

[SPNHC](#)

The Society for the Preservation of Natural History Collections

Collection Forum

Winter 2001, Volume 16, Number 1 & 2

The Contamination of Museum Materials and the Repatriation Process for Native California: Proceedings of a Working Conference at the San Francisco State University, 29 September to 1 October 2000
Edited by Niccolo Caldararo, Lee Davis, Peter Palmer, and Janet Waddington

[Introduction](#)

[Historical Survey of the Sources of Contamination of Ethnographic Materials in Museum Collections](#)

Catharine Hawks

2419 Barbour Road, Falls Church, VA 22043-3026, USA

Abstract: From the mid-18th century onwards, pests, particularly insect pests, were viewed as the greatest threat to the preservation of collections. Initially, collectors combated pests through the use of metal salts, some aromatic herbs and oils, and possibly toxic derivatives from plants, such as strychnine. Collection growth, the use of cabinets to store specimens, and discoveries in organic chemistry eventually led to the use of gas-phase chemicals as fumigants for the contents of individual cabinets or for large-scale treatments. The legacy of pesticide use continues to pose problems for staff and various collections users, especially the recipients of repatriated objects. Modern pest control for collections focuses on prevention first, and then on treatments that do not leave lasting residues. Aside from pesticides, other potentially hazardous contaminants on collections include: residues from mold, rodent, or insect infestations; soot; asbestos from decrepitating building or pipe insulation; and powdered lead paint from old storage furniture. Efforts are underway to record the history of collections and their treatment, develop tests to identify and mitigate various contaminants, and to evaluate the risks from potentially hazardous residues. Modern practice places human safety above the safety of objects or specimens. In the long run, this approach, along with improvements in storage and display techniques should help ensure that collections will be preserved with less alteration in the future.

[The Issue of Pesticides on Native American Cultural Objects: A Report on the Conservation and Education Activities at University of Arizona](#)

Nancy Odegaard and Alyce Sadongei

Arizona State Museum, University of Arizona, Tucson, AZ 85721, USA

Abstract: As a result of the Native American Graves Protection and Repatriation Act (NAGPRA), federally recognized American Indian tribes have begun to claim and receive certain cultural objects previously held with museums and federal agencies. Unfortunately, a wide range of pesticide substances has been applied to

museum collections for the purpose of preserving them. It is the actual repatriation or the transfer of pesticide contaminated cultural objects from museums to tribes for culturally appropriate use, storage, retirement, or disposal that has brought this concern to an urgent level. This paper discusses the activities initiated by the Arizona State Museum.

[The Effectiveness of Compressed Air in Removal of Pesticides from Ethnographic Objects](#)

Jens Glastrup

Department of Conservation, The National Museum of Denmark, Brede, DK 2800 Lyngby, Denmark

Abstract: Objects from the Danish National Museum and from the Danish Museum of Arms and Uniforms, originally stored in areas that are known to have been treated with pesticides in the past, were analysed using gas chromatography. It is shown that many of these objects still contain pesticides. Cleaning of the objects with compressed air results in a maximum removal of 40 percent of the pesticides, however the overall level of pesticides on the objects is significantly lower after cleaning. Personnel are at risk of exposure to pesticides during the cleaning process and when handling objects before and after cleaning. However, also in this case the exposure level is significantly lower after cleaning.

[Open Discussion 1](#)

[Testing at the San Francisco State University NAGPRA Lab \(Summary\)](#)

Jeff Fentress

[A Review of Analytical Methods for the Determination of Mercury, Arsenic, and Pesticide Residues on Museum Objects](#)

Peter T. Palmer

Department of Chemistry and Biochemistry, San Francisco State University, San Francisco, CA 94132-4163

Abstract: The historical use of arsenic, mercury, and various organic pesticides for preservation of museum objects has led to justifiable and valid concerns regarding the potential health risks of humans coming in contact with them. As the past treatment of specific objects within individual collections is for the most part unknown and undocumented, chemical analysis represents the most reliable means for determining whether an object has been contaminated and the level of contamination. It is important that museum professionals and other interested parties understand the analytical methods that can be applied to this problem, the details involved in designing and effecting a study, and the relative advantages and disadvantages of each technique. This paper outlines the various stages involved in a chemical analysis, reviews the sundry analytical methods for the determination of arsenic, mercury, and organic pesticides, and provides a framework which will hopefully assist non-experts in determining which method is most appropriate for a specific application.

[Open Discussion 2](#)

[More Than Magic: Pesticides on NAGPRA Sacred Objects \(Summary\)](#)

Monona Rossol

[Public Health Issues Involved with Implementing NAGPRA Law \(Summary\)](#)

Enrique Manzanilla

[Chemical Contamination of Repatriated Native Californian NAGPRA](#)

[Materials: Principles of Risk Assessment for Acute and Chronic Health Effects](#)

Thomas E. Kearney

Department of Clinical Pharmacy, UCSF School Of Pharmacy and Managing Director, San Francisco Division-California Poison Control System, San Francisco General Hospital, 1001 Potrero Avenue, San Francisco, CA 94110-3518

Abstract: An overview of the components of risk assessment (hazard identification, dose-response evaluation, exposure assessment and risk characterization) facilitates a discussion of the potential acute and chronic health effects from exposure to contaminated repatriated native Californian NAGPRA materials. The presentation encompasses terminology (carcinogen classification, dose-response curve, reference dose, hazard index, and minimal risk levels) and limitations of risk assessment of hazardous chemicals. It provides a general survey of the acute and chronic health effects of hazardous materials used by museums that may have contaminated tribal materials including: arsenic, DDT, dieldrin, lindane, mercuric chloride, carbon tetrachloride, carbon disulfide, borax, naphthalene, paradichlorobenzene, and thymol. The chemical and physical characteristics, sources, uses, potential routes of exposure, cancer classification and toxic exposure levels are provided for each chemical respectively. The acute and chronic health effects are put in context with respect to target organ, dose and duration of exposure, and grouped by chemical and toxicity categories: heavy metals (arsenic, mercuric chloride), organochlorine pesticides (DDT, dieldrin, lindane), halogenated solvents (carbon tetrachloride), repellents (naphthalene, paradichlorobenzene), and other antiseptics and disinfectants (borax, thymol, carbon disulfide). This will provide a framework for future discussions and risk assessments of materials of known contamination levels and exposure circumstances.

[The Hoopa Tribal Museum's Experience with Chemical Contamination of Repatriated Materials \(Summary\)](#)

David Hostler, Shawn Kane, and Lee Davis

[Pesticide Testing of Hoopa Tribe Repatriated Regalia: Taking the Samples](#)

Niccolo Caldararo¹, Lee Davis², David Hostler³, Shawn Kane³ and Peter Palmer⁴

¹Conservation Art Service, P.O. Box 77570, San Francisco, CA 94107 and Department of Anthropology, San Francisco State University, San Francisco, CA 94132;² Department of California Studies, Pacific West Center for Regional Humanities, San Francisco State University, San Francisco, CA 94132; ³Hoopa Tribal Museum, Hoopa, CA 95546; ⁴Department of Chemistry and Biochemistry,

San Francisco State University, San Francisco, CA 94132-4163, USA

Abstract: Seventeen items of regalia repatriated under NAGPRA by the Hoopa Tribal Museum from the Peabody Museum at Harvard were reported as being contaminated by pesticides. The Hoopa Museum Director worked with faculty from San Francisco State University (SFSU) to develop a method for taking samples from these precious objects so they could be tested for pesticide contamination at in the SFSU Chemistry Lab. Sample sizes were chosen to provide sufficient mass for scientific analysis in an acceptable ethical manner from the perspective of the Hoopa Tribal Museum.

[NAGPRA Artifact Repatriation and Pesticides Contamination: Human Exposure to Pesticide Residue Through Hopi Cultural Use \(Summary\)](#)

[Micah Loma'omvaya](#)

[Occupational Health Information on Pesticide Contamination \(Summary\)](#)

[David Goldsmith](#)

[The Analysis of Museum Objects for the Presence of Arsenic and Mercury: Non-Destructive Analysis and Sample Analysis](#)

[P. Jane Sirois](#)

Analytical Research Laboratory, Canadian Conservation Institute, Department of Canadian Heritage, 1030 Innes Road, Ottawa, ON K1A 0M5, Canada

Abstract: Many natural history specimens and First Nations artifacts have been prepared or treated using a wide range of pesticides and biocides, including arsenic and mercury compounds, to prevent insect damage. These compounds can be toxic to humans so it is important to identify them. The Analytical Research Laboratory of the Canadian Conservation Institute has analysed a representative selection of natural history specimens in five museums, as well as a collection of First Nations masks and a varied anthropology collection in two other museums, to determine the presence of arsenic and mercury compounds. The artifacts were analysed on-site using a portable X-ray energy spectrometer, a cadmium-109 radioisotope x-ray source and a lithium-drifted silicon x-ray detector. This technique permits the non-destructive analysis of a 3-cm-diameter area, and can detect elements above atomic number 19 (potassium) in the periodic table. Although the technique cannot determine whether the arsenic is present in the interior or exterior of the specimen, samples can be taken for further analysis if residues are noticed on the surface of a highly contaminated specimen. Approximately 80 percent of the natural history specimens examined contained arsenic, mercury, or both (arsenic was encountered far more frequently than mercury). The incidence of arsenic and mercury in the First Nations and anthropology artifacts analysed to date was 23 percent.

[Open Discussion 3](#)

[The Identification of Four Persistent and Hazardous Residues Present on Historic Plant Collections Housed Within The National Museum and Galleries](#)

of Wales

Victoria Purewal

National Museum and Galleries of Wales, Department of Biodiversity and Systematic Biology, Cathays Park, Cardiff, CF10 3NP, Wales; Division of Environmental Sciences, University of Derby, Kedleston Road, Derby, DE22 1GB; and Department of Applied Sciences, De Montfort University, The Gateway, Leicester, LE1 9BH, UK

Abstract: Natural history specimens can remain contaminated with pesticide residues years after the chemical was originally applied. The problem facing conservators and curators is that the collections may pose a risk to health through working with the collections. Analysis was conducted to identify whether the National Museum of Wales (NMW) Herbarium posed such a threat. The results identified four residues and established high concentrations. Quantitative and qualitative results were attained through Atomic Absorption Spectrophotometry (AAS), Tandem Mass Spectrometry (MS-MS), Flow Injection Mercury System-AAS (FIMS-AAS) and Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Mercury (Hg), arsenic (As) and barium (Ba) were found in high concentrations e.g. one specimen held 1000 PPM of mercury. Naphthalene (C₁₀H₈) was also identified but not quantified. Biological monitoring has indicated that staff members handling the collections had become contaminated with arsenic and mercury. The possible routes of contamination are through inhalation, ingestion and absorption. Safe standard procedures were implemented to reduce the contamination through working on the collections. Within one year the biological monitoring provided evidence that all previously elevated levels had returned to normal in all members of staff.

Photodestruction of Malathion on Surfaces

John F. Asmus

Institute for Pure and Applied Physical Sciences, University of California, San Diego, 9500 Gilman Dr., La Jolla, CA 92093-0360, USA

Abstract: At least twenty years ago it was learned that excimer laser radiation in the ultraviolet portion of the spectrum can be used to destroy and/or remove toxic and hazardous chemicals from surfaces of skin, fabric, plastic, rubber, paint, wood, and metal without damaging those surfaces. The investigation reported herein was performed to determine whether ultraviolet radiation from a simple and inexpensive xenon flashlamp is equally effective. Tests were performed with an ultraviolet flashlamp to remove and destroy Malathion on glass plates and painted surfaces. Destruction rates, Malathion fragment species, and surface damage character were all noted. As flashlamp-induced decontamination of the test surfaces was found to be comparable to that determined previously with lasers, it is probable that flashlamp effectiveness on organic and porous materials will be analogous to that determined with lasers. It is concluded that flashlamp radiation may be effective in decontaminating Native American museum artifacts with as few as three flashlamp pulses at a flux of about 3 J/cm². However, proof tests will have to be performed on

authentic historic materials in order to validate this extrapolation.

Insecticide Contamination at The National Museum of Denmark: A Case Study

Ole Schmidt

National Museum of Denmark, Brede, DK-2800 Lyngby, Denmark

Abstract: At the National Museum of Denmark many different insecticides have been used historically to protect artefacts against moths, woodborers and other pests. In 1983, prompted by the need to transfer artefacts to Greenland, the first artefacts were examined for insecticides. All the samples contained DDT in various concentrations. Procedures were developed for cleaning the artefacts. Late in the 1980s the whole museum was tested for the presence of insecticides, including DDT, Lindane, and methoxychlor. The museum's Safety Department set up work procedures and instructed the employees on how to remove hazardous insecticides from artefacts, exhibition rooms and stores. Today after many years work the task is now as good as completed and the National Museum will be pleased to make its experience available to other museums. The process used to detect insecticides is described in detail.*Ole Schmidt*

Recommended Actions Regarding the Pesticide Contamination of Museum Materials

Lee Davis, Niccolo Caldararo, and Peter Palmer

<no abstract prepared>