Just how dangerous is that object?

Identifying and Managing Hazardous Materials In Museum Collections

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Summary

- Introduction
- What makes a material hazardous?
- Hazardous materials common in museum and heritage collections
- Surveying your collection for hazardous materials
- Identification
- Management and safe working procedures
Unlike industrial workers who are likely to encounter higher doses of potentially hazardous materials resulting in acute exposure, museum workers are more likely to be exposed to low-level doses of heavy metals [and other toxins] over an extended period of time, resulting in chronic health problems.

AIC Health and Safety, 2008
Exhibition prep
Object photography
Complying with WorkSafe BC requirements
Storage reorganizations

DDT
Naphthalene
Asbestos
Arsenic, mercury & lead
What makes a material hazardous?
Hazardous materials commonly found in cultural collections:

**Pesticides** - organic and inorganic

**Preservatives** (for wet specimens)

**Heavy metals** (non-pesticide)
- Pigments
- Mercury-felted hats
- As associated with 19th C dying
- Solid lead and lead solder
- Corrosion products of lead and cadmium
- Liquid mercury
- Geological specimens

**Asbestos**
- Incorporated in objects and architectural elements
- Mineral specimens

**Pharmaceuticals, patent medicines & controlled substances**

**Ethnobotanical and other biological toxins**
- Poison darts/arrows, and herbaria
- Including: strychnine, aconite, ergot, curare, *Abrus precatorius*, etc. etc.
- Mold
- Pathogens (from contaminated objects)

**Chemicals**
- Historic industrial or household
- CTC-containing grenade-style extinguishers

**Explosive and pressurized objects**
- Firearms, ammunition, firecrackers, pressurized fire extinguishers, etc.

**Cellulose nitrate & celluloid**

**Deterioration products of some plastics**

**Radioactive objects and specimens**
Evaluating your collection
Research!

- What have other museums identified?
- Historical information (ie. details of manufacture, or timelines of use for specific materials such as pesticides or pigments).
- Toxicological data
Surveying

- Walk your aisles, explore your records
- Visual and non-analytical positive IDs
- Likely IDs (good candidates for further testing and/or preemptive flagging)
Analytical testing (when possible)

- Non-invasive techniques
  Such as X-Ray Fluorescence (XRF)

- Invasive techniques which require sampling
  (Such as GC-MS - especially for detecting organic molecules such as organic pesticides and ethnobotanical toxins)
Visual & otherwise straightforward identifications
Visual & otherwise straightforward identifications

- Uranium glass
- Liquid preservatives
- Cellulose nitrate (many names)
- Liquid mercury
- Solid lead
- Radium paint
- Naphthalene
- Abrus precatorius
- “Poison!”
XRF Non-invasive elemental analysis
XRF Non-invasive elemental analysis

- Mercury & lead
- Mercury (cinnabar / vermilion) lacquer
- Zinc (possibly zinc hexafluorosilicate)
- Arsenic (As-Cu green pigment)
- Mercury
- Arsenic, mercury and lead
- Lead paint (& mercury-gas tubes)
- Mercury
- Arsenic
GC-MS
Minimally invasive analysis of organic molecules
GC-MS
Minimally invasive analysis of organic molecules

To be tested, suspected:  
*Adenium boehmianium*

**DDT** &  
**Naphthalene**

**Strychnos toxifera**  
(curare)

**Pentachlorophenol**

**Antiaris toxicaria**
Just how dangerous is that object?
Hazard vs. Risk
What's the difference?

**Hazard**: a *dangerous property*
- Chemical hazards such as toxicity, carcinogenicity, reproductive toxicity, etc.
- Physical hazards such as flammability, radioactivity, pressurization, etc.

**Risk**: a combination of the hazardous property and the *likelihood and degree* of exposure
Managing the Hazards in Your Collection

- Labels and database records (tagging and flagging)
- Storage and housing upgrades
- Safe working practices and PPE
Labels and database records
Lead

Hazardous Material Procedures:

- Required PPE: Gloves and labcoat
- Work surface/space requirements: No special requirements
- Cleanup: Recycle Gloves.
- Housing, storage and transportation requirements: No special requirements
- Exhibition requirements: No special requirements
- Special notes & warnings: In case of fire - lead released in smoke and deposited in soot

Hazardous Material Notes:

- High levels of lead detected.
- Method of testing - XRF [2015]
- Toxicity - 4 (high levels of lead)
- Transferability - 1 (bound in paint film)
- Very high lead in red paint on chin

Hazard Risk: Low toxicity-risk
Hazardous Material:
Lead

Required PPE:
Gloves and labcoat

Work surface/space requirements:
No special requirements

Cleanup:
Recycle gloves.

Housing, storage and transportation requirements:
Store bottles in boxes or trays that support and prevent bottles from tipping over and allow for easy transportation. Earthquake barriers a must

Exhibition requirements:
Must be kept beyond visitor reach

Special notes & warnings:
In case of spill, use chemical spill kit or HEPA vacuum. Dispose of as hazardous material

Hazardous Material Notes:
Bottle contains lead white powder.
Not tested
Toxicity - 4 (highly toxic)
Transferability - 4 (loose toxic powder)
"Flake white" is lead carbonate.

Hazard Risk:
High toxicity risk
Storage and housing upgrades
Safe Working Practices
Thank you!