintenance areas, waste storage) and working with the person in charge or their designee.
- The worksheet is designed to be used with a clipboard, allowing for information to be gathered during a hospital walk-through. Being out in the work area will provide a better understanding of the circumstances in which mercury products are used.
- Interviews can be conducted in a single, focused sweep or in shorter visits over the course of several days.
- There is nothing sacred about the form – notes can be written in the margins, on the backside, or on additional sheets of paper. If your interviews suggest additional questions that should be asked, ask them!
- You may find that no policies or documented practices, such as mercury clean up procedures, exist. Don’t feel that this is a failure in any way. The assessment is not a judgment, it is merely a written description of what the hospital does at this point in time.

Follow up to the walk-through assessment

After completing the interview(s), the findings should be summarized promptly to ensure that the key points are recorded and clearly stated. The summary report becomes the baseline for prioritizing improvement activities and for measuring future progress. A sample summary report is shown in Appendix II-4 (to be added).
The worksheets (notes) from individual departments should also be maintained on file by the leadership team. These notes can serve as a useful resource in future months.
III. Quantifying mercury use – the whys and hows of doing a mercury inventory

<table>
<thead>
<tr>
<th>Key points</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Conduct a baseline count (inventory) of mercury-containing products and materials in the facility</td>
</tr>
<tr>
<td>• Compile the findings into a database</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Toolkit resource for this Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Mercury inventory worksheet (Appendix III-1)</td>
</tr>
<tr>
<td>• Sample completed mercury inventory worksheet (Appendix III-2)</td>
</tr>
<tr>
<td>• Record sheet for inventory process (Appendix III-3)</td>
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The mercury inventory provides a detailed description of mercury in the hospital, including the type of mercury-containing product or material, where they are located and the number or amount of each type of product or material. This information is important for several reasons:
- It facilitates estimating the total amount of mercury in the hospital,
- It allows the team to gain consensus on the magnitude and extent of the hospital’s mercury use and to develop a prioritized strategy for eliminating the mercury,
- It helps explain the scope of the team’s work to someone outside the team, and
- It demonstrates the benefits of undertaking the mercury reduction work.

How to conduct the inventory

1. Distribute the worksheets to the designated contact in each department. To keep track of inventory activities, the Mercury Team may wish to keep a master list of the departments and contact person for each department.
   - Appendix III-1 Inventory worksheet
   - Appendix III-3 Record Sheet for Inventory Process

2. In each department, the designated staff member goes through department with the Mercury Inventory worksheet and locates all the mercury-containing products. For each product, he/she records a brief description of product and the quantity of that product in the department. If the product is a liquid or material measured by volume or weight, the appropriate measure should be recorded. For example: 10 unopened jars (125 g each) of mercuric oxide. 1 partially used jar approximately ½ full (~63 g).

   The staff member chosen to perform the inventory in his/her department should be familiar with the devices or materials used in that department and knowledgeable about how to identify mercury. (In clinical areas, most of the mercury will be in the form of a silvery liquid contained in a glass column or ampoule.)

3. The completed form is returned to the Mercury Leadership Team.

4. The Mercury Team (or designee) will compile the inventory information into a database.
5. The database will be used to estimate total amount of mercury, amount by department, et cetera that will be used to prioritize and develop action plans, as well as to measure progress over time.
IV. Prioritizing and developing action plans

Key points

- Toolkit resource for this Activity

  - Tools for prioritizing and developing action plans – to be added

- Criteria and methods for prioritizing mercury reduction efforts
  - Cost
  - Volume of mercury
  - Potential for spill
  - Ease

- How to find alternatives
- How to evaluate alternatives
- Case study – piloting mercury reduction in one area

Tools
Worksheets
V. Implementing action plans

Please check back later!

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<thead>
<tr>
<th>Key points</th>
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<table>
<thead>
<tr>
<th>Toolkit resource for this Activity</th>
</tr>
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<tbody>
<tr>
<td>• Fact sheet: Replacing mercury thermometers with digital thermometers (Appendix V-1)</td>
</tr>
<tr>
<td>•</td>
</tr>
</tbody>
</table>
VI. Post-implementation assessment

Please check back later!

Key points

- Toolkit resource for this Activity

  - Tools to be added

- How to monitor performance
- Using key indicators (from III) effectively
VII. Special Topics

Please check back later!

<table>
<thead>
<tr>
<th>Key points</th>
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</thead>
<tbody>
<tr>
<td>Toolkit resource for this Activity</td>
</tr>
<tr>
<td>• Mercury spill clean up (Appendix VII-1)</td>
</tr>
<tr>
<td>• Management of mercury containing waste (Appendix VII-2)</td>
</tr>
<tr>
<td>• Dental: Mercury Hygiene Guidance (Appendix VII-3)</td>
</tr>
<tr>
<td>• Dental: Best Management Practice for Amalgam Waste (Appendix VII-4)</td>
</tr>
</tbody>
</table>

A. Mercury Spill Clean Up
How to assemble a spill kit
How to clean up a spill

B. Management of Mercury Containing Waste
Non-dental
Dental
Appendices: tools & resources

Appendix I: Toolkit for Developing Organizational Capacity
   I-1 Matrix of training and review meetings for mercury reduction
   I-2 Guidance notes for mercury reduction training - government and non-gov’t stakeholders
   I-3 Guidance notes for mercury reduction training – hospital staff
   I-4 Sample PowerPoint presentation #1
   I-5 Sample PowerPoint presentation #2
   I-6 Bowling Green State University Mercury Vapor Experiment (video)

Appendix II: Toolkit for Baseline Assessment of policies and practices
   II-1 How to identify mercury policies in your hospital
   II-2 Sample mercury policies for hospitals
   II-3 Walk-through Interviews and Assessment (worksheet)
   II-4 Sample summary report
   II-5 Sample database record
   II-6 List of national and local mercury regulations and policies¹ - Mexico
   II-7 List of national and local mercury regulations and policies - Ecuador

Appendix III: Toolkit for Quantifying Mercury Use (Mercury inventory)
   III-1 Mercury Inventory worksheet
   III-2 Sample completed mercury inventory worksheet
   III-3 Record sheet for inventory process

Appendix IV: Toolkit for Prioritizing and Developing Action Plans

Appendix V: Toolkit for Implementing Action Plans
   V-1 Replacing Mercury Thermometers with Digital Thermometers (Fact sheet)

Appendix VI: Toolkit for Post-implementation Assessment

Appendix VII: Toolkit for Special Topics
   VII-1 How to prepare a spill kit
   VII-2 Mercury spill clean up (EPA)
   VII-3 Mercury Quick Facts: Cleaning up Mercury Spills in Your House & (Spanish) Datos basicos sobre el mercurio: Limpieza de los vertidos de mercurio en su hogar (EPA/ATSDR)
   VII-4 Dental: Mercury Hygiene Guidance & (Spanish) Recomendaciones para la Higiene de Mercurio (FDI)

¹ Regulations and policies may include national laws, standards, rules and norms that apply to mercury.
# GUIDANCE NOTES

## Matrix of Training & Review Meetings for the Mercury Reduction Project

*Guidance for planning and carrying out effective education sessions in your hospital*

<table>
<thead>
<tr>
<th>Type of Meeting:</th>
<th>Purpose of meeting:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Launch</strong></td>
<td>Formal launch of a mercury reduction project in your hospital. May include guests and dignitaries from government, partner NGOs, and other collaborators (e.g. university). Typically ceremonial as well as educational.</td>
</tr>
<tr>
<td><strong>Initial employee education session</strong></td>
<td>Employee education session featuring basic introduction to mercury &amp; its drawbacks, introduction to the hospital's plans for mercury reduction, and action plans/timing for addressing mercury in the hospital.</td>
</tr>
<tr>
<td><strong>Continuing education session</strong></td>
<td>In-depth focus on a particular topic that is part of the hospital's mercury reduction effort. Examples: conducting a mercury inventory, mercury spill clean up, mercury waste disposal, alternatives to mercury devices, introduction to The ABCs of Mercury Reduction (workbook), developing mercury policies for the hospital.</td>
</tr>
<tr>
<td><strong>Year end review</strong></td>
<td>Year end review of progress, barriers, and next steps (may be held at intervals other than yearly)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Topics to cover:</th>
<th>Welcome &amp; introductions</th>
<th>Participant assessment*</th>
<th>Mercury overview</th>
<th>Project or topic overview</th>
<th>Highlights of accomplishments &amp; obstacles</th>
<th>In-depth presentation on topic of interest</th>
<th>Evaluation of past year</th>
<th>Next steps</th>
<th>Participant assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Launch</td>
<td>√</td>
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<tr>
<td>Initial employee education session</td>
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<td>Continuing education session</td>
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<td>Year end review</td>
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* "Participant assessment" is a short evaluation of participant knowledge on the meeting topic, measured once at the start of the meeting and a second time at the end of the presentation*
# GUIDANCE NOTES FOR

**Year End Review Meeting**

## Option 1: Single meeting *(longer in duration; 5 hour session)*

<table>
<thead>
<tr>
<th>Time</th>
<th>Session (single session)</th>
<th>Led by</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30-9:00</td>
<td>Registration, opening, short participant assessment</td>
<td>Facilitator and hospital administrator</td>
</tr>
<tr>
<td>9:00-10:00</td>
<td>Technical training session: discuss specific mercury reduction topic(s) that hospital considers a priority</td>
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<tr>
<td>10:00-11:00</td>
<td>Review of the draft Mercury Reduction Workbook</td>
<td></td>
</tr>
<tr>
<td>11:00-11:15</td>
<td>Break</td>
<td></td>
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<tr>
<td>11:15-12:00</td>
<td>Discussion on the hospital’s written mercury reduction policy</td>
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<tr>
<td>12:00-13:00</td>
<td>Evaluation of the project’s first year. Identification of the project topics for Yr 2.</td>
<td></td>
</tr>
<tr>
<td>13:00-13:15</td>
<td>Closing remarks and post-training assessment</td>
<td>Facilitator and hospital representative</td>
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</tbody>
</table>

## Option 2: Two shorter meetings *(2.5 hour sessions)*

<table>
<thead>
<tr>
<th>Time</th>
<th>Session 1</th>
<th>Led by</th>
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<tbody>
<tr>
<td>8:45-9:00</td>
<td>Registration, opening, short participant assessment</td>
<td>Facilitator and hospital administrator</td>
</tr>
<tr>
<td>9:00-10:00</td>
<td>Technical training session: discuss specific mercury reduction topic(s) that hospital considers a priority</td>
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<tr>
<td>10:00-11:00</td>
<td>Review of the draft Mercury Reduction Workbook</td>
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<tr>
<td>13:00-13:15</td>
<td>Closing remarks and post-training assessment</td>
<td>Facilitator and hospital representative</td>
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<tr>
<th>Time</th>
<th>Session 2</th>
<th>Led by</th>
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<tbody>
<tr>
<td>8:45-9:00</td>
<td>Registration, opening, and short participant assessment</td>
<td>Facilitator and hospital administrator</td>
</tr>
<tr>
<td>9:00-10:00</td>
<td>Discussion on the hospital’s written mercury reduction policy</td>
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<tr>
<td>10:00-11:00</td>
<td>Devaluation of the project’s first year</td>
<td></td>
</tr>
<tr>
<td>11:00-11:15</td>
<td>Closing remarks and final participant assessment</td>
<td>Facilitator and hospital representative</td>
</tr>
</tbody>
</table>
Guidance note on the SHP mercury reduction training workshop for government and non-government stakeholders in Ecuador and Mexico

Objectives
The purpose of the mercury reduction training workshop is to:

- launch formally the UML-EPA Mercury Project in Mexico and Ecuador;
- ensure government and non-government stakeholders’ support to the Project;
- promote national and regional policies on mercury reduction in healthcare;
- produce a workshop statement that can be used as a mechanism to strive regional and national mercury reduction policies, programs, and other initiatives;
- promote the Project’s approach for other healthcare facilities.

Organizers
The UMASS Lowell’s Sustainable Hospitals Program (SHP) will organize the two training workshops (one in Mexico and one in Ecuador) jointly with the facilitating institutes of each country:
- Institute for the Development of Production and the Work Environment (IFA), Quito, Ecuador; and
- Department of Chemical and Biological Sciences, the University of Hermosillo, Sonora, Mexico.

These facilitators will select the most suitable training workshop venue, for example, within their own premises.

Participants
In the training workshop, the participating organizations may include representatives, for example, from the following organizations:
- Key government agencies administering public health, environmental protection, and occupational safety and health (OSH) policies (e.g. Ministries of Health, Environment, Labor);
- Non-government agencies – with a focus on public health, environmental protection, and OSH research and/or advocacy (e.g. trade unions and other non-profit organizations);
- Universities with significant programs on nursing, public health, OSH, and environmental protection;
- Healthcare industry representatives (participating hospitals, large healthcare organizations);
- Representatives of appropriate internationals organizations, if possible (e.g. EPA, World Health Organization, other).

The facilitators will identify and invite the most appropriate participating organizations to the training workshop.

Model program
A model program outline is presented on the next page. The facilitators will tailor the outline into a final agenda.

The 1st session. The training workshop starts with welcoming addresses by the UML representative, facilitators, and a prominent Government representative who places importance on the mercury reduction.

Refreshment break. The project will provide a small budget for refreshments and snacks.

Participant assessment. A brief participant assessment will be carried out as required by the EPA.

The 2nd session. The UML representative and facilitators will give a background presentation on the importance of mercury reduction in healthcare, existing international efforts, and specific aims of the UML-EPA Project.
The 3rd session. An appropriate government representative will give a presentation on existing mercury reduction policies or programs in Ecuador/Mexico and needed action/initiatives for the future.

The 4th session. An appropriate representative gives a presentation on past and present existing mercury reduction efforts in healthcare in Ecuador/Mexico. This presentation will highlight the following: what national and international healthcare-related mercury reduction efforts have been or are being carried out, achievements thus far, and lessons learned from these efforts (strengths and weaknesses).

The 5th session. A guided group work to promote important mercury reduction initiatives will be conducted. The participants will receive max 3-5 pages document containing thought-provoking illustrations (e.g. texts of existing mercury reduction policies, photos of mercury containing products with non-mercury alternatives, diagrams how mercury enters the environment, statistics/statements that highlight the magnitude of the global mercury problem (e.g. countries advising to limit the consumption of fish). The selected illustrations will be accompanied with 2-4 closed- and open-ended questions to prompt the participants to think concretely about mercury reduction initiatives: what can they do themselves and in which areas more systemic efforts are needed.

The 6th session. The workshop statement will be based on the participants’ answers to questions in the guided group work.

Final participant assessment. The same participant assessment will be repeated to measure the increased knowledge.

Closing remarks. The appropriate government representative, the UML representative, and the facilitators will thank the participants and remind them about the next important steps.

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>8.30 - 9.15</td>
<td>Registration, opening welcomes, and introduction</td>
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<tr>
<td></td>
<td>- Representatives of the key Government agencies</td>
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<td></td>
<td>- Rafael Moure</td>
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<td></td>
<td>- Facilitator</td>
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<tr>
<td>9.15-9.30</td>
<td>Refreshment break</td>
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<tr>
<td>9.30 – 9.45</td>
<td>Short participant assessment</td>
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<tr>
<td>9.30 – 10.15</td>
<td>Background to mercury reduction in healthcare</td>
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<td></td>
<td>- Rafael Moure</td>
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<td>- Facilitator</td>
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<tr>
<td>10.15-11.00</td>
<td>Presentation on existing national and regional mercury reduction policies</td>
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<td></td>
<td>- Selected government representative</td>
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<tr>
<td>11.00-11.45</td>
<td>Presentation on mercury reduction efforts in healthcare</td>
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<td></td>
<td>- Selected healthcare sector representative</td>
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<tr>
<td>11.45-12.30</td>
<td>Guided group work on needed mercury reduction policies, programs, and</td>
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<tr>
<td></td>
<td>other initiatives</td>
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<tr>
<td>12.30-12.45</td>
<td>Summary of the workshop statement</td>
</tr>
<tr>
<td>12.45-13.00</td>
<td>Final participant assessment</td>
</tr>
<tr>
<td>13.00</td>
<td>Closing remarks:</td>
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<td></td>
<td>- Government representative</td>
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<td>- Rafael Moure-Eraso</td>
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<td>- Facilitator</td>
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Guidance note on the SHP mercury reduction training for hospital staff in Ecuador and Mexico

Objectives
The purpose of the mercury reduction training in the participating Project’s hospitals include:

- launch formally the project work with the four participating hospitals;
- ensure that the hospital staff members who will be collaborating with the Project understand:
  - the basic concepts of mercury reduction in healthcare;
  - activities and expected outcomes of the Project;
- discuss appropriate approaches and any challenges anticipated in the Project’s activities;

Organizers
The training in each hospital will be organized jointly by:

- UMASS Lowell’s Sustainable Hospitals Program (SHP);
- The facilitating institute of Ecuador: the Institute for the Development of Production and the Work Environment (IFA); and
- The facilitating institute of Mexico: the Department of Chemical and Biological Sciences, the University of Hermosillo;
- each participating hospital of Ecuador/Mexico.

The facilitating institutes will select the venue that is most convenient to the hospital staff, for example, within the participating hospital’s training room.

Participants
The participants will include the frontline staff and department managers of the participating hospitals. In consultation with the hospital administrators/directors, the facilitators will identify and invite the most appropriate individuals.

Model program
A model program outline is presented on the next page. The facilitating institutes will tailor the outline into a final training agenda.

The 1st session. Each training event starts with welcoming addresses by the UML representative, the facilitating institute, and a director/administrator of the participating hospital.

Participant assessment. A brief participant assessment will be carried out as required by the EPA.

Refreshment break. The project will provide a small budget for refreshments and snacks.

The 2nd session. The UML representative and facilitators will give a background presentation on the importance of mercury reduction in healthcare, existing international efforts, and specific aims of the UML-EPA Project.

The 3rd session. An appropriate hospital representative on gives a presentation on past and present existing healthcare-related mercury reduction efforts in Ecuador/Mexico. This presentation will highlight the following: what healthcare-related efforts have been or are being carried out and by whom, achievements, and lessons learned from these efforts (i.e. strengths and weaknesses).
The 5th session. An interactive session – moderated by the UML representative and the facilitators – will go through all of the Project’s activities and specific tasks. The purpose of this session is to: (i) ensure that the key staff is clear what outcomes are expected, (ii) give a possibility to staff to suggest the best approaches and note the challenges, and (iii) clarify who will be doing what?

The 6th session. Based on the notes of the 5th session, next steps and future action items will be listed on a flip chart.

Final participant assessment. The same participant assessment will be repeated to measure the increased knowledge.

Closing remarks. A representative of the participating hospital, the UML representative, and the facilitators will thank the participants and remind them about the next important steps.

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>8.30 - 9.00</td>
<td>Registration, opening welcomes, and introduction</td>
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<tr>
<td></td>
<td>• Rafael Moure</td>
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<td></td>
<td>• Facilitator</td>
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<td>• Hospital administrator</td>
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<tr>
<td>9.00-9.15</td>
<td>Short participant assessment</td>
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<tr>
<td>9.15 – 9.30</td>
<td>Break</td>
</tr>
<tr>
<td>9.30 – 10.15</td>
<td>Background to international mercury reduction work and the importance of mercury reduction in the healthcare sector (45 min)</td>
</tr>
<tr>
<td></td>
<td>• Rafael Moure</td>
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<tr>
<td></td>
<td>• Facilitator</td>
</tr>
<tr>
<td>10.15- 11.00</td>
<td>Hospital presentation on mercury sources</td>
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<td>• Selected hospital representative</td>
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<tr>
<td>11.00-12.30</td>
<td>Interactive session on the upcoming project tasks (2 hrs)</td>
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<tr>
<td></td>
<td>• Rudimentary assessment and review of plans</td>
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<td></td>
<td>• Inventory</td>
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<td></td>
<td>• Implementing one alternative</td>
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<tr>
<td></td>
<td>• Posts-implementaton assessment</td>
</tr>
<tr>
<td>12.30-12.45</td>
<td>Summary of the next steps, action items.</td>
</tr>
<tr>
<td>12.45-13.00</td>
<td>Final participant assessment.</td>
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<tr>
<td>13.00</td>
<td>Closing remarks</td>
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<td></td>
<td>• Rafael Moure</td>
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<td>• Facilitator</td>
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<td>• Hospital representative</td>
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</tbody>
</table>
Sustainable Hospitals Program
University of Massachusetts Lowell

Catherine Galligan, Project Manager
www.sustainablehospitals.org

Sustainable Hospitals Program (SHP)
Reduce occupational and environmental hazards

Sustainable Hospitals Project
- In-hospital and field research
- Speak at meetings and conferences
- Technical literature
- Website of alternative products and practices (www.sustainablehospitals.org)

Mercury in Healthcare
- Why is mercury a problem?
- Environmentally Preferable Purchasing
- Alternative products

Mercury
- Elemental - medical instruments (liquid & vapor)
- Organic - methyl mercury (liquid)
- Inorganic - mercury salts (solid)

Why Mercury?
- Cohesive fluid
- Sensitive to temperature
- Favorable properties for pressure indication
- Good electrical conductor
So What’s the Problem?

Persistent

• long-lasting
• don’t break down easily
• difficult to clean up

Bioaccumulative

• Bioaccumulate in food chains and build up in the body

Toxic

• poisonous

So What’s the Problem? Pollution

Mercury contamination from:
• Spills from broken hospital devices
• Air pollution from coal
• Industrial waste

Because of this...

• More regulations and controls
Elemental Mercury

- Easily vaporizes
- Readily taken up from the lungs and delivered to brain and fetus
- $\text{Hg}^0$ oxidized in red blood cells, brain and fetus to $\text{Hg}^{2+}$
- Trapped by virtue of being ionized
- Neurological damage

Mercury in Fish

- Mercury enters the environment and collects in lakes and rivers
- Microorganisms convert mercury to methylmercury
- Methylmercury bioaccumulates in fish
- Biomagnification up the food chain

Atmospheric Transport of Mercury

- Mercury in the air is transported and deposited
- Microorganisms convert mercury to methylmercury
- Methylmercury is concentrated in fish

Methyl Mercury (Organic)

- Lipid-soluble
- Distributed to central nervous system
- Crosses placenta and concentrates in fat tissue and brain of fetus
- Oxidized to $\text{Hg}^{2+}$
- Neurological damage

Environmentally Preferable Purchasing:

- Reducing Waste, Hazards, and Cost At the Source

Moving up the food chain

- This process is called "bioaccumulation"

http://www.epa.gov/mercury/exposure.htm#comp

http://www.mercury.utah.gov/atmospheric_transport.htm

http://www.geocities.com/EPP_how_to_guide/
What is Environmentally Preferable Purchasing?
• Selecting products and services whose environmental impacts have been considered and found to be preferable to those of comparable alternatives.

What are the Benefits of EPP?
• Reduced impact on the environment from hospital operations
• Healthier environment for patients and employees
• Potential cost savings
• Positive publicity

Why Purchasing?
• Central point for procuring nearly every hospital product or service
• Money changes hands here
• Proactive pollution prevention

Keys to EPP Success
• A hospital policy to implement and support environmentally preferable purchasing
• Measurable goals
• Education of staff, patients, GPOs, manufacturers

Example of a Hospital Purchasing Policy
Kaiser Permanente

Kaiser Permanente’s RFPs state that Kaiser is:

- Favoring products that cause the least environmental harm
- Partnering with suppliers who demonstrate a commitment to environmental quality
- Collaborating with distributors, manufacturers, and suppliers in designing/refining products to minimize environmental impact

Kaiser asks vendors to submit information on:

- Vendor’s Sustainable Practices
- Pollution prevention attributes of products
- How products reduce solid waste
- Mercury content of products

Kaiser EPP Results

- Kaiser no longer procures:
  - Hg thermometers or sphygmomanometers
  - Certain Hg-containing lab products
- Kaiser recycles fluorescent lights
- Kaiser recycles xylene and alcohol
- Kaiser switched from latex to nitrile gloves

Examples of measurable goals

- Reduce purchase of mercury-containing products by 80% by next year.
- Increase purchase of recyclables or reusables by 30% by next fiscal year.
- Reduce packaging waste or total solid waste by 20% in 12 months.

Reducing Mercury With EPP

- Thermometers
- Sphygmomanometers
- Calibrators
- Gastrointestinal tubes
- Lab Chemicals
- Batteries, Lighting, Switches

Summary:

Mercury in Healthcare

- Mercury is a problem
- Environmentally Preferable Purchasing is a solution
- Alternative products have a good track record in many U.S. hospitals
Reducción del uso del Mercurio en el Sector Salud: Un Proyecto Colaborativo Global

Rafael Moure-Eraso, Ph.D., CIH
University of Massachusetts Lowell

INSTITUCIONES PATROCINANTES

US Environmental Protection Agency
EPA – Washington DC, USA

University of Massachusetts Lowell
UML – Lowell, USA

Corporacion para el Desarrollo de la Producción y el Medio Ambiente Laboral
IFAD – Quito, Ecuador

INSTITUCIONES PARTICIPANTES

ECUADOR
- Ministerio del Medio Ambiente del Ecuador
- Ministerio de Salud
- Hospital “Carlos Andrade Marín” – Quito
- Hospital General “Dr. Enrique Garcés” – Quito

MÉXICO
- Universidad de Sonora- Hermosillo, Sonora
- Ministerio de Salud
- Hospital Infantil Del Estado De Sonora -Hermosillo
- Hospital Integral de La Mujer – Sonora - Hermosillo

¿Qué es Mercurio? /Características
- Hg: Hydrargirous (nombre en Latin) Agua de Plata
- Componente natural de la geología de la Tierra
- Es un elemento, no se crea ni se destruye
- Con propiedades químicas y físicas únicas que ofrecen múltiples usos
- Extraído y utilizado durante siglos
- Altamente tóxico para los humanos y los animales

Porque preocuparse por el Mercurio?

Historia Dramática de la Toxicidad del Mercurio (Hg) I
- Figures históricas intoxicadas por el Mercurio:
  - Abraham Lincoln- reacciones violentas, comportamiento errático hasta que ceso uso de Hg como tratamiento médico
  - Wolfang Amadeus Mozart- muerte a 35, fallo renal, tratado con sales de mercurio por problemas “urinarios”.
  - “Sombrereros” – exposiciones ocupacionales a sombrereros que usaban mercurio metálico para preparar fieltros (Alicia en el País de las Maravillas)
Historia Dramática de la Toxicidad del Mercurio (Hg) II (Inhalación e Ingestión)

- Efectos Principales de Hg Metálico y Sales Inorgánicas
  - Cambios Neuro-siquiátricos – Irritabilidad, Depresión
  - Cambios Sensor motores - Tremores de manos y brazos
  - Efectos Pulmonares-Neumonitis
  - Efectos Renales – Neutrotoxica, Proteinuria

- Efectos Principales Hg Orgánico (CH₃-Hg, C₂H₅-Hg)
  - Problemas de la Piel - Dermatitis
  - Cambios Sensor motores – Tremores, Insomnio
  - Constricción del campo visual- Visión de Túnel
  - Cambios Neuro-siquiátricos – Irritabilidad, Depresión

Historia Dramática de la Toxicidad del Mercurio (Hg) III (Inhalación e Ingestión Pediátrica)

- Efectos Principales de Hg Metálico y Sales Inorgánicas
  - Agudos: Efectos Pulmonares-Neumonitis
  - Agudos: Acrodinia- Calambres, Erupción eritematosa (plantas pies-manos), sensación de hormigueo
  - Crónicos: Sistema Nervioso Central (SNC)- Pérdida de Memoria

- Efectos Principales Hg Orgánico (CH₃-Hg, C₂H₅-Hg)
  - Crónicos: Sistema Nervioso Central- Pérdida de habilidad de aprender (IQ bajos para niños que consumen pescado contaminado con CH₃-Hg- Estudios Epidemiológicos en Asia)

Antecedentes

- Se puede reducir el uso de instrumentos y productos que contienen mercurio
- La disposición de desechos de instrumentos o productos que contienen mercurio es una fuente importante de la contaminación en aire, suelo y agua (i.e. Incineración- la peor práctica)
- El sector de servicios de salud es una de las fuentes mayores de contaminación de mercurio. Sin embargo, es una fuente de contaminación muy susceptible a ser controlada (eliminación por sustitución)
- Instrumentos que contienen mercurio (p.e. termómetros, tensiómetros) se pueden romper y derramar mercurio elemental en áreas cerradas
- Exposición humana a mercurio elemental por inhalación
- Alternativas costo-efectivas de productos sin mercurio
  - para la mayoría de productos que contiene mercurio hay alternativas disponibles y rentables

El Mercurio es un Problema Global que requiere Soluciones Globales

El mercurio utilizado en el Sector Salud

- Mercurio metálico
  - Interruptores
  - medición de temperatura
  - medición de presión arterial
  - tubos-Sondas gastrointestinales
  - iluminación
  - amalgamas dentales
  - pilas
- Compuestos formulados
  - Reactivos en Laboratorios Clínicos
  - Conservantes, fungicidas, pigmentos, catalizadores

El ciclo del mercurio en el medio ambiente
Porque es el Mercurio un Problema

- Contaminación ambiental:
  - del Aire
  - de las Aguas (ríos, lagos, oceanos)
  - de Alimentos (pescado, semillas)
- Contaminación ocupacional de usuarios
  - hospitalarios
  - Mineros
  - Manufactureros (instrumentos, cloro, baterías, etc..)

Origen de la contaminación:
- Derrames por roturas de instrumentos en Hospitales – Disposición de deshechos médicos- Incineración
- Contaminación del Aire por uso de Carbón en la producción de electricidad
- Uso en manufactura (ocupacional- deshechos)

Políticas Globales
- En el año 2005 la Organización Mundial de la Salud (OMS/OPS) publicó una resolución llamando a tomar acciones a corto, mediano y largo plazo para sustituir (eliminar) productos médicos con mercurio por alternativas más seguras. (La OPS es la organización representante la OMS en SurAmerica)
- La Asociación Médica Mundial pasó una resolución en el año 2008 llamando a la sustitución de insumos con mercurio por alternativas más seguras.

Políticas Regionales
- La Unión Europea (EU) ha prohibido en el año 2008 el uso doméstico y en el sector salud de los termómetros con mercurio. La UE está considerando una prohibición similar para los esfigmomanómetros (tensiómetros).

Políticas Nacionales I
- En febrero de 2009, el Gobierno Argentino, a través de una resolución del Ministerio de Salud de la Nación, instruyó a los hospitales y centros de salud del país a no comprar más termómetros y tensiómetros de mercurio.
- Suecia, Holanda y Dinamarca han eliminado con éxito todos los productos médicos con mercurio, incluyendo los esfigmomanómetros.

Políticas Nacionales II
- En la última década el sector salud en Estados Unidos ha eliminado virtualmente los productos médicos con mercurio. Hoy en día es prácticamente imposible comprar un termómetro con mercurio en los Estados Unidos.
- En Estados Unidos treinta estados han prohibido los termómetros con mercurio y más de un tercio de la población estadounidense está amparada por leyes estatales restringiendo o prohibiendo los esfigmomanómetros con mercurio.
Políticas Nacionales III

- Desde 1980, Cuba ha implementado una política nacional de reemplazo de esfigmomanómetros con mercurio por tensiómetros sin mercurio que fueron comprados en China.
- El enfoque del gobierno Cubano en salud pública indujo a que se estableciera esta política en 1980, 25 años antes de que del OMS/OPS promulgara la resolución sobre eliminación del mercurio en el sector salud.

Hospitales y Sistemas de Salud I

Un número creciente de hospitales en países en vías de desarrollo se están encaminando hacia un cuidado de la salud libre de mercurio:
- En Filipinas más de 50 hospitales están trabajando para lograr un cuidado de la salud libre de mercurio.
- Dos hospitales en China están dando los primeros pasos hacia la sustitución del mercurio.

Hospitales y Sistemas de Salud II

- En India, más de una docena de hospitales tienen propuestas piloto de cuidado de la salud libre de mercurio
- Hospitales en México, Perú, Argentina, Honduras (estos son los países que conocemos los datos) han establecido planes de eliminación de mercurio en operaciones piloto en decenas de hospitales

Proyecto Eliminación de Mercurio en el Sector Salud – Ecuador

Colaboraciones:
- UML- Hospitales Sustentables
- US-EPA Oficina de Substancias Tóxicas
- IFA-Quito Ecuador
- Hospital "Carlos Andrade Marín" - Quito
- Hospital General “Dr. Enrique Garcés” – Quito

Objetivos del Proyecto

- **Objetivo 1**: Asistir Hospitales Piloto seleccionados en Ecuador y México para reducir o eliminar el uso de productos que contienen mercurio y mejorar el manejo de desechos contaminados con mercurio
- **Objetivo 2**: Proveer Ecuador y México con información sobre métodos de planificación para determinar la cantidad de equipos y productos que contienen mercurio en uso corriente en los hospitales y otras dependencias de los servicios de salud para el propósito de planear estrategias para su reducción o eliminación.
- **Objetivo 3**: Desarrollar capacidad de gestión en Ecuador y México de tal manera que este conocimiento pueda ser exitosamente replicado en hospitales adicionales

Fases/actividades del Proyecto

- Provisión de Entrenamiento Guías de Implementación
- Evaluación de Planes y Prácticas
- Evaluación de las oportunidades para la eliminación del uso del mercurio
- Plan de Desarrollo y Mejoramiento
- Evaluación de la Post-Implementación
Quienes somos?

La Estrategia P2OSH de SHP

CONCLUSION

Es Posible el Eliminar el Mercurio en el Sector Salud en el Ecuador?

Foco en Hospitales
Si hay Mercurio en nuestros hospitales

La herencia de contaminación en una sociedad basada en uso de productos tóxicos

Termómetros de Mercurio

- Tasa de rotura: 500 termómetros/mes en el HHN
- Contenido de mercurio aproximado/termómetro: 0.5 g

Esfigmomanómetros de Mercurio

- Contenido de mercurio aproximado/esfigmomanómetro: 80 g

Tubos/Sondas Gastrointestinales Mercurio

- En el HHN, contenido de mercurio aproximado/12 juegos: 3,000 g (3 kg)

Farmacia/ Laboratorio

Diagnostico de Fuentes de Mercurio en un Hospital Pediátrico en Central America

Total mercury amount 16.706 g (16.7 kg) quantified at HHN, in 2008.
Plan General: Eliminación del Uso del Mercurio

- Hacer un COMPROMISO
- Establecer un PLAN DE ACCION

1. Obtener el apoyo vigoroso de la administración del hospital
2. Formación de un Grupo de Trabajo: Determinar responsabilidades, Escoger un Departamento Piloto en el Hospital
3. Diagnóstico y inventario preliminar del uso de Mercurio (planear para inventarios periódicos)
4. Almacenamiento seguro equipo y productos en uso (corto plazo-largo plazo)

6. Capacitación y educación para personal médico y pacientes
7. La limpieza de los derrames del mercurio – maletines para controlar derrames
8. Compras libres de mercurio

Plan del Inventario I
- Áreas donde es común el uso de mercurio
  1. Atención al paciente (servicios médicos)
  2. Ingeniería y mantenimiento
  3. Laboratorio y farmacia
- Áreas donde están equipos desuso de mercurio
- Áreas de suministros
- Auditoria anual de instrumentos/reactivos con mercurio
  1. Identificar todos sus usos y fuentes

Plan del Inventario II
Investigar y identificar los dispositivos/productos que pueden ser reemplazados por alternativas libres de mercurio

1. de manera paulatina
2. de acuerdo a la disponibilidad presupuestaria

Inventario: cuantificar el mercurio total

| Equipos mercury | Contenido de mercurio cada (g) | Contenido de mercurio total (g) | Contenido de mercurio total (g) | Notas/observ.
|-----------------|-------------------------------|-------------------------------|-------------------------------|-----------------|
Plan para la disposición de desechos que contengan Mercurio

1. Desarrollar e implementar un programa de segregación para los residuos de mercurio mientras se pone en práctica el reemplazo (o en los casos en los que aún no están disponibles las alternativas)

2. El programa debe procurar una disposición final adecuada **evitando a toda costa la incineración** de dichos residuos

El manejo del almacenamiento de materiales que contienen Mercurio I

**Conocer el origen de los residuos de mercurio**

- **Instrumentos médicos**
  - Termómetros rotos
  - Mercurio metálico de equipos desusados
  - Esfigmomanómetros desusados
  - Tubos/Sondas gastrointestinales
- **Producto químico**
  - Residuo de amalgamas dentales
  - Químicos de laboratorio
  - Barametros/dispositivos para la medición de presión

El manejo del almacenamiento de materiales que contienen Mercurio II

**Conocer el origen de los residuos de mercurio**

- **Dispositivos eléctricos**
  - Lámparas fluorescentes
  - Termostatos
  - Interruptores
  - Relés datados

Etiquetar los productos y equipos: Almacenamiento temporal-desecho permanente

**Contiene Mercurio**  **Puede contener mercurio**

**Lámparas con mercurio**  **No quebrarlas al cambiar**

CAPACITACIÓN Y EDUCACIÓN
Capacitación y educación para personal médico y pacientes

Los programas de capacitación de gestión ambiental las consecuencias del uso de mercurio en el sector de la salud
1. la salud  
2. el ambiente

Informar al público sobre nuestra preocupación por
1. el ambiente  
2. la salud de la comunidad  
3. sobre las medidas tomadas para eliminar nuestro aporte de mercurio al medio ambiente

Limpieza de Derrames Pequeños

Ejemplos de los pequeños derrames:
1. Equipos rotos: termómetro o termostato  
2. Menos de 20 ml de mercurio derramado del esfigmomanómetro

Para cantidades superiores a 20 ml, póngase en contacto con personal especializado

Los pequeños derrames pueden ser limpiados de la madera, baldosas, linóleo o de otro tipo de superficies duras y lisas

En Caso de un Derrame 1

1. Aislar el derrame  
2. Mantener a la gente alejada de la zona del derrame  
3. Abrir puertas y ventanas exteriores para ventilar  
4. Desactivar el sistema de ventilación

En Caso de un Derrame 2

5. Retirar el mercurio de ropa, calzado y piel  
6. Notificar a la autoridad del hospital encargada de los derrames de mercurio  
7. Decidir quien va a limpiar el derrame: gente capacitada del departamento u otro personal especializado en el uso del Maletín de Emergencia para Limpiar Derrames

ADQUISICION DE PRODUCTOS LIBRES DE MERCURIO
Plan de Adquisiciones de Productos Libres de Mercurio

1. Priorización y sustitución del equipo médico
   - Identificación de riesgo de exposición
   - Identificación de contenido de Mercurio
2. Identificar las alternativas disponibles
3. Evaluar las alternativas
   - Como comparar los costos y la eficacia de las alternativas?
   - Identificar los proveedores de otros productos que no contengan mercurio

Priorización para la sustitución del equipo médico

<table>
<thead>
<tr>
<th>Prioridad</th>
<th>Equipos</th>
<th>Cantidad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muy alto</td>
<td>Tubos/Sondas Gastrointestinales</td>
<td>1 juego</td>
</tr>
<tr>
<td>Muy alto</td>
<td>Termómetros de fiebre</td>
<td>700</td>
</tr>
<tr>
<td>Alto</td>
<td>Termómetros de laboratorio</td>
<td>15</td>
</tr>
<tr>
<td>Mediano</td>
<td>Esfígmomanómetros</td>
<td>63</td>
</tr>
</tbody>
</table>

Productos y equipos libres de mercurio

Fuentes de Información para esta Presentación

1. Sustainable Hospitals. University of Massachusetts Lowell
   (www.sustainablehospitals.org/Mercuryresources.shtml) - Contrato UML-EPA-HQ-OPPT-2008-004
Bowling Green State University - Mercury Vapor Experiment

Bowling Green State University (BGSU), Bowling Green, Ohio, USA has produced a very effective video showing the vaporization of mercury. This can be found online at:


According to their website, “This video documents an experiment conducted by BGSU, Ohio EPA, and Rader Environmental Services. Toxic mercury vapors can not be seen with the naked eye. However, mercury vapors can create a shadow when placed between a short-wave ultraviolet light source and a fluorescent background.”
# Mercury Reduction in Ecuador and Mexico

A Joint Project of IFA and UMass Lowell, USA

*Fund by the U.S. Environmental Protection Agency*

**Walk-Through Interviews and Assessment**

Name of Facility:  
Location:  
Number of beds:  
Hospital Representative(s):  
Date:  

## I. Mercury policies and practices

<table>
<thead>
<tr>
<th>Written procedure?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What departments are responsible for environmental care at your hospital?</strong> (e.g. Health &amp; Safety, Maintenance/Facility, Industrial Hygienist, Environmental Department, Nursing, other)</td>
<td></td>
</tr>
<tr>
<td><strong>Written plans &amp; general training</strong></td>
<td></td>
</tr>
<tr>
<td>Does your facility have a Mercury Management Plan?</td>
<td></td>
</tr>
<tr>
<td>Train employees on mercury awareness?</td>
<td></td>
</tr>
<tr>
<td><strong>Purchasing guidance</strong></td>
<td></td>
</tr>
<tr>
<td>Does the facility have a purchasing policy which includes a commitment to purchase mercury-free products whenever possible?</td>
<td></td>
</tr>
<tr>
<td>Have a policy regarding the purchase of mercury-containing devices?</td>
<td></td>
</tr>
<tr>
<td>Require the manufacturer/vendor to disclose mercury concentrations?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase out mercury devices or components when replacing equipment (e.g. thermometers, temperature sensors)?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Identification of mercury containing products</strong></td>
</tr>
<tr>
<td>Does the facility have equipment and supplies that contain mercury been identified?</td>
</tr>
<tr>
<td>Centrally track or have an inventory form for mercury products?</td>
</tr>
<tr>
<td>Label the equipment as containing mercury?</td>
</tr>
<tr>
<td>Inventoried and labeled all mercury-containing facility devices (switches, thermostats, etc.)?</td>
</tr>
<tr>
<td><strong>Spills and handling of liquid mercury</strong></td>
</tr>
<tr>
<td>Does the facility train employees how to properly respond to and clean up a mercury spill?</td>
</tr>
<tr>
<td>Have a policy or guidance on how to clean up a mercury spill?</td>
</tr>
<tr>
<td>Have a spill kit in each department or area? If so, is it stored in a designated or clearly identified area? Who is responsible for replacing the used spill kit or missing items?</td>
</tr>
<tr>
<td>Have procedures for cleaning and refilling instruments with mercury?</td>
</tr>
<tr>
<td>Estimate the number of spills of mercury in the facility last year? #__________ or _Don’t know</td>
</tr>
<tr>
<td>Estimate the amount of mercury involved in spills last year?</td>
</tr>
</tbody>
</table>
### Waste

Does the facility have employees been trained on the correct procedures for segregating mercury waste?

Have procedures for controlling mercury at the end of a device’s service life?

How is the mercury containing waste stored in the facility? Is the area clearly marked? Is access to the waste limited (e.g. to trained staff)

Have a protocol for disposal of intact mercury-containing products?

Does the facility completely drain and recycle all residual mercury from thermometers, blood pressure reservoirs, and other medical devices prior to discarding the equipment?

Recycle mercury containing parts when you replace old equipment (e.g. remove and recycle mercury switches)?

Have a policy to ensure that mercury is not flushed down the drain?

Clean mercury out of pipes?

### Issue mercury thermometers

Send patients or new mothers home with mercury thermometers? What circumstances (e.g. monitoring H1N1 flu, newborns)?

   If so, how many are issued each year?
**Issue mercury thermometers**

Send patients or new mothers home with mercury thermometers? What circumstances (e.g. monitoring H1N1 flu, newborns)?

If so, how many are issued each year?

---

**II. Mercury equipment**

*Does your facility or its satellites use or purchase:*

- Mercury thermometers
- Mercury sphygmomanometers
- Mercury lamps (fluorescent lights)
  
  Are spent lights recycled?
- Mercury weighted esophageal dilators
- Mercury weighted Cantor tubes
- Mercury weighted Miller Abbott tubes
- Mercury weighted feeding tubes
- Mercury containing dental amalgams

Reference: Questions for this assessment were taken from multiple sources, including "Environmental Self-Assessment for Health Care Facilities: A Checklist for Pollution Prevention, May 2001; The Mercury Challenge Handbook: The Opportunity to Become a Mercury-Free Facility, May 2001; EPA New England Hospital Environmental Assessment Template, EPA 001-F-04001, April 2001; Mercury Pollutant Minimization Program Guidance Manual for Municipalities, Wisconsin Dept. of Natural Resources; DNR Pub-WT-831 2006."
## Thermostats with mercury switches

## Gauges with liquid mercury

## Equipment with mercury switches

## Mercury Barometers

## Other mercury containing equipment

<table>
<thead>
<tr>
<th>III. Mercury in labs and non-clinical areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has your facility examined and inventoried mercury-containing laboratory chemicals?</td>
</tr>
<tr>
<td>Are mercury thermometers used in labs or non-clinical areas?</td>
</tr>
<tr>
<td>Are other mercury devices in use? (barometers, hydrometers, hygrometers)?</td>
</tr>
</tbody>
</table>

Examples of Mercury Polices & Documented Practices


MWRA / MASCO MERCURY WORK GROUP
PHASE II MERCURY MANAGEMENT SUBCOMMITTEE
MERCURY MANAGEMENT GUIDEBOOK (May 1999)

From the Guidebook:

Guidebook Purpose and Content

This Guidebook is a product of the Phase II MWRA/MASCO Mercury Work Group, Mercury Management Subcommittee, Mercury Management Plan Subgroup. It can be used as a reference by industrial facility owners in the development of a Mercury Management Plan to solve sewer discharge compliance problems. The plan of action may involve initiation of a source reduction program or enhancement of an existing one, and it may also involve implementation of an industrial wastewater pretreatment strategy.

This Guidebook is intended to help owners of industrial facilities to understand the process of identifying, reducing, and eliminating sources of mercury; provide information on methods for monitoring and treating mercury discharges; and present industry-specific case studies on mercury sources and successful control programs. Several subject areas and processes are highlighted that may help MWRA-permitted sewer dischargers to find solutions to mercury compliance problems.

The Mercury Management Subcommittee of the MWRA/MASCO Mercury Work Group hopes that this Mercury Management Guidebook will be a valuable and practical tool for many facilities, providing insight into the many variables associated with creating and successfully implementing a comprehensive Mercury Management Plan.

Sutter Health’s Policy for Mercury-free Purchasing


Examples of Mercury Purchasing Language
Source: Sustainable Hospitals Project

Mercury Free Resolution and Purchasing Policy
SOURCE:Dartmouth Hitchcock Medical Center

DHMC endorsed a resolution to be a "mercury free" facility. (See below). The resolution states:

BE IT FURTHER RESOLVED that DHMC should discontinue the purchase of new mercury containing equipment where other non-hazardous alternatives are available such as aneroid sphygmomanometers and non-mercury thermometers, and that existing mercury devices should be replaced with non-hazardous devices whenever possible, and strongly encourages the elimination or reduction of mercury and mercury compounds in any process or procedure
Appendix II-2

performed at DHMC.

In support of this resolution, DHMC has adopted the following purchasing policy:

1. DHMC will inform manufacturers, vendors, and group purchasing organizations (GPOs) of its non-mercury purchasing policy, and will encourage them to identify and label products containing mercury, and to offer non-mercury alternative products whenever feasible alternatives exist that do not compromise patient care.

2. Supplier shall represent and warrant in the purchase agreement and with the submission of this Policy that the products proposed to be furnished under any purchase agreement do not contain mercury.

3. If the products proposed do contain mercury, it must be identified and listed in an exhibit to this Policy. Supplier shall specify the amount of mercury contained in any products listed in this exhibit and indicate if a feasible mercury-free alternative is available.

A Resolution in Support of a Mercury Free Initiative
Dartmouth Hitchcock Medical Center

WHEREAS elemental mercury and mercury compounds are known to be hazardous to human health and the environment and are a potential source of exposure to patients, visitors and staff, and

WHEREAS the DHMC Hazard Communication Policy and the "List Of Highly Restricted Hazardous Materials" requires consideration of less hazardous alternatives, and

WHEREAS DHMC has experienced 69 mercury spills since 1994 resulting in a cost of $25,800 for cleanup, labor and disposal costs, and

WHEREAS mercury continues to be a dangerous and persistent pollutant recognized as a bio-accumulative toxin and is largely responsible for federal advisories against the consumption of fish, and

WHEREAS DHMC is participating in the "AHA/EPA Memorandum of Understanding" process to eliminate mercury from health care, and

WHEREAS EPA New England is encouraging hospitals in the region to participate in the "Mercury Challenge Program" to find alternatives to using mercury in health care equipment and products, and

WHEREAS the state of New Hampshire "Mercury Reduction Strategy" report identifies the health
care industry as a major source of mercury pollution, and

WHEREAS the DHMC Statement of Environmental Principles confirms DHMC’s commitment to improving environmental management throughout the organization, and that DHMC will manage, minimize and eliminate, whenever possible, the use of hazardous materials, and

WHEREAS DHMC continues to be committed to the health and welfare of the people and communities we serve and the environment we all share, and

WHEREAS there are recognized and widely accepted alternatives to mercury and mercury containing devices in health care.

NOW THEREFORE LET IT BE RESOLVED that the Environmental Resources Committee and the Safety Committee hereby supports, endorses and commends all efforts consistent with institutional goals and financial considerations to eliminate and/or reduce mercury use at DHMC.

BE IT FURTHER RESOLVED that DHMC should discontinue the purchase of new mercury containing equipment where other non-hazardous alternatives are available such as aneroid sphygmomanometers and non-mercury thermometers, and that existing mercury devices should be replaced with non-hazardous devices whenever possible, and strongly encourages the elimination or reduction of mercury and mercury compounds in any process or procedure performed at DHMC.

____________________________  ______________________
Chairperson, ERC

____________________________  ______________________
Chairperson, Safety Committee

Mercury Reduction
SOURCE: Kaiser Permanente

Kaiser Permanente is committed to minimizing the amount of mercury utilized in its operations, and desires to avoid the acquisition of products that contain mercury whenever feasible alternatives exist that do not compromise patient care.

Supplier shall represent and warrant in the purchase agreement and with the submission of this
Proposal that the products proposed to be furnished under any Agreement do not contain mercury, except as identified and listed in an exhibit to this Proposal. Supplier shall specify the amount of mercury contained in any products listed in this exhibit and indicate in the Proposal if a feasible mercury-free alternative is available.

**Purchasing Procedure Mercury Abatement Policy**
Source: Butterworth Hospital

The Purchasing Department will make every attempt to not purchase any product that contains mercury. This list of products includes, but is not limited to, sphygmomanometers, diffusion pumps, esophageal, and mercury electrodes.

The Purchasing staff will work with the requisitioning department to find alternate products to acquire in place of the products that contains mercury. For example, Disposable thermometers will be replaced by digital thermometers or disposable temperature strips. Mercury filled sphygmomanometers will be replaced with digital sphygmomanometers.

The environmental Services Director will be notified if the mercury containing product has to be purchased because there is no substitute product available.
Inventario de Mercurio
Modificado del formato de Proyecto HNN-MINAET-CCSS-EPA para
la Reducción del Uso de Mercurio en el Hospital de Nacional de Niños, Costa Rica

Nombre del Hospital: _______________________________  Nombre del Departamento: ______________________________________________________
Fecha del Inventario: _______________________________  Persona Responsable del Inventario: ________________________________________________

<table>
<thead>
<tr>
<th>Aparatos/ equipos/ instrumentos mercurio</th>
<th>Cantidad</th>
<th>Notas/ observaciones</th>
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</tbody>
</table>

Look for mercury-containing products, including thermometers (fever, laboratory, freezer), blood pressure devices with a mercury column, switches containing visible mercury, barometrics, laboratory chemicals (e.g. thimersol), liquid and power mercury for dental fillings, other.

ABCs of Mercury Reduction:
Mercury Inventory Worksheet
Inventario de Mercurio
Modificado del formato de Proyecto HNN-MINAET-CCSS-EPA para
la Reducción del Uso de Mercurio en el Hospital de Nacional de Niños, Costa Rica

Nombre del Hospital: **General Hospital**
Nombre del Departamento: **Pediatrics**
Fecha del Inventario: **23/2/10**
Persona Responsable del Inventario: **Pia Markkanen**

<table>
<thead>
<tr>
<th>Aparatos/ equipos/ instrumentos mercurio</th>
<th>Cantidad</th>
<th>Notas/ observaciones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever thermometer</td>
<td>12</td>
<td>Stored in cabinet (new; unused)</td>
</tr>
<tr>
<td>Fever thermometer</td>
<td>5</td>
<td>In examination rooms</td>
</tr>
<tr>
<td>Sphygmomanometer</td>
<td>2</td>
<td>In examination rooms, mounted to wall</td>
</tr>
<tr>
<td>Sphygmomanometer</td>
<td>5</td>
<td>Portable devices stored on shelf – 1 of the 5 is broken and not being used.</td>
</tr>
</tbody>
</table>

Look for mercury-containing products, including
- Thermometers (fever, laboratory, freezer)
- Blood pressure devices with a mercury column
- Switches containing visible mercury
- Barometrics
- Laboratory chemicals (e.g. thimersol)
- Liquid and power mercury for dental fillings
- Other
# Record Sheet for Inventory Process

*This summary tool can be used to help the Mercury Team keep track of inventory activities.*

<table>
<thead>
<tr>
<th>Completed</th>
<th>Inventory request: Date issued</th>
<th>Inventory worksheet: Due date</th>
<th>Department &amp; Contact Person</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Department</td>
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<td></td>
<td></td>
<td>Contact person &amp; phone number</td>
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<td>Contact person &amp; phone number</td>
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<td>Contact person &amp; phone number</td>
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<td></td>
<td>Department</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Contact person &amp; phone number</td>
<td></td>
</tr>
</tbody>
</table>
Re replacing Mercury Thermometers with Digital Thermometers

The purpose of this factsheet is to encourage healthcare administrators to replace mercury fever thermometers with digital thermometers. Mercury is a persistent, bio-accumulative, toxic material that can harm the brain, heart, kidneys, lungs, and immune system of people of all ages. (Reference: U.S. EPA) When a mercury thermometer breaks, spilled mercury can evaporate and become an invisible, odorless toxic vapor. For this reason, efforts are underway globally to eliminate the use of mercury-containing medical devices.

The transition may not be an easy one because the cost increases seem to be enormous: the purchase price of a digital thermometer can be ten times or greater than the price of a mercury thermometer. The following section lays out a number of facts explaining why digital thermometers are indeed preferable and cost effective in the long run.

Advantages and cost-saving elements of digital thermometers

Digital thermometers avoid the shortcomings of glass/mercury thermometers and are appealing for several reasons:

- Digital thermometers are **easier and faster to use**: “Shaking down” the thermometer is eliminated. The digital thermometer senses and then beeps to indicate that the temperature reading is ready to be recorded. The digital readout can be read easily, compared with having to assess the mercury level and read the temperature scale divisions on the glass tube.
- The **risks of broken glass and exposure to mercury spills are eliminated**, as well as the time needed to clean up and safely dispose of mercury from a broken thermometer. Avoiding exposure to mercury is healthier for hospital workers, patients and visitors.
- It is likely that **fewer thermometers will be purchased each year**. Eliminating the need to shake down the thermometer decreases the likelihood of dropping and breaking the device, whether it is glass or digital. Patient-related breakage, including young patients biting on the thermometer and patients accidentally dropping the thermometer, are also eliminated.

The higher up-front cost of digital thermometers is the price a hospital pays for ease of use, reduced breakage, reduced need for replacement thermometers, a healthier environment and prevention of long term health effects caused by mercury exposure. Numerous interviews with digital thermometer users provide convincing evidence that the digital devices are viable and well-received in health care facilities.

(Continued, next page)

Important considerations for selecting digital thermometers
Accuracy - With the variety of digital thermometers available, it is essential to ensure the quality of the tool you select. One way to do this is to seek thermometers that have been tested and shown to meet voluntary standards set by the American Society of Testing and Materials (ASTM). The following table shows the maximum error allowed under the ASTM standards. (Glass/mercury and digital thermometers have the same requirements over the range of 96.4 - 106 °F.)

<table>
<thead>
<tr>
<th>Thermometer Type</th>
<th>Maximum Error over Temperature Range Shown</th>
<th>°C</th>
<th>°F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Celsius Scale:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mercury in Glass</td>
<td>+0.3 °C to +0.1 °C</td>
<td>35.8 °C to &lt;37 °C</td>
<td>+0.2 °C to +0.1 °C</td>
</tr>
<tr>
<td>Digital Thermometers</td>
<td>+0.3 °C to +0.2 °C</td>
<td>35.8 °C to 37.0 °C</td>
<td>+0.2 °C to +0.1 °C</td>
</tr>
</tbody>
</table>

| **Fahrenheit Scale:**     |                                          |    |    |
| Mercury in Glass          | +0.4 °F to +0.2 °F                       | 96.4 °F to <98.0 °F | +0.3 °F to +0.2 °F | 98.0 °F to 102.0 °F | +0.3 °F to +0.2 °F | >102 to 106 °F | +0.3 °F to +0.2 °F | >106 °F | +0.4 °F |
| Digital Thermometers      | +0.5 °F to +0.3 °F                       | 96.4 °F to 98.0 °F | +0.3 °F to +0.2 °F | 98.0 °F to 102.0 °F | +0.3 °F to +0.2 °F | >102 to 106 °F | +0.3 °F to +0.2 °F | >106 °F | +0.5 °F |


Batteries – A drawback to digital thermometers is that most use miniature batteries, which have their own environmental impact. When you are evaluating different devices, ask the manufacturer or supplier how the thermometer is powered. There are solar powered digital thermometers on the market that completely eliminate the need for batteries. While preferable, they cost considerably more; on the order of 65% higher in cost than battery powered thermometers. If you choose a thermometer that uses a miniature battery, make sure that the battery can be replaced. Otherwise, you will have to discard the entire device when the battery wears out. Because the batteries contain metals, salts, acids and plastics, the spent (dead) batteries should be collected and recycled, rather than put in the trash.

Flexible Tips – When possible, it is best to avoid thermometers with flexible tips. Some digital thermometers have flexible tips made out of polyvinyl chloride (also called “PVC” or “vinyl”). The purpose of the flexible tip is to make the thermometer more comfortable for the patient. However PVC has both known and suspected health and environmental shortcomings at all stages: during manufacture, in use as a medical device, and after disposal. During use, a concern is that plasticizers -- additives used to make the PVC flexible (and hence more comfortable for the patient) -- can slowly leach from the PVC. There are sufficient questions about safety to avoid PVC when possible.

Evaluate alternative products – Ask for samples. A hands-on look at the digital thermometers is essential. If the samples look promising, do a small scale clinical trial in the hospital. Look closely at employee feedback. This will help rule out inferior devices or, from criticism and questions raised, will identify key points to communicate during widespread introduction and training for the new thermometers. When you buy a new device, consider using the manufacturer’s representative for training staff and to introduce the new product to all the different departments in the hospital. Encourage staff members to question and offer constructive criticism to the manufacturer’s representative. The representative is a direct link back to the design engineers and this is one way products get refined and improved.

Keep purchasing agreements flexible – The first thermometer you select may prove over time to have drawbacks that you don’t want to live with. Make sure you have the freedom to procure different thermometers if this happens.

Be prepared for uncertainty when selecting a product – There are no perfect products. For example, which is preferable: a solar-powered thermometer with a PVC flexible tip or a battery-powered thermometer without PVC? In situations like this, see if the supplier has a product with the best of both alternatives: a solar powered thermometer without PVC. Look at the bigger picture for guidance. Finally, remember that either type of digital thermometer is safer than a mercury thermometer.
The following information is taken from the EPA webpage http://www.epa.gov/mercury/spills/ (accessed 5/4/10). Although it was developed for in-home spills, the methods are also suitable for hospitals. Please refer to the website for the full text.

**Mercury Releases and Spills**
http://www.epa.gov/mercury/spills/

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**Cleanups and Proper Disposal**
Humans use mercury in a variety of manufacturing processes and products such as thermometers and fluorescent bulbs. If you improperly dispose of products with mercury in them, they may break and release mercury vapors which are harmful to human and ecological health.

**What Never to Do After a Mercury Spill**
- Never use a vacuum cleaner to clean up mercury (but see the "What to Do if a Fluorescent Light Bulb Breaks" section below for more specific instructions about vacuuming broken fluorescent light bulbs). The vacuum will put mercury into the air and increase exposure.
- Never use a broom to clean up mercury. It will break the mercury into smaller droplets and spread them.
- Never pour mercury down a drain. It may lodge in the plumbing and cause future problems during plumbing repairs. If discharged, it can cause pollution of the septic tank or sewage treatment plant.
- Never wash clothing or other items that have come in direct contact with mercury in a washing machine, because mercury may contaminate the machine and/or pollute sewage. Clothing that has come into direct contact with mercury should be discarded. By "direct contact," we mean that mercury was (or has been) spilled directly on the clothing. For example:
  - if you broke a mercury thermometer and some of elemental mercury beads came in contact with your clothing, or
  - if you broke a compact fluorescent bulb (CFL) so that broken glass and other material from the bulb, including mercury-containing powder, came into contact with your clothing.

You can, however, wash clothing or other materials that have been exposed to the mercury vapor from a broken CFL, like the clothing you happened to be wearing when you cleaned up the broken CFL, as long as that clothing has not come into direct contact with the materials from the broken bulb.
- Never walk around if your shoes might be contaminated with mercury. Contaminated clothing can also spread mercury around.

**What to Do if a Fluorescent or Other Mercury-Containing Light Bulb Breaks**
Compact fluorescent lights (CFLs) are lighting more homes than ever before, and EPA is encouraging Americans to use and recycle them safely. Carefully recycling CFLs prevents the release of mercury into the environment and allows for the reuse of glass, metals and other materials that make up fluorescent lights.

<table>
<thead>
<tr>
<th>Types of Mercury-Containing Bulbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluorescent bulbs, which include linear, U-tube and circline fluorescent tubes, bug zappers, tanning bulbs, black lights, germicidal bulbs, high output bulbs, cold-cathode fluorescent bulbs, and compact fluorescent bulbs;</td>
</tr>
<tr>
<td>High intensity discharge bulbs, which include metal halide, ceramic metal halide, high pressure sodium, and mercury vapor;</td>
</tr>
<tr>
<td>Mercury short-arc bulbs; and</td>
</tr>
<tr>
<td>Neon bulbs.</td>
</tr>
</tbody>
</table>

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This information is from the U.S. EPA:
Mercury Releases and Spills
Fluorescent light bulbs contain a very small amount of mercury sealed within the glass tubing. EPA recommends the following clean-up and disposal below. Please also read the information above about what Never to Do After a Mercury Spill.

**Before Clean-up: Air Out the Room**
- Have people and pets leave the room, and don't let anyone walk through the breakage area on their way out.
- Open a window and leave the room for 15 minutes or more.
- Shut off the central forced-air heating/air conditioning system, if you have one.

**Clean-Up Steps for Hard Surfaces**
- Carefully scoop up glass pieces and powder using stiff paper or cardboard and place them in a glass jar with metal lid (such as a canning jar) or in a sealed plastic bag.
- Use sticky tape, such as duct tape, to pick up any remaining small glass fragments and powder.
- Wipe the area clean with damp paper towels or disposable wet wipes. Place towels in the glass jar or plastic bag.
- Do not use a vacuum or broom to clean up the broken bulb on hard surfaces.

**Clean-up Steps for Carpeting or Rug**
- Carefully pick up glass fragments and place them in a glass jar with metal lid (such as a canning jar) or in a sealed plastic bag.
- Use sticky tape, such as duct tape, to pick up any remaining small glass fragments and powder.
- If vacuuming is needed after all visible materials are removed, vacuum the area where the bulb was broken.
- Remove the vacuum bag (or empty and wipe the canister), and put the bag or vacuum debris in a sealed plastic bag.

**Clean-up Steps for Clothing, Bedding and Other Soft Materials**
- If clothing or bedding materials come in direct contact with broken glass or mercury-containing powder from inside the bulb that may stick to the fabric, the clothing or bedding should be thrown away. Do not wash such clothing or bedding because mercury fragments in the clothing may contaminate the machine and/or pollute sewage.
- You can, however, wash clothing or other materials that have been exposed to the mercury vapor from a broken CFL, such as the clothing you are wearing when you cleaned up the broken CFL, as long as that clothing has not come into direct contact with the materials from the broken bulb.
- If shoes come into direct contact with broken glass or mercury-containing powder from the bulb, wipe them off with damp paper towels or disposable wet wipes. Place the towels or wipes in a glass jar or plastic bag for disposal.

**Disposal of Clean-up Materials**
- Immediately place all clean-up materials outdoors in a trash container or protected area for the next normal trash pickup.
- Wash your hands after disposing of the jars or plastic bags containing clean-up materials.
- Check with your local or state government about disposal requirements in your specific area. Some states do not allow such trash disposal. Instead, they require that broken and unbroken mercury-containing bulbs be taken to a local recycling center.

**Future Cleaning of Carpeting or Rug: Air Out the Room During and After Vacuuming**
- The next several times you vacuum, shut off the central forced-air heating/air conditioning system and open a window before vacuuming.
- Keep the central heating/air conditioning system shut off and the window open for at least 15 minutes after vacuuming is completed.

**What to Do if a Mercury Thermometer Breaks**

*NOTE: these instructions also apply to spills from other sources, if the amount spilled is less than or similar to the amount in a thermometer (see specific information above about how to clean up broken fluorescent bulbs)*

- Have everyone else leave the area; don't let anyone walk through the mercury on their way out. Make sure all pets are removed from the area. Open all windows and doors to the outside; shut all doors to other parts of the house.
- DO NOT allow children to help you clean up the spill.
Mercury can be cleaned up easily from the following surfaces: wood, linoleum, tile and any similarly smooth surfaces.

If a spill occurs on carpet, curtains, upholstery or other absorbent surfaces, these contaminated items should be thrown away in accordance with the disposal means outlined below. Only cut and remove the affected portion of the contaminated carpet for disposal.

**Items needed to clean up a small mercury spill**

1. 4-5 ziplock-type bags
2. trash bags (2 to 6 mils thick)
3. rubber, nitrile or latex gloves
4. paper towels
5. cardboard or squeegee
6. eyedropper
7. duct tape, or shaving cream and small paint brush
8. flashlight
9. powdered sulfur (optional)

**Cleanup Instructions**

1. Put on rubber, nitrile or latex gloves.

2. If there are any broken pieces of glass or sharp objects, pick them up with care. Place all broken objects on a paper towel. Fold the paper towel and place in a zip lock bag. Secure the bag and label it as directed by your local health or fire department.

3. Locate visible mercury beads. Use a squeegee or cardboard to gather mercury beads. Use slow sweeping motions to keep mercury from becoming uncontrolable. Take a flashlight, hold it at a low angle close to the floor in a darkened room and look for additional glistening beads of mercury that may be sticking to the surface or in small cracked areas of the surface. Note: Mercury can move surprising distances on hard-flat surfaces, so be sure to inspect the entire room when "searching."

4. Use the eyedropper to collect or draw up the mercury beads. Slowly and carefully squeeze mercury onto a damp paper towel. Place the paper towel in a zip lock bag and secure. Make sure to label the bag as directed by your local health or fire department.

5. After you remove larger beads, put shaving cream on top of small paint brush and gently "dot" the affected area to pick up smaller hard-to-see beads. Alternatively, use duct tape to collect smaller hard-to-see beads. Place the paint brush or duct tape in a zip lock bag and secure. Make sure to label the bag as directed by your local health or fire department.

6. **OPTIONAL STEP:** It is **OPTIONAL** to use commercially available powdered sulfur to absorb the beads that are too small to see. The sulfur does two things: (1) it makes the mercury easier to see since there may be a color change from yellow to brown and (2) it binds the mercury so that it can be easily removed and suppresses the vapor of any missing mercury. Where to get commercialized sulfur? It may be supplied as mercury vapor absorbent in mercury spill kits, which can be purchased from laboratory, chemical supply and hazardous materials response supply manufacturers. **Note:** Powdered sulfur may stain fabrics a dark color. When using powdered sulfur, do not breathe in the powder as it can be moderately toxic. Additionally, users should read and understand product information before use.

7. If you choose not to use this option, you may want to request the services of a contractor who has monitoring equipment to screen for mercury vapors. Consult your local environmental or health agency to inquire about contractors in your area. Place all materials used with the cleanup, including gloves, in a trash bag. Place all mercury beads and objects into the trash bag. Secure trash bag and label it as directed by your local health or fire department.

This information is from the U.S. EPA:

**Mercury Releases and Spills**

8. Contact your local health department, municipal waste authority or your local fire department for proper disposal in accordance with local, state and federal laws.

Remember to keep the area well ventilated to the outside (i.e., windows open and fans in exterior windows running) for at least 24 hours after your successful cleanup. Continue to keep pets and children out of cleanup area. If sickness occurs, seek medical attention immediately.

This information is from the U.S. EPA:
Mercury Releases and Spills
What NEVER to Do When Cleaning Up a Mercury Spill

• Never use a vacuum cleaner or broom to clean up the spill.
A vacuum cleaner or broom will break the mercury into smaller drops and spread it around more. Tiny mercury droplets will settle throughout the area, increasing the spread of the mercury in the room. The droplets will evaporate faster and increase your chance of breathing high levels of mercury vapor. They will be harder to clean up.

• Never pour mercury down a drain.
The mercury can become lodged in the “p” traps and may continue to vaporize into the room. Mercury can also pollute septic tanks or wastewater-treatment plants.

• Never allow people who are wearing mercury-contaminated shoes or clothing to walk around the house.
This will help limit the spread of spilled mercury.

• Never use a washing machine to launder clothing or other items that may have come in contact with mercury.
Mercury can contaminate the washer and/or pollute sewage. Throw all clothing that came in contact with liquid mercury in the trash. If mercury is visible on the clothing take it to your local household hazardous waste collection site for disposal. Wash clothing or other items that were exposed to mercury vapor during the cleanup, but did not get mercury directly on them.

“In no case should a vacuum cleaner or broom be used to remove mercury. This will spread the mercury over a larger area and will put mercury vapors into the air and increase your chance of breathing high levels of mercury vapors.”
How to Clean up a Small Mercury Spill  
(a broken thermometer, thermostat or compact fluorescent bulb)

Step 1. Isolate the spill and ventilate the area right away.
- The person who will clean up the spill should have everyone else, especially children, leave the spill area, including pets. Don’t let anyone walk through the mercury on their way out.
- Open all windows and doors that open to the outside of the house.
- Close all doors between the room where the mercury was spilled and the rest of the house.
- Close all cold air returns so that mercury vapor is not carried throughout the house.
- Turn down heaters and turn up single-room air conditioners, but don’t use central air conditioning.
- Use fans to blow mercury-contaminated air outside. Turn off fans that do not blow air to the outside.

Step 2: Get the items needed to clean up a small mercury spill.
You will need the following items:
1. 4 or 5 zipper-top plastic bags
2. trash bags (2 to 6 mm thick)
3. rubber, nitrile or latex gloves
4. paper towels
5. cardboard or squeegee
6. eye dropper
7. duct tape, or shaving cream and small paint brush
8. flashlight
9. powdered sulfur (optional)

Step 3: Cleanup Instructions
- Put on rubber, nitrile or latex gloves.

- Pick up any broken pieces of glass and place them on a paper towel. Fold the paper towel, place it in a zipper-top bag, and seal the bag.

- Clean up the beads of mercury. Use a squeegee or cardboard to slowly roll the beads onto a sheet of paper. An eye dropper can also be used to collect the beads. Slowly squeeze mercury from the eye dropper onto a damp paper towel. Put the paper towel, paper, eye dropper, or anything else that has mercury on it, into a zipper-top bag, and seal the bag.

- After you remove larger beads, put shaving cream on top of a small paint brush and gently blot the affected area to pick up smaller hard-to-see beads. You can also use duct tape or masking tape to collect smaller hard-to-see beads. Place the paint brush or tape into a zipper-top bag,
Step 3 continued...

- It is OPTIONAL to use commercially available powdered sulfur to absorb beads that are too small to see. The sulfur does two things: (1) it makes the mercury easier to see since there may be a color change from yellow to brown, and (2) it binds the mercury so that it can be easily removed, and it helps to keep mercury that may have been missed during the cleanup from vaporizing into the room. Mercury spill kits that contain sulfur can be purchased from laboratory, chemical and hazardous materials response supply manufacturers. Read and understand how to use the cleanup kit before using. **Note:** Powdered sulfur may stain fabrics. Also, when using powdered sulfur, avoid breathing in the powder as it can be moderately toxic.

Step 4: Look for mercury that may have been missed during the cleanup.

- Take a flashlight, hold it at a low angle close to the floor in a darkened room, and look for additional glistening beads of mercury that may be sticking to the surface or in small cracks. **Note:** Mercury can move surprising distances on hard and flat surfaces, so be sure to carefully inspect the entire room when you are searching.

Step 5: Remove contaminated carpet and throw away.

- Place outside the house in a safe place until household trash is picked up.

Step 6: Remove mercury from shoes, clothing, and skin.

- If mercury had touched your skin, shoes or clothing, remain still and have someone bring you a plastic trash bag and wet paper towels. Wipe off any visible beads of mercury with the wet paper towels and then put them into the trash bag. Remove contaminated shoes and clothing and place them in a trash bag. Seal that bag and place it in another bag.

Step 7: Properly dispose of contaminated cleanup materials.

- Place all materials used in the cleanup, including gloves, in a trash bag. Place the zipper-top bags that contain mercury and other objects into the trash bag. Close and seal the trash bag and place it in a safe place outside your house. Label the bag as directed by your local health or fire department.
Step 7 continued…

• Contact your local health department, municipal waste authority, or your local fire department for proper disposal in accordance with local, state and federal laws.

Step 8: Following the spill

• Keep the area well ventilated to the outside (i.e., windows open and fans in exterior windows running) for at least 24 hours after cleaning up the spill. Continue to keep pets and children out of the cleanup area. If anyone gets sick, call your doctor or the Poison Control Center at (888) 222-2122 immediately.

• You may want to hire a contractor who has monitoring equipment to screen for mercury vapors. Consult your local environmental or health agency to inquire about contractors in your area.

• If young children or pregnant women are in the house, seek additional advice from your local or state health or environmental agency.

What to Do for Mercury Spills Greater Than the Amount in a Thermometer, Thermostat or Compact Fluorescent Light Bulb

Mercury is heavy. Just two tablespoons weigh nearly one pound. If more than the amount of mercury in a thermometer or thermostat or a compact fluorescent light bulb is spilled in your house, be sure to follow these steps:

• Have everyone else leave the area; don't let anyone walk through the mercury on their way out.
• Open all windows and doors to the outside.
• Turn down the heater in winter and turn up the air conditioner in summer.
• Shut all doors to other parts of the house, and leave the area.
• Call your local or state health or environmental agency for help.

If more than two tablespoons of mercury are spilled in your house, you are strongly urged to call the National Response Center (NRC), available 24 hours a day, 1-800-424-8802.
Datos básicos sobre el mercurio
Limpieza de los vertidos de mercurio en su hogar

Si se rompe un termómetro u otro pequeño artículo que contenga mercurio, como un termostato o una bombilla fluorescente, puede que logre limpiarlo usted mismo. Siga los pasos que se indican en este folleto para limpiar el vertido. Si el vertido de mercurio es mayor de dos cucharadas, siga las instrucciones que se indican en este folleto y pida ayuda profesional para limpiarlo.

Qué no debe hacerse NUNCA al limpiar un vertido de mercurio

- **No deben usarse nunca una aspiradora ni una escoba para limpiar el vertido.**
  Una aspiradora o una escoba romperán el mercurio en gotas más pequeñas y las esparcirán todavía más. Las diminutas gotitas de mercurio se fijarán por todo el área y aumentará la dispersión del mercurio en la sala, se evaporarán con más velocidad y aumentará la posibilidad de que respire concentraciones elevadas de vapor de mercurio y, además, serán más difíciles de limpiar.

- **No debe nunca verter el mercurio por el desagüe.**
  El mercurio puede quedar atrapado en los sifones y continuar evaporándose en la habitación. Además, también puede contaminar los depósitos sépticos o las plantas de tratamiento de aguas residuales.

- **No debe nunca permitir que las personas con zapatos o ropa contaminados con mercurio se paseen por la casa.**
  Esto ayudará a limitar la dispersión del mercurio vertido.

- **No debe usar nunca una lavadora para el lavado de ropa u otros artículos que puedan haber entrado en contacto con el mercurio.**
  El mercurio puede contaminar la lavadora o el desagüe. Tire a la basura toda la ropa que haya entrado en contacto con el mercurio líquido. Si puede verse el mercurio en la ropa, llévala al punto de recogida de residuos peligrosos domésticos para su desecho. Lave la ropa u otros artículos que hayan estado expuestos al vapor de mercurio durante la limpieza, pero que no hayan entrado directamente en contacto con él.

«Para eliminar el mercurio no debe usarse en ningún caso una aspiradora ni una escoba, porque esparcirá el mercurio en una zona mayor, provocará que haya vapores de mercurio en el aire y aumentará la posibilidad de que respire concentraciones elevadas de los vapores de mercurio».

Llame a la ATSDR al (913) 669-3924 o al 669-2589 si tiene alguna pregunta sobre el mercurio en relación con la salud. Si tiene alguna pregunta sobre cómo limpiar un vertido de mercurio, independientemente de su tamaño, llame a la oficina regional 6 de la EPA (Agencia de Protección Ambiental de Estados Unidos) al teléfono gratuito (800) 533-3508.
Cómo limpiar un pequeño vertido de mercurio
(un termómetro, un termostato o una bombilla fluorescente rotos)

Paso 1. Aísle el vertido y ventile inmediatamente la zona.

- La persona que vaya a limpiar el vertido debe hacer que todo el mundo, especialmente los niños, abandone el lugar, incluyendo los animales domésticos. No permita que nadie pase al salir por la zona donde se encuentre el mercurio.
- Abra todas las puertas y ventanas que den al exterior de la casa.
- Cierre todas las puertas que separen la sala donde se vertió el mercurio del resto de la casa.
- Cierre todos los conductos para el aire frío, de forma que el vapor de mercurio no se esparza por toda la casa.
- Baje la potencia de los calentadores y encienda los acondicionadores de aire de la habitación, pero no use el acondicionador de aire centralizado.
- Use los ventiladores para impulsar el aire contaminado con mercurio hacia el exterior y apague los que no impulsen el aire al exterior.

Paso 2: Hágase con los artículos que necesita para limpiar un pequeño vertido de mercurio.

Necesitará los siguientes elementos:
1. 4 o 5 bolsas de plástico de cierre con cremallera
2. bolsas de basura (de 2 a 6 mm de grosor)
3. guantes de goma, nitrilo o látex
4. pañuelos de papel
5. cartón o material absorbente
6. gotero
7. celo o crema de afeitar y un pincel pequeño
8. linterna
9. azufre en polvo (optativo)

Paso 3: Instrucciones para la limpieza

- Colóquese guantes de goma, nitrilo o látex.
- Recoja todas las piezas rotas de cristal y colóquelas sobre un paño de papel, pliéguelo el paño de papel, colóquelo en una bolsa con cierre de cremallera y séllela.
- **Limpie las gotas de mercurio.** Use un cartón o papel absorbente para empujar las gotas rodando a una hoja de papel. También puede utilizarse un cuentagotas para recoger las gotas. Apriete lentamente el cuentagotas para que el mercurio vaya cayendo a un paño de papel húmedo. Coloque el paño de papel, el cuentagotas y cualquier otra cosa que tenga mercurio en una bolsa de plástico con cierre de cremallera y séllela.
- Después de eliminar las gotas de mayor tamaño, coloque crema de afeitar en la punta de un pequeño pincel y páselo con cuidado por el área afectada para recoger las gotas de menor tamaño más difíciles de ver. También puede utilizar celo o cinta de carrocería para recoger esas gotas de menor tamaño menos visibles. Coloque el pincel o la cinta en una bolsa con cierre de cremallera y séllela.
Cómo limpiar un pequeño vertido de mercurio
(un termómetro, un termostato o una bombilla fluorescente rotos)

Paso 3 (cont.)
• Es OPCIONAL utilizar azufre en polvo de venta en comercios para absorber las gotas que son demasiado pequeñas para verlas. El azufre hace dos cosas: (1) facilita ver el mercurio, puesto que cambia de color amarillo a marrón y (2) se une al mercurio para que pueda eliminarse con facilidad, de forma que contribuye a impedir que el mercurio que haya quedado después de la limpieza se evapore al aire de la habitación. Pueden comprarse equipos para la recogida de vertidos de mercurio con azufre de los fabricantes que suministran artículos para respuesta contra los materiales de laboratorio, químicos y peligrosos. Antes de usarlo, debe leer y comprender cómo utilizar el equipo de limpieza. **Nota:** el azufre en polvo puede manchar la tela. Además, al usarlo debe evitar respirar el polvo, puesto que puede resultar moderadamente tóxico.

Paso 4: Busque el mercurio que pueda haber quedado tras la limpieza.
• Tome una linterna, manténgala en un ángulo pequeño cerca del suelo en una habitación a oscuras y busque gotas brillantes de mercurio que puedan haber quedado pegadas a la superficie o en las grietas pequeñas. **Nota:** el mercurio puede desplazarse a distancias sorprendentemente grandes sobre las superficies duras y planas, por lo que debe revisar toda la habitación.

Paso 5: Retire la alfombra contaminada y tírela.
• Colóquela fuera de la casa en un lugar seguro hasta que la recoja el basurero.

Paso 6: Elimine el mercurio de zapatos, ropa y piel.
• Si el mercurio ha entrado en contacto con la piel, los zapatos o la ropa, no se mueva y pida a otra persona que le traiga una bolsa plástica para basura y paños de papel húmedos. Limpie toda gota visible de mercurio con los paños de papel húmedos y colóquelos en la bolsa para basura. Quítese la ropa y los zapatos contaminados y colóquelos en una bolsa para basura. Séllela y colóquela a su vez en otra bolsa.

Paso 7: Deseche correctamente los materiales de limpieza contaminados.
• Coloque todos los materiales que haya utilizado en la limpieza, guantes incluidos, en una bolsa para basura. Coloque las bolsas con cierre de cremallera que contengan mercurio y otros objetos en la bolsa para basura. Cierre y selle la bolsa para basura y colóquela en un lugar seguro fuera de su casa. Etiquete la bolsa según lo indique su unidad de bomberos o sanitaria local.
Cómo limpiar un pequeño vertido de mercurio
(un termómetro, un termostato o una bombilla fluorescente rotos)

Paso 7 (cont.)

- Póngase en contacto con su departamento sanitario local, el organismo encargado de la limpieza municipal o los bomberos para el desecho correcto de acuerdo con la legislación local, regional y nacional.

Paso 8: Seguimiento del vertido

- Mantenga el área bien ventilada hacia el exterior (es decir, mantenga las ventanas abiertas y los ventiladores en las ventanas exteriores en funcionamiento) durante al menos las 24 horas siguientes a la limpieza del vertido. Continúe manteniendo alejados del área de limpieza a los niños y animales domésticos. Si alguien cae enfermo, llame inmediatamente a su médico o a los Centros de Información y Asesoramiento Toxicológico (TIAC) al (888) 222-2122.

- Puede que desee contratar a alguien que tenga equipo de monitorización para comprobar que no haya vapores de mercurio. Consulte a su agencia sanitaria o medioambiental local para ver qué contratistas hay en su área.

- Si hay niños pequeños o mujeres embarazadas en la casa, pida más consejo a su agencia sanitaria o medioambiental local o regional.

Qué hacer en caso de vertidos de mercurio en cantidades mayores a las de un termómetro, termostato o lámpara fluorescente

El mercurio es pesado: sólo dos cucharadas pesan casi una libra (medio kilogramo). Si se vierte una cantidad superior a la que hay en un termómetro, termostato o lámpara fluorescente en su hogar, siga los pasos que se indican a continuación:

- Pida a todo el mundo que abandone la zona y no deje que nadie pase al salir por el lugar donde se encuentra el mercurio.
- Abra todas las ventanas y puertas al exterior.
- Baje la potencia del calentador en invierno y encienda el acondicionador de aire en verano.
- Cierre todas las puertas que dan a otras partes de la casa y abandone la zona.
- Llame a su agencia sanitaria o medioambiental local o regional para pedir ayuda.

Si se vierten más de dos cucharadas de mercurio en su hogar, le urgimos encarecidamente que llame al NRC (National Response Center, Centro Nacional de Respuesta), al 1-800-424-8802, disponible las 24 horas del día.
### FDI POLICY STATEMENT

**Mercury Hygiene Guidance**

Original version adopted by the General Assembly on October 1998, Barcelona

Revised version adopted by the General Assembly: 26th October 2007, Dubai

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**Introduction:** The FDI Mercury Hygiene Statement includes recommendations on handling both precapsulated and bulk mercury. The use of precapsulated mercury/alloy is the preferred technique. Recommendations that are only applicable to bulk mercury are not necessary when there is no bulk mercury used in the operatory.

1. **Know the key issues on potential exposure to mercury:**
   - avoid direct skin contact with mercury or freshly mixed dental amalgam
   - avoid exposure to the following potential sources of mercury vapour:
     - accidental mercury spills;
     - malfunctioning amalgamators
     - leaky amalgam capsules
     - malfunctioning bulk mercury dispensers
     - during trituration
     - during placement and condensation of amalgam
     - during polishing or removal of amalgam;
     - vapourization of mercury from contaminated instruments
     - open storage of amalgam scrap or used capsules.

2. Train all personnel involved in the handling of mercury and dental amalgam regarding the potential hazards of mercury vapour and the necessity of observing good mercury hygiene.

3. Install impervious, easy to clean surfaces including continuous seamless-sheet flooring extending up the walls

4. Work in well-ventilated areas, with fresh air exchanges and outside exhaust. If the work areas are air-conditioned, replace the air-conditioning filter periodically.

5. Use pre-capsulated amalgam in order to:
   - eliminate the possibility of a bulk mercury spill
   - eliminate the mercury dispenser as a potential exposure source of mercury vapour

6. Use an amalgamator with a completely enclosed arm and which complies with international standard ISO 7488.

7. Recap single-use capsules after use if feasible. Store them in a closed container and dispose of them through a mercury reclamation company that handles amalgam waste.
8. Use high-volume evacuation systems (fitted with traps or filters) when finishing or removing amalgam.

9. Clean amalgam contaminants from instruments before heat sterilization or heat disinfection

10. Avoid heating mercury or amalgam or any equipment used with amalgam.

11. Follow Best Management Practices for Amalgam Waste:
   - Salvage and send the following to a mercury reclamation company that handles amalgam waste:
     - used single-use capsules
     - amalgam scrap not contaminated with patient fluids
     - amalgam waste that is contaminated with patient fluids such as amalgam debris from restorations after removal
     - chair-side traps containing amalgam waste
     - vacuum pump filters or other amalgam collecting devices if they contain amalgam.
     - extracted teeth that contain amalgam restorations (if the recycler requires extracted teeth to be disinfected then disinfect by immersion the extracted teeth in a disinfectant before recycling them along with chairside trap waste.)
   - Do not put amalgam waste in biohazard containers, infectious waste containers or regular garbage.
   - Use suction line cleaners (e.g. non-chlorine-containing cleaners) that minimize dissolution of amalgam.
   - Do not use bleach or other chlorine-containing cleaners to flush wastewater lines.
   - Use an amalgam separator which complies with International Standards ISO 11143, to address environmental concerns.

12. Clean up all mercury spills (regardless of size)
   - Pick up droplets using an adhesive tape or hypodermic syringe.
   - Mix small mercury spills (less than 10 grams) with alloy powder to form amalgam and add the resultant scrap to the scrap container.
   - Use commercial mercury spill clean up kits to manage larger spills (10 grams or more).
   - Never use a vacuum cleaner of any type
   - Do not use household cleaning products
   - Do not pour or allow mercury to go down the drain.
   - Do not use a broom or a paintbrush to clean up mercury.
   - Prevent people whose shoes may be contaminated with mercury from walking around or leaving the spill area until the mercury-contaminated items have been removed.

13. Handling and use of bulk mercury is to be strongly discouraged. However, if it is used, then:
• Minimize the amount of mercury stored
• Store in unbreakable, tightly sealed containers,
• Store containers in a well-ventilated place away from any source of heat.
• Use mercury and amalgam equipment only in areas that have impervious and suitably lipped surfaces, so that spilt mercury or excess amalgam is confined and recovery is facilitated.
• Exercise care in handling bulk mercury to minimize possibilities of spill (e.g. use a funnel when mercury is being dispensed into an amalgamator; place a lipped tray under the mercury dispenser).
• Use only capsules that remain sealed during amalgamation (Note: this can be checked by wrapping a piece of adhesive surgical tape around the junction of the two halves of the capsule, and doing a test mix. Leakage of mercury will show as a black line on the tape after it is removed).
• Handle mercury dispensers carefully
• Select an appropriate alloy to mercury ratio to minimize the need for removal of excess mercury prior to placement
• Check mercury dispensers periodically for mercury leakage
• Examine the mercury dispenser orifice after use for residual mercury. Any mercury droplet remaining should be disposed of as described in recommendation 12.
• Check the dental operatory for mercury vapour, preferably annually or after a spill clean-up.
Declaración de Principios de la FDI

Recomendaciones para la Higiene de Mercurio

Versión original adoptada por la Asamblea General en octubre de 1998, en Barcelona
Versión revisada adoptada por la Asamblea General el 26 de octubre de 2007, en Dubai

Introducción: La Declaración de la FDI concerniente a la Higiene de Mercurio incluye recomendaciones sobre el manejo del mercurio pre-encapsulado y en grandes cantidades. El uso de mercurio/aleación pre-encapsulado es la técnica preferida. Las recomendaciones que sólo se aplican al mercurio en grandes cantidades, no son necesarias cuando no se utiliza el mercurio en grandes cantidades.

1. Conozca bien los aspectos principales relacionados con la posible exposición al mercurio:
   • evite el contacto directo de la piel con el mercurio o con la amalgama dental que acaba de ser mezclada
   • evite la exposición a las posibles fuentes de vapor de mercurio siguientes:
     Ø derrames accidentales de mercurio;
     Ø amalgamadores defectuosos
     Ø cápsulas de amalgama defectuosas
     Ø dispensadores defectuosos de mercurio en grandes cantidades
     Ø durante la trituración;
     Ø durante la colocación y condensación de la amalgama;
     Ø durante el pulido o remoción de la amalgama
     Ø vaporización del mercurio de instrumentos contaminados
     Ø almacenamiento abierto de sobrantes de amalgama o de cápsulas usadas.

2. Enseñe al personal que trabaja con mercurio y amalgama dental cómo debe manejarlo y adviértale sobre los posibles peligros del vapor de mercurio y sobre la necesidad de observar buenas normas de higiene.

3. Instale superficies impermeables y fáciles de limpiar como material sin costura para el piso que cubre hasta las paredes.

4. Trabaje en espacios bien ventilados, con buen recambio de aire fresco y escape externo. En los lugares con aire acondicionado se deberán cambiar periódicamente los filtros de la instalación.

5. Utilice amalgama pre-encapsulada para:
• eliminar la posibilidad de un derrame de mercurio
• eliminar el dispensador de mercurio como fuente potencial de exposición al vapor de mercurio

6. Utilice un amalgamador con brazos completamente cerrados y que cumpla con la especificación internacional de la OIN/ISO 7488.

7. Si es posible, cierre de nuevo las cápsulas de uso único después de haberlas utilizado. Colóquelas en un recipiente cerrado y deshágase de ellas utilizando los servicios de una compañía de de mercurio que maneje residuos de amalgama.

8. Utilice sistemas de evacuación de mercurio de alta velocidad (con filtros o trampas en el circuito), durante el acabado o remoción de la amalgama.

9. Limpie los instrumentos contaminados con amalgama antes de la esterilización o desinfección por calor.

10. No deberá calentar el mercurio o la amalgama o cualquier equipo utilizado con amalgama.

11. Para los residuos de amalgama, siga los mejores protocolos establecidos:
   • Recupere y envíe a una compañía de reciclaje de mercurio que maneje los residuos de amalgama lo abajo indicado:
     - Cápsulas de uso único ya usadas
     - Sobrantes de amalgama no contaminados con fluidos del paciente
     - Residuos de amalgama contaminados con fluidos del paciente como restos de amalgama de las restauraciones removidas
     - Trampas de circuito de sillón que contienen residuos de amalgama
     - Filtros de bombas de vacío u otros dispositivos de colección de la amalgama si contienen amalgama.
     - Dientes extraídos que contienen restauraciones de amalgama (si el reciclador requiere que se desinfecten los dientes extraídos extraídos habrá entonces que desinfectarlos por inmersión en un desinfectante antes de reciclarlos conjuntamente con tales trampas del sillón).

   • No coloque residuos de amalgama en recipientes bio-peligrosos, de desecho infectados o de basura común.
   • Utilice limpiadores de succión (por ejemplo, limpiadores sin cloro), que minimizan la disolución de la amalgama.
   • No utilice lejía u otros limpiadores que contienen cloro para limpiar las líneas de agua de desecho.
   • Utilice un separador de amalgama que cumpla con las Normas Internacionales de ISO/OIN 11143, para tratar los problemas ambientales.

12. Debe limpiarse todo derrame de mercurio (cualquiera sea su cantidad):
• Utilice una cinta adhesiva o una jeringa hipodérmica para recoger las gotas.
• Mezcle un pequeño derrame de mercurio (menos de 10 gramos), con polvo de aleaciones para formar amalgama y añada el sobrante resultante al recipiente del sobrante.
• Utilice limpiadores comerciales de derrame de mercurio para tratar derramamientos más copiosos (10 gramos o más).
• No utilice nunca una aspiradora de ningún tipo
• No utilice productos de limpieza doméstica
• No eche o permita que se tire el mercurio por el desagüe.
• No utilice una escobilla o una brocha para limpiar el mercurio
• Hasta que se haya eliminado todo lo que ha sido contaminado con mercurio, no permita que la gente cuyos zapatos puedan haber sido contaminados con mercurio, camine o se aleje de la zona donde ha ocurrido el derrame

13. Se debe evitar la manipulación y el uso del mercurio en grandes cantidades, pero en caso de hacerlo, se deberá:

• Minimizar la cantidad de mercurio almacenado
• Conservarlo en recipientes irrompibles, herméticamente cerrados.
• Colocar los recipientes en un lugar bien ventilado y alejado de toda fuente de calor.
• Utilizar el equipo de mercurio y amalgama solamente en áreas con superficies no absorbentes y con rebordes adecuados, de modo de encerrar y recobrar fácilmente el mercurio derramado y el exceso de amalgama.
• Tener mucho cuidado en el manejo de mercurio en grandes cantidades para minimizar las posibilidades de derrame (por ejemplo, utilice un embudo para verter el mercurio en un amalgamador; coloque una bandeja con reborde bajo para el dispensador de mercurio).
• Utilice solamente cápsulas que permanecen herméticamente cerradas durante la amalgamación (Nota: esto puede comprobarse envolviendo con una cinta adhesiva la unión de las dos partes medias de la cápsula y haciendo una mezcla de prueba. La filtración de mercurio aparecerá sobre la cinta como una línea negra después de su remoción).
• Tener mucho cuidado en la manipulación el manipuleo de dispensadores de mercurio
• Elegir una proporción adecuada de aleación y de mercurio para minimizar la necesidad de remoción del exceso de mercurio antes de colocarlo.
• Examinar periódicamente los dispensadores de mercurio para comprobar que no se ha producido una pérdida de mercurio.
• Examinar el orificio del dispensador de mercurio después de usarlo para comprobar que no han quedado residuos de mercurio. Las gotas de mercurio deben ser eliminadas como se describe en la recomendación 12.
• Se deberá comprobar la presencia de vapor de mercurio en el consultorio dental, preferiblemente todos los años o después de haber limpiado un derrame de mercurio.
BEST MANAGEMENT PRACTICES
FOR AMALGAM WASTE

American Dental Association
October 2007
Dental Amalgam Waste

Dental amalgam waste can be recycled to help prevent the release of mercury to the environment. Following the simple suggestions outlined in this document will help protect the environment.

Concern about the effects of mercury in the environment has increased over the years. Mercury in the environment is bioaccumulative, which means that it can build up in fish and cause health problems in humans and other animals that eat fish. Many state health professionals recommend limiting fish consumption, especially for children and pregnant women.

Mercury is a naturally occurring metal; however, about half of the mercury released to the environment comes from human activity. Of that amount, 53% is emitted from combustion of fuels for energy production and 34% is from the combustion of waste. Sources associated with manufacturers and consumers make up the remaining 13%, with dentistry contributing less than one percent.

Some mercury released into the air eventually collects in the waterways, where it enters the food chain. As a precautionary measure, U.S. regulators typically assume that all or most of the mercury released into the air or surface water may accumulate in fish. According to the EPA in 2000, metals (mainly due to the detection of mercury in fish tissue samples) were the second most common pollutant impairing 3.2 million acres of the 17.3 million acres of assessed lakes (the assessed lakes comprised 43% of the total lake acres).

Although mercury in the form of dental amalgam is stable, amalgam should not be disposed of in the garbage, infectious waste “red bag,” or sharps container. Amalgam also should not be rinsed down the drain. These cautions are important because some communities incinerate municipal garbage, medical waste, and sludge from wastewater treatment plants. If amalgam waste ends up in one of these incinerated waste streams, the mercury can be released to the environment due to the high temperatures used in the incineration process. Increasingly, local communities are enacting restrictions on the incineration of wastes containing mercury.

The good news is that amalgam waste, kept separate from other waste, can be safely recycled. The mercury can be recovered from amalgam wastes through a distillation process and reused in new products. The ADA strongly recommends recycling as a best management practice for dental offices.

The following information demonstrates how to manage and recycle dental amalgam waste to help protect the environment.

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Glossary of Amalgam Waste Terms

- **Amalgam capture device** is an apparatus such as a chair side trap, vacuum pump filter or amalgam separator that collects amalgam particles.

- **Amalgam sludge** is a mixture of liquid and solid material that collects within vacuum pump filters, amalgam separators or other amalgam capture devices that may be used.

- **Contact amalgam** is amalgam that has been in contact with the patient. Examples are extracted teeth with amalgam restorations, carving scrap collected at chair side, and amalgam captured by chair side traps, filters, or screens.

- **Dental Best Management Practices** are a series of amalgam waste handling and disposal practices that include, but are not limited to, initiating bulk mercury collection programs, using chair side traps, amalgam separators compliant with ISO 11143, and vacuum collection, inspecting and cleaning traps, and recycling or using a commercial waste disposal service to dispose of the amalgam collected.

- **Empty amalgam capsules** are the individually dosed containers left over after mixing precapsulated dental amalgam.

- **Non-contact amalgam (scrap)** is excess mix leftover at the end of a dental procedure.

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The ADA recommends against the use of bulk elemental mercury, also referred to as liquid or raw mercury, for use in the dental office. Since 1984, the ADA has recommended use of precapsulated amalgam alloy.

If you still have bulk elemental mercury in the office, you should recycle it. Check with a licensed recycler to determine whether they will accept bulk mercury. **Do not** pour bulk elemental mercury waste in the garbage, red bag or down the drain. You also should check with your state regulatory agency and municipality to find out if a bulk mercury collection program is available. Such bulk mercury collection programs provide an easy way to dispose of bulk mercury.

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Steps for Recycling Amalgam Waste

1. Stock amalgam capsules in a variety of sizes to minimize the amount of amalgam waste generated.

2. Amalgam waste may be mixed with body fluids, such as saliva, or other potentially infectious material, so use personal protective equipment such as utility gloves, masks, and protective eyewear when handling it.

3. Contact an amalgam waste recycler about any special requirements that may exist in your area for collecting, storing and transporting amalgam waste.

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211 East Chicago Avenue, Chicago, Illinois 60611-2678
If you need to find a recycler, check with your city, county or local waste authority to see whether they have an amalgam waste recycling program.

4. Store amalgam waste in a covered plastic container labeled “Amalgam for Recycling” or as directed by your recycler. Your recycler may have its own requirements, so ask your recycler about containers and what may be placed in them.

5. Look for recyclers who comply with the ADA-ANSI standard. This standard is meant to encourage recycling.

Questions to Ask Your Amalgam Waste Recycler

Below is a list of questions you may want to ask your amalgam waste recycler. Note that not all recycling companies accept every type of amalgam waste, and the services offered by recyclers vary widely. The ADA recommends that you contact a recycler before recovering amalgam and ask about any specific handling instructions the recycler may have. Importantly, select a reputable company that complies with applicable federal and state law and provides adequate indemnification for its acts and omissions. Look for recyclers who comply with ANSI/ADA Specification 109: Procedures for Storing Dental Amalgam Waste and Requirements for Amalgam Waste Storage/Shipment Containers. This standard is meant to encourage recycling.

Ask Your Recycler …

- What kind of amalgam waste do you accept?
- Do your services include pick up of amalgam waste from dental offices? If not, can amalgam waste be shipped to you?
- Do you provide packaging for storage, pick up or shipping of amalgam waste?
- If packaging is not provided, how should the waste be packaged?
- What types of waste can be packaged together?
- Do you accept whole filters from the vacuum pump for recycling?
- Is disinfection required for amalgam waste?
- How much do your services cost?
- Do you pay for clean non-contact amalgam (scrap)?
- Do you accept extracted teeth with amalgam restorations?
- Does your company have an EPA or applicable state license?
- Does the company use the proper forms required by the EPA and state agencies?

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211 East Chicago Avenue, Chicago, Illinois 60611-2678
## Best Management Practices for Amalgam Waste

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<tr>
<th><strong>DO</strong></th>
<th><strong>DON’T</strong></th>
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<tr>
<td><em>Do</em> use precapsulated alloys and stock a variety of capsule sizes</td>
<td><em>Don’t</em> use bulk mercury</td>
</tr>
<tr>
<td><em>Do</em> recycle used disposable amalgam capsules</td>
<td><em>Don’t</em> put used disposable amalgam capsules in biohazard containers, infectious waste containers (red bags) or regular garbage</td>
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<tr>
<td><em>Do</em> salvage, store and recycle non-contact amalgam (scrap amalgam)</td>
<td><em>Don’t</em> put non-contact amalgam waste in biohazard containers, infectious waste containers (red bags) or regular garbage</td>
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<tr>
<td><em>Do</em> salvage (contact) amalgam pieces from restorations after removal and recycle the amalgam waste</td>
<td><em>Don’t</em> put contact amalgam waste in biohazard containers, infectious waste containers (red bags) or regular garbage</td>
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<tr>
<td><em>Do</em> use chair-side traps, vacuum pump filters and amalgam separators to retain amalgam and recycle their contents.</td>
<td><em>Don’t</em> rinse devices containing amalgam over drains or sinks</td>
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<tr>
<td><em>Do</em> recycle teeth that contain amalgam restorations. (<em>Note:</em> Ask your recycler whether or not extracted teeth with amalgam restorations require disinfection)</td>
<td><em>Don’t</em> dispose of extracted teeth that contain amalgam restorations in biohazard containers, infectious waste containers (red bags), sharps containers or regular garbage</td>
</tr>
<tr>
<td><em>Do</em> manage amalgam waste through recycling as much as possible</td>
<td><em>Don’t</em> flush amalgam waste down the drain or toilet</td>
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<tr>
<td><em>Do</em> use line cleaners that minimize dissolution of amalgam</td>
<td><em>Don’t</em> use bleach or chlorine-containing cleaners to flush wastewater lines</td>
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Practical Guide to Integrating BMPs Into Your Practice

**Non-contact (scrap) amalgam**
- Place non-contact, scrap amalgam in wide-mouthed, container that is marked “Non-contact Amalgam Waste for Recycling.”
- Make sure the container lid is well sealed.
- When the container is full, send it to a recycler.

**Amalgam capsules**
- Stock amalgam capsules in a variety of sizes.
- After mixing amalgam, place the empty capsules in a wide-mouthed, airtight container that is marked “Amalgam Capsule Waste for Recycling.”
- Capsules that cannot be emptied should likewise be placed in a wide-mouthed, airtight container that is marked “Amalgam Capsule Waste for Recycling.”
- Make sure the container lid is well sealed.
- When the container is full, send it to a recycler.

**Disposable chair-side traps**
- Open the chair-side unit to expose the trap.
- Remove the trap and place it directly into a wide-mouthed, airtight container that is marked “Contact Amalgam Waste for Recycling.”
- Make sure the container lid is well sealed.
- When the container is full, send it to a recycler.
- Traps from dental units dedicated strictly to hygiene may be placed in with the regular garbage.

**Reusable chair-side traps**
- Open the chair-side unit to expose the trap.
- Remove the trap and empty the contents into a wide-mouthed, airtight container that is marked “Contact Amalgam Waste for Recycling.”
- Make sure the container lid is well sealed.
- When the container is full, send it to a recycler.
- Replace the trap into the chair-side unit (Do not rinse the trap under running water as this could introduce dental amalgam into the waste stream.

**Vacuum pump filters**
- Change the filter according to the manufacturer’s recommended schedule.
- Note: The following instructions assume that your recycler will accept whole filters; some recyclers require different handling of this material, so check with your recycler first.
- Remove the filter.
- Put the lid on the filter and place the sealed container in the box in which it was originally shipped. When the box is full, the filters should be recycled.

**Amalgam separators**
- Select an amalgam separator that complies with ISO 11143.
- Follow the manufacturer’s recommendations for maintenance and recycling procedures.

**Line cleaners**
- Use non-bleach, non-chlorine–containing line cleaners, which will minimize amalgam dissolution, such as those listed in the Additional Resources section of this document.
Additional Resources

The following articles published in the Journal of the American Dental Association are available through the ADA Division of Science and also are available to ADA members online.

For information on proper mercury hygiene practices see “Dental Mercury Hygiene Recommendations”. 2003:134(11);1498-9.

For information on choosing line cleaners that minimize the dissolution of mercury from amalgam see: “The effect of disinfectants and line cleaners on the release of mercury from amalgam” 2006:137(10);1419-25.

For information on amalgam separators see:

- “Laboratory evaluation of amalgam separators” 2002:133;577-89.