



## ICOM-CC Working Group on Ethnographic Collections



### Bibliography on Use of Biocides in Museum Collections

The following is a list of articles and web resources on the subject of use of biocides (including pesticides) in museum collections and related subjects such as health hazards, handling and mitigation strategies. This list was made possible through the generous contribution of colleagues working in this field. Special thanks for providing us with extensive bibliographies go to Nancy Odegaard, Jane Sirois, Jessica Johnson and Helene Tello, whose contributions were essential to accumulating this list.

We have tried to be as comprehensive as possible but would like to ask for your input especially if you see essential articles missing in this list. Please send additional references, comments and suggestions to Farideh Fekrsanati ([farideh@volkenkunde.nl](mailto:farideh@volkenkunde.nl)) or Monika Harter ([MHarter@horniman.ac.uk](mailto:MHarter@horniman.ac.uk)).

Agriculture Canada, Central Experimental Farm, *Control of Fabric Pests, Publication 1202*, revised edition, Ottawa (1974).

Anderson, R.M., *Methods of Collecting and Preserving Vertebrate Animals, Biological Series No. 18*, 2nd revised edition, National Museum of Canada, Bulletin No. 69, Department of Mines and Resources, Ottawa (1948).

Andison, H., *Control of the European Earwig, Publication 1097*, Canada Department of Agriculture, Experimental Farms, Saanichton B.C. (1960).

Andres, A., and Müller, A., 'Ein einfaches Verfahren der Blausäureentwicklung aus Cyannatriumlösungen und seine Verwendung zur Bekämpfung schädlicher Insekten', *Zeitschrift für angewandte Entomologie*, ed. K. Escherich, VI(1) (1919) 372-389.

Asmus, J., 'Photodestruction of malathion on surfaces', *Collection Forum* 16(1-2) (2001) 87-91.

Austin, M., Firnhaber, N., Goldberg, L., Hansen, G., and Magee, C., 'The legacy of anthropology collections care at the National Museum of Natural History', *Journal of the American Institute for Conservation* 44(3) (2005) 185-202.

Backes, S., *Untersuchungen zur Veränderung von Flachs- und Hanffasern durch die Behandlung mit Bioziden*, Masters dissertation, University of Applied Sciences and Art, Hildesheim (2005).

Bartoll J., Unger, A., Püschner, K., and Stege, H., 'Micro XRF investigations of chlorine containing wood preservatives in art objects', *Studies in Conservation* 48(3) (2003) 195-202.

Bengston, L., 'Testing for pesticide residues in the public program collections at the Royal B.C. Museum', *ICOM-CC Ethnographic Conservation Newsletter* 26 (2005) 7-8.

Bolle, J., 'Die Ermittlung der Wirksamkeit von insektentötenden Mitteln gegen die Nagekäfer des verarbeiteten Werkholzes', *Zeitschrift für angewandte Entomologie*, ed. K. Escherich, V (1919) 105-117.

Bond, K., *Reliability of X-ray Fluorescence for the Quantitative Analysis of Arsenic in Contaminated Leather*, Master of Art dissertation, Queen's University, Kingston (2005).

Brown, T., *The Taxidermist's Manual; or the Art of Collecting, Preparing and Preserving Objects of Natural History. Designed for the use of Travellers, Conservators of Museums and Private Collectors*, Archibald Fullarton & Co., Glasgow (1833).

Caldararo, N., Davis, L., Palmer, P., and Waddington, J., (eds.), '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', *Collection Forum* 16(1-2) (2001).

Campbell, J.L., Smith, M.A., Eiteman, M.A., Williams, P.L., and Boeniger, M.F., 'Comparison of solvents for removing pesticides from skin using an in vitro porcine model', *American Industrial Hygiene Association Journal* 61(1) (2000) 82-88.

Center, D., and Walker, A.K., (eds.), *Care and Conservation of Natural History Collections*, Butterworth-Heinemann, Oxford (1998).

Clark, S.H., 'Preservation of herbarium specimens: an archive conservator's approach', *TAXON* 35 (1986) 675-682.

Clavir, M., *Preserving what is Valued : Museums, Conservation, and First Nations*, University of British Columbia Press, Vancouver (2001).

Contaminated Collections: Preservation, Access and Use. Proceedings of a Symposium Held at the National Conservation Training Center (NCTC) Shepherdstown, West Virginia, April 6-9, 2001, *Collection Forum* 17(1-2) (2001).

Conserve O Gram, *Dichlorvos (Vapona) Update*, *Conserve O Gram* 2/4, National Park Service (1993).

Conserve O Gram, *Hazardous Materials Health and Safety Update*, *Conserve O Gram* 2/1, National Park Service (1993).

Conserve O Gram, *Hazardous Material in Your Collection*, *Conserve O Gram* 2/10, National Park Service (1998).

Conserve O Gram, *Arsenic Health and Safety Update*, *Conserve O Gram* 2/3, National Park Service (2000).

Conserve O Gram, *DDT Health and Safety Update*, *Conserve O Gram* 2/14, National Park Service (2000).

Conserve O Gram, *Chronology on Pesticides Used On National Park Service Collections*, *Conserve O Gram* 2/16, National Park Service (2001).

Conserve O Gram, *Physical Properties And Health Effects of Pesticides Used on National Park Service Collections*, *Conserve O Gram* 2/17, National Park Service (2001).

Conserve O Gram, *Guidelines For The Handling Of Pesticides Contaminated Collections*, *Conserve O Gram* 2/19, National Park Service (2002).

Cornish, L., and Jones, C.G., 'Laser cleaning of natural history specimens and subsequent SEM examination', in *Proceedings of Conservation Science 2002 conference, Edinburgh 22-24 May 2002*, ed. J.Townsend, K. Eremin, and A. Adriaens, Archetype Publications, London (2003) 101-106.

Cravello, B., Bianchetto Songia, M., Strobino, C., Di Nola, C., and Tonin, C., 'Investigation on fibers and contaminants found in historical wool rugs: the problem of the organo-chlorine pesticides', in *10<sup>th</sup> International Wool Textile Research Conference Proceedings, November 26-December 1, 2000, Aachen, Germany*, Deutsches Wollforschungsinstitut, Aachen (2001) Pp. OT-P4, 1-8.

Creelman, I.S., *Control of Silverfish and Firebrats, Publication 1057*, Canada Department of Agriculture, Central Experimental Farm, Ottawa (1969).

Cross, P., 'The removal of arsenic (III) and mercury salts from materials using aqueous alpha-lipoic acid solutions', in *Mitigation of Pesticides on Museum Collections*, MCI, Smithsonian Institution, Washington DC (forthcoming in 2008).

Cross, P.S., *Aqueous  $\alpha$ -Lipoic Acid Solutions for Removal of Arsenic and Mercury from Materials Used in Museum Artifacts*, doctoral dissertation, University of Arizona, Department of Materials Science and Engineering, Tucson (2007).

Dawson, J.E., *Solving Museum Insect Problems: Chemical Control, Technical Bulletin No. 15*, revised by T.J.K.Strang, Canadian Conservation Institute, Ottawa (2000).

Derrick, M., Burgess, H., Baker, M., and Binnie, N., 'Sulfuryl fluoride (vikane): a review of its use as a fumigant', *Journal of the American Institute for Conservation* 29(1) (1990) 77-90.

Di Nola, C., Tonin, C., Bianchetto Songia, M., Peila, R., Vineis C., Roggero, R., and Brancati, L.E., 'Conservation project of an early 19th-century Turkish Chiodes rug found to have significant pesticide (DDT) contamination: the result of a successful cooperation', in *ICOM Committee for Conservation, 13<sup>th</sup> Triennial ICOM-CC Meeting, Rio de Janeiro, Brazil, 22-27 September 2002: Preprints*, ed. R. Vontobel, James & James, London (2002) Vol. II 730-735.

Elert, K., *Schädlingsbekämpfung in völkerkundlichen Sammlungen*, Masters dissertation, Institut für Technologie der Malerei der Staatlichen Akademie der Bildenden Künste, Stuttgart (1994).

*Encyclopaedia of Occupational Health and Safety*, International Labour Office, Geneva (1983).

Ertel, D., 'Decontamination in conservation', *AIC News* 27(5) (2002) 1-6.

Florian, M.-L.E., *Heritage Eaters: Insects & Fungi in Heritage Collections*, James & James, London (1997).

Found, C., and Helwig, K., 'The reliability of spot tests for the detection of arsenic and mercury in natural history collections: a case study', *Collection Forum* 11(1) (1995) 6-15.

Gibson, L.T., and Brokerhof, A.W., 'A passive tube-type sampler for the determination of formaldehyde vapours in museum enclosures', *Studies in Conservation* 46(4) (2001), 289-303.

Glastrup, J., 'Insecticide analysis by gas chromatography in the stores of the Danish National Museum's ethnographic collection', *Studies in Conservation* 32(2) (1987) 59-64.

Glastrup, J., 'The effectiveness of compressed air in removal of pesticides from ethnographic objects', *Collection Forum* 16(1-2) (2001) 19-22.

Goldberg, L., 'A history of pest control measures in the anthropology collections, National Museum of Natural History, Smithsonian Institution', *Journal of the American Institute for Conservation* 35(1) (1996) 23-43.

Greene, R.V., and Wimbush, J.M., 'The extraction for chemical analysis of pesticide residues in wool and wool products', in *Proceedings of the 9<sup>th</sup> International Wool Textile Research Conference, Biella, Italy, 28 June - 05 July 1995*, Citta degli Studi Biella & International Wool Secretariat, Biella (1995) 321-329.

Grosche, E., *Die Analyse lösemittelhaltiger Holzschutzmittel in der Restaurierung, Bestandsaufnahme, Weiterentwicklung und Anwendung dünn-schicht-chromatographischer Methoden*, Masters dissertation, University of Applied Sciences, Köln (2005).

Guglia, O., 'Beiträge zur Sammel-und Musealhygiene des Naturhistorikers', *Entomologische Zeitschrift* 64(17) (1954) 193-208.

Gustafsson, K., 'A method for removing paradichlorobenzene from textiles by low-frequency sound', in *Textile Cleaning and Conservation Today and Tomorrow*, seminar at the Army Museum, 12 October 1993, Army Museum Stockholm, Stockholm (1993) 29-33.

Hahn, O., 'Influence of fungicides and insecticides on colour materials', in *Dyes in History and Archaeology 16/17*, ed. J. Kirby, Archetype Publications, London (2001) 204-210.

Haakanson, S., 'Understanding sacredness: facing the challenges of cultural change', in *Stewards of the Sacred*, ed. L.E. Sullivan and A. Edwards, American Association of Museums, Washington, DC (2004) 123-128.

Hack, U., and Herdin, M., 'Präventive Konservierung am Bayerischen Nationalmuseum', in *Preventive Conservation Workshop, University for Applied Sciences Berlin, 1 March 2007*, ed. A. Jelebrien, and M. Knaut, Berliner Beiträge zur Konservierung von Kulturgut und Grabungstechnik, Vol. 2, Berlin (2007) 11-19.

Hatchfield, P.B., *Pollutants in the Museum Environment*, Archetype Publications, London (2002).

Hawks, C.A., and Williams, S.L., 'Arsenic in natural history collections', *Leather Conservation News*, 2(2) (1986) 1-4.

Hawks, C., and Bell, D., 'Removal of stains caused by mercuric chloride treatments from herbarium sheet labels', in *ICOM Committee for Conservation, 12<sup>th</sup> Triennial ICOM-CC Meeting, Lyon, France, 29 August- 3 September 1999: Preprints*, ed. J. Bridgland, James & James, London (1999) Vol. II 723-727.

Hawks, C., 'Historical survey of the sources of contamination of ethnographic materials in museum collections', *Collection Forum* 16(1-2) (2001) 2-11.

Henry, E.E., 'The Merckoquant 10026 Arsenic Test for natural history collections', *WAAC Newsletter* 18(1) (1996) 19-19.

Hill, R.W., and Reuben, P., 'Decontaminating sacred objects of the Haudenosaunee', in *Symposium 2007, Preserving Aboriginal Heritage: Technical and Traditional Approaches, Ottawa, September 24-28 2007*, Canadian Conservation Institute, Ottawa (forthcoming in 2008).

Hornaday, W.T., *Taxidermy and Zoological Collecting: A Complete Handbook for the Amateur Taxidermist, Collector, Osteologist, Museum-builder, Sportsman, and Traveller*, Charles Scribner's Sons, New York (1905).

Hough, W.A.M., 'The preservation of museum specimens from insects and the effects of dampness', in *Annual Report of the Board of Regents of the Smithsonian Institution for the Year Ending June 30, 1887*, Government Printing Office, Washington, D.C (1889).

Jelen, E., Weber, A., Unger, A., and Eisbein, M., 'Detox Cure for Art Treasures', *Pesticide Outlook* 14(1) (2003) 7-9.

Jelen, E., 'Neues Verfahren zur Dekontamination von holzschutzmittelbelasteten Objekten', in *Restaurator im Handwerk* (2004/2005) 18-19.

Jelen, E., Wideman G., and Püschner, K., 'Decontamination of biocide loaded wooden art treasures', poster abstract in *6<sup>th</sup> International Congress on Lasers in the Conservation of Artworks, Lacona, 21-25 September 2005: Lacona VI Book of Abstracts*, Lacona (2005) 64.

Johnson, J.S., 'Masked hazard', *Common Ground: Archaeology and Ethnology in the Public Interest* (1999) 26-31.

Johnson, J., and Pepper Henry, J., 'Pesticides and repatriation at the National Museum of the American Indian', in *ICOM Committee for Conservation, 13<sup>th</sup> Triennial Meeting, Rio de Janeiro, 22-27 September 2002: Preprints*, ed. R. Vontobel, James & James, London (2002) Vol. II 673-678.

Johnson J.S., Heald, S., and Chang, L., 'Case studies in pesticide identification at the National Museum of the American Indian', in *ICOM Committee for Conservation, 14<sup>th</sup> Triennial Meeting, The Hague, 12.-16. September 2005: Preprints*, ed. I. Verger, James & James, London (2005) Vol. I 89-95.

Johnson, J.S., Heald, S., McHugh, K., Brown, L., and Kaminitz, M., 'Practical aspects of consultation with communities', *Journal of the American Institute for Conservation* 44(3) (2005) 203-215.

Kaiser, R., and Haraldsen, K., 'Decontamination of sensitive equipment', in *Surface Contamination and Cleaning*, ed. K.L. Mittal, VSP BV imprint of Brill, Utrecht (2003) Vol. 1 109-127.

Kaiser, R., 'Diffusion cleaning as a possible pesticide decontamination technique', in *Mitigation of Pesticides on Museum Collections*, MCI, Smithsonian Institution, Washington DC (forthcoming in 2008).

Kaminitz, M.A., 'A review of methods to mitigate the risks from use of contaminated objects', *Collection Forum* 17(1-2) (2001) 122-127.

Kang, S., Unger, A., and Morrell, J., 'The effect of supercritical carbon dioxide extraction on color retention and pesticide reduction of wooden artifacts', *Journal of the American Institute for Conservation* 43(2) (2004) 151-160.

Kearney, T.E., 'Chemical contamination of repatriated Native Californian NAGPRA materials: principles of risk assessment for acute and chronic health effects', *Collection Forum* 16(1-2) (2001) 44-52.

Keilbach, R., *Fachkunde für Schädlingbekämpfung*, Volk und Wissen, Volkseigener Verlag, Berlin (1952) 114-181 .

Klaus, M., Almazan, T., Coleman, C., Norton, R., and Plitnikas, J., 'Preliminary results from a survey for residual arsenic on the North American ethnographic collections at the Field Museum, Chicago', poster abstract in *ICOM Committee for Conservation, 14<sup>th</sup> Triennial Meeting, The Hague, 12-16 September 2005: Preprints*, ed. I. Verger, James & James, London (2005) Vol. I 127.

Koestler, R.J., Parreira, E., Santoro, E.D., and Noble, P., 'Visual effects of selected biocides on easel painting materials', *Studies in Conservation* 38(4) (1993) 265-273.

Kress, P., *Entfernen von Pestizidrückständen aus historischen Textilien mit überkritischem CO<sub>2</sub>. Erarbeitung einer Projektskizze anhand der textilen Sammlungsbestände des Germanischen Nationalmuseums Nürnberg*, Masters dissertation, University of Applied Sciences, Köln (2000).

Krieger, R., (ed.), *Handbook of Pesticide Toxicology; Principles and Agents*, Academic Press, New York (2001) 2 Vol.

Krooß, J. and Stolz, P., 'Innenraumbelastung von Museumsmagazinen durch biozide Wirkstoffe', *Staub – Reinhaltung der Luft* 53 (1993) 301-305.

Krug, S., Tello, H., Unger, A., Paz, B., and Simon, S., 'Biocide determination in ethnological collections - a methodological approach', *Zeitschrift für Kunsttechnologie und Konservierung*, 21(2) (2007) 270-274.

Ku, Y., Chang, J.-L., Cheng, S.-C., 'Effect of solution pH on the hydrolysis and phytolysis of diazinon in aqueous solution', *Water, Air & Soil Pollution* 108(3-4) (1998) 445-456.

Laughlin, J., 'Decontaminating pesticide protective clothing', *Reviews of Environmental Contamination and Toxicology* 130 (1993) 79-94.

Leechman, D., *Technical Methods in the Preservation of Anthropological Museum Specimens*, *NMC Bulletin* 67, National Museums of Canada, Ottawa (1931) 127-158.

Lehmann, D., 'Die EULAN-Behandlung von Textilien und zoologischen Präparaten', in *Ergänzungsbände des Berliner Jahrbuchs für Vor- und Frühgeschichte*, ed. O.-F. Gandert et al., Vol. 1, Verlag Bruno Hessling, Berlin (1964) 67-72.

Lehmann, D., 'Restaurieren und konservieren historischer Textilien', *Arbeitsblätter der Arbeitsgemeinschaft der Restauratoren* 1 Gruppe 10 (1974) 27-36.

Leimbrock, W., and Wagner, B., 'Ermittlung der Gefahrstoffbelastung durch Insektizide und Konservierungsmittel bei Tierpräparatoren und Mitarbeitern von zoologischen Sammlungen und Ausstellungen', *Der Präparator* 44 II 3/4 (1998) 111-112.

Loma'omvaya, M., 'NAGPRA artifact repatriation and pesticides contamination: the Hopi experience', *Collection Forum* 17(1-2) (2001) 30-37.

Lundbaek, T., 'Temporary storage: a challenge to the National Museum of Denmark', *Museum International*, 47(4) (1995) 23-27.

MacNay, C.G., *Control of Fabric Pests, Publication 1202*, Canada Department of Agriculture, Central Experimental Farm, Ottawa (1965).

MacNay, C.G. *Booklice, Household Pest Bulletin, Publication 1322*, Canada Department of Agriculture, Central Experimental Farm, Ottawa (1967).

- MacNay, C.G., *Collembola (Springtails, Snowfleas), Household Pest Bulletin, Publication 1325*, Canada Department of Agriculture, Central Experimental Farm, Ottawa (1967).
- Makos, K., and Hawks, C., 'Inherent and acquired hazards in museum collections: implications for care and use of collections', *Cultural Resource Management* 23(5) (2000) 31-37.
- Marte, F., Péquignot, A., and Von Endt, D., 'Arsenic in taxidermy collections: history, detection, and management', *Collection Forum* 21(1-2) (2006) 143-150.
- Martin, G., and Kite, M., 'Conservator safety – mercury in felt hats', in *Proceedings of Conservation Science 2002 conference, Edinburgh 22-24 May 2002*, ed. J. Townsend, K. Eremin, and A. Adriaens, Archetype Publications, London (2003) 177-181.
- Meharg, A., 'Killer wallpaper', *Spectroscopy Europe* 16(5) (2004) 16-19.
- Millette, J.R., Brown, R.S., and Mount, M.D., 'Lead arsenate', *The Microscope* 43(4) (1995) 187-191.
- Morrow, A., 'Care and feeding of the stuffed and mounted', *IIC-CG Bulletin* 18(1) (1993) 14.
- Muir, D., Lovell, M., and Peace, C.P., 'Health hazards in natural history museum work', *Museums Journal* 80(4) (1981) 205-206.
- Murayama, H., Mukai, H., Mitobe, H., and Moriyama, N., 'Simple method for determining trace pesticides in air using extraction disks', *Analytical Sciences* 16(3) (2000) 257- 263.
- Nason, J.D., 'Poisoned heritage: curatorial assessment and implications of pesticide residues in anthropological collections', *Collection Forum* 17(1-2) (2001) 67-81.
- NIOSH, CDC, Division of Surveillance, Hazard Evaluations and Field Studies, 'DDT exposures in a natural history museum', *Morbidity and Mortality Weekly Report* 32(34) (1983) 443-444.
- Odegaard, N., *A Guide to Handling Anthropological Museum Collections*, Western Association of Art Conservation, Los Angeles (1992).
- Odegaard, N., Carroll, S., and Zimmt, W.S., *Material Characterization Tests for Objects of Art and Archaeology*, Archetype Publications, London (2000).
- Odegaard, N., 'Methods to mitigate risks from use of contaminated objects, including methods to decontaminate affected objects', *Collection Forum* 17(1-2) (2001) 117-121.
- Odegaard, N., Boyer, L.V., Huber, M.J., Kaplan, L., Kunioka, C., Moreno, T., Podsiiki, C., Sadongei, A., Smith, D.R., and Zimmt, W., 'New ideas for the testing, documentation and storage of objects previously treated with pesticides', in *American Institute for Conservation 31st Annual Meeting, Arlington, 5-10 June, 2003: Object Specialty Group Postprints*, American Institute for Conservation, Washington, DC, 10 (2003) 33-42.
- Odegaard, N., and Sadongei, A., *Old Poisons, New Problems: A Museum Resource for Managing Contaminated Cultural Materials*, Alta Mira Press, Walnut Creek (2005).
- Odegaard, N., Smith, D.R., Boyer, L., and Anderson, J., 'Use of handheld XRF for the study of pesticide residues on museum objects', *Collection Forum* 20(1-2) (2006) 42-48.

- Ormsby, M., Johnson, J.S., Heald, S.C., Chang, L., and Bosworth, J., 'Investigation of solid phase microextraction sampling for organic pesticide residues on museum collections', *Collection Forum* 20(1-2) (2006) 1-12.
- Palmer, P.T., 'A review of analytical methods for the determination of mercury, arsenic, and pesticide residues on museum objects', *Collection Forum* 16(1-2) (2001) 25-41.
- Palmer, P.T., Martin, M., Wentworth, G., Caldararo, N., Davis, L., Kane, S., and Hostler, D., 'Analysis of pesticide residues on museum objects repatriated to the Hupa tribe of California', *Environmental Science and Technology* 37(6) (2003) 1083-1088.
- Palmer, P.T., Martin, M., Wentworth, G., Ostini, S., Prospero, C., and Fang, M., 'Pesticide contamination on Native American artifacts - methods, results from six case studies and next steps', *Collection Forum* 20(1-2) (2006) 23-32.
- Park, J.M.C., Branson, D.H., Burks, S., 'Pesticide decontamination from fabric by laundering and simulated weathering', *Journal of Environmental Science and Health* B25(3) (1990) 281-293.
- Péquignot, A., Marte, F., and Von Endt, D., 'L'Arsenic dans les collections d'histoire naturelle', *La lettre de l'OCIM* (2006) 4-10.
- Perkow, W. and Ploss, H., *Wirksubstanzen der Pflanzenschutz- und Schädlingsbekämpfungsmittel*, Stuttgart (2004).
- Piening, H., 'Depot-Dekontamination Schloss Nymphenburg München', *Restaura* 107(4) (2001) 253.
- Pinniger, D., *Pest Management in Museums, Archives and Historic Houses*, Archetype Publications, London (2001).
- Pool, M.A., *Health and Safety Technical Resources on Pesticides for the Conservator: An Annotated Bibliography*. A special insert to the American Institute for Conservation Newsletter, September (2004).
- Pool, M., *Pesticide Use History at the National Museum of the American Indian*, unpublished report, on file in the Archives of the National Museum of the American Indian, Washington, DC (2001).
- Püschner, K., *Versuche zur Detoxifizierung holzschutzmittelbelasteter Kunstobjekte durch Emulsionsbildung*, Masters dissertation, University of Applied Sciences, Köln (2002).
- Purewal, V., 'The identification of four persistent and hazardous residues present on historic plant collections housed within the National Museum and Galleries of Wales', *Collection Forum* 16(1-2) (2001) 77-86.
- Reuben, P., 'Detection and mitigation strategies for contaminated NAGPRA objects - the Seneca Nation's experience', *Collection Forum* 20(1-2) (2006) 33-41.
- Roane, T.M., and Pepper, I.L., 'Microorganisms and metal pollutants', in *Environmental Microbiology*, ed. R. Maier, I.L. Pepper, and C.P. Gerba, Academic Press, San Diego (2000) 403-423.
- Roane, T.M., 'Bacterial removal of mercury from museum materials: a new remediation technology?', in *Mitigation of Pesticides on Museum Collections*, MCI, Smithsonian Institution, Washington DC (forthcoming in 2008).



- Rossol, M., and Jessup, W.C., 'No magic bullets: safe and ethical pest management strategies', *Museum Management and Curatorship* 15(2) (1996) 145-168.
- Ryhl-Svendsen, M., 'Luftschadstoffe in Museen', *Restauro* 107(8) (2001) 613-618.
- Sadongei, A. 'American Indian concepts of object use', *Collection Forum* 17(1-2) (2001) 113-116.
- Schieweck, A., Hoffmann, J., Genning, C., and Salthammer, T., 'Organische und anorganische Schadstoffe, Untersuchungen in Magazinen des Niedersächsischen Landesmuseums Hannover', *Restauro* 111(5) (2005) 354-361.
- Schieweck, A., Lohrengel, B., Siwinski, N., Genning, C., and Salthammer, T., 'Organic and inorganic pollutants in storage rooms of the Lower Saxony State Museum Hanover', in *Atmospheric Environment* 39(33) (2005) 6098-6108.
- Schieweck, A., and Salthammer, T., *Schadstoffe in Bibliotheken und Archiven: Raumluft-Baustoffe-Exponate*, Braunschweig (2006).
- Schmidt, O., 'Insecticide contamination at the National Museum of Denmark: a case study', *Collection Forum* 16(1-2) (2001) 92-95.
- Seifert, S.A., Boyer, L.V., Odegaard, N., Smith, D.R., and Dongoske, K.E., 'Arsenic contamination of museum artifacts repatriated to a Native American tribe', *JAMA (Journal of the American Medical Association)* 283(20) (2000) 2658-2659.
- Silverman, R., 'Fire and ice: soot removal technique using dry ice blasting', *International Preservation News*, 39 (2006) 20-24.
- Simon, C., *DDT, Kulturgeschichte einer Verbindung*, Christoph Merian Verlag, Basel (1999).
- Simmons, J.E., Campbell, A.C., and Greenbaum, E., 'Presence of elemental mercury in fluid preserved specimens', in: *Collection Forum* 22(1-2), 2007, 32-36.
- Sirois, P.J. and Taylor, J., 'The determination of arsenic and mercury in natural history specimens using radioisotope excited X-ray energy spectrometry and scanning electron microscopy', in *Proceedings of the 14th Annual IIC-CG Conference, Toronto, May 27-30, 1988*, ed. J. Wellheiser, the Toronto Area Conservation Group of the IIC-CG, Toronto (1989) 124-136.
- Sirois, P.J. 'The analysis of museum objects for the presence of arsenic and mercury: non-destructive analysis and sample analysis', *Collection Forum* 16(1-2) (2001) 65-75.
- Sirois, P.J., and Sansoucy, G., 'Analysis of museum objects for hazardous pesticide residues: a guide to techniques', *Collection Forum* 17(1-2) (2001) 49-66.
- Smith, B., and Coulehan, B., 'Potential exposure to arsenic and other highly toxic chemicals when handling museum artifacts', *Applied Occupational and Environmental Hygiene* 17(11) (2002) 741-743.
- Solajic, M.R., Pretzel, B., Cooper, M., Townsend, J.H., Seddon, T., Ruppel, J., Ostapkowicz, J., and Parker, T., 'A collaborative examination of the colourfastness of Amazonian featherwork: assessing the effects of exposure to light and laser radiation', in *ICOM Committee for Conservation, 13<sup>th</sup> Triennial Meeting, Rio de Janeiro, 22-27 September 2002: Preprints*, ed. R. Vontobel, James & James, London (2002) Vol. II 701-707.

Stewart, J., and Unglik, H., *Analysis for Arsenic and Mercury in Natural History Specimens - St. Lawrence Islands N.P. of Canada*, Laboratory Number: 2002-1178, 1179, 1180, 1181, 1184, 1185, 1186, 1187, 1183, Analytical Services Section, Ontario Service Centre, Parks Canada (2002) 1-10.

Tello, H., Unger, A., Gockel, F., and Jelen, E., 'Decontamination of ethnological objects with supercritical carbon dioxide', in *ICOM Committee for Conservation, 14<sup>th</sup> Triennial Meeting, The Hague, 12-16 September 2005: Preprints*, ed. I. Verger, James & James, London (2005) Vol. I 110-119.

Tello, H., Jelen, E., Unger, A., 'Decontamination of ethnological objects with supercritical carbon dioxide', *Collection Forum* 19(1-2) (2005), 45-48.

Tello, H., *Investigations on Super Fluid Extraction (SFE) with Carbon Dioxide on Ethnological Materials and Objects Contaminated with Pesticides*, Masters dissertation, University of Applied Sciences, Berlin (2006).

Tello, H., and Unger, A., 'The decontamination of ethnological objects with supercritical and liquid carbon dioxide', in *Mitigation of Pesticides on Museum Collections*, MCI, Smithsonian Institution, Washington DC (forthcoming in 2008).

Thurmann, U., *Erfassung und umwelttoxikologische Bewertung von ausgewählten Holzschutzmittelwirkstoffen*, Bremer Umweltinstitut, Reihe Umweltwissenschaften Bd. 2, Bremen (1999).

Trebše, P., and Arčon, I., 'Degradation of organophosphorus compounds by X-ray irradiation', *Radiation Physics and Chemistry* 67(3-4) (2003), 527-530.

Unger, A., 'Umweltschädliche Holzschutzmittel, Möglichkeiten der Dekontaminierung und Maskierung', *Restaura* 104(3) (1998) 186-191.

Unger, A., *Detoxifizierung holzschutzmittelbelasteter national wertvoller Kunstobjekte mit Farbfassungen und Oberflächenveredelungsschichten am Beispiel des Epitaphs von Döben und des Heiligen Grabes des Stiftes Neuzelle*, Abschlußbericht zum Projekt, Az 17134, Deutsche Bundesstiftung Umwelt (2003).

Unger, A. and Tello, H., 'Handle with care; the dry cleaning and decontamination of ethnological objects with liquid carbon dioxide', poster abstract in *ICOM Committee for Conservation, 15<sup>th</sup> Triennial Meeting, New Delhi, 22-26 September 2008: Preprints* (forthcoming in September 2008).

Vingelsgaard, V., and Schmidt, A.L., 'Removal of insecticides from furs and skins. Registration of conservation condition', in *ICOM Committee for Conservation, Symposium on Ethnographic and Water-Logged Leather, Amsterdam, 9 -11 June 1986*, ed. P.B. Hallebeek, Central Research Laboratory for Objects of Art and Science, Amsterdam (1986) 51-60.

Von Rotberg, W., Gagelmann, M., Wilke, N., Piening, H., Sieke, R.W., Roux, K., and Michaelis, S., 'PCP Pilotsanierung durch ein feuchtegekoppeltes thermisches Verfahren', *Umwelt* 27(5) (1997) 56-59.

Von Ullmann, A., *Entfernung von Pestizidrückständen aus Textilien mit besonderer Berücksichtigung ausgewählter Beispiele aus dem wertvollen Bestand des Germanischen Nationalmuseums, Nürnberg, durch überkritisches CO<sub>2</sub>*, Abschlußbericht zum Projekt, Az 17159, Deutsche Bundesstiftung Umwelt (2001) Vol. 1-2.

Von Ulmann, A., 'Non polluting removal of pesticides from historic textiles - a project at the Germanisches Nationalmuseum Nürnberg and the Deutsche Bundesstiftung Umwelt (1999-2001)', in *Cultural Heritage Research: A Pan-European Challenge, Proceedings of the 5th European Conference on Research for Protection, Conservation and Enhancement of Cultural Heritage, Cracow, Poland, 16 – 18 May 2002*, ed. R. Kozłowski, Polish Academy of Sciences, Institute of Catalysis and Surface Chemistry, Cracow (2003) 334-336.

Wagstaffe, R., and Fidler, J.H. (ed.), *The Preservation of Natural History Specimens Vol. 2, Zoology-Vertebrates, Botany, Geology*, H.F. & G. Witherby Ltd., London (1968) 69.

Williams, S.L., and Hawks, C.A., 'History of preparation materials used for recent mammal specimens', in *Mammal Collection Management*, ed. H.H. Genoways, C. Jones, and O.L. Rossolimo, Texas Tech University Press, Lubbock (1987) 21-49.

Winkler, K., Föckel, A., and Unger, A., 'Das Vakuumwaschverfahren, Dekontaminierung belasteter Hölzer im Einbauzustand', *Restaura* 108(5) (2002) 339-343.

Wolbers, R., 'Os Produtos de Substituicao', in *II Encontro Nacional*, Instituto de Desenvolvimento e Inspeccao de Condicoes de Trabalho, Lisboa (2000) 43-48 [in English].

Zabik, M., and Dugan, L.R., 'Potential of freeze drying for removal of chlorinated hydrocarbon insecticides from eggs', *Journal of Food Science* 36(1) (1971) 87-88.

Zimmt, W., Odegaard, N., and Smith, D., 'Pesticide Extraction Studies Using Supercritical Carbon Dioxide (scCO<sub>2</sub>)', in *Mitigation of Pesticides on Museum Collections*, MCI, Smithsonian Institution, Washington DC (forthcoming in 2008).

Zimmt, W., Odegaard, N., and Smith, D., 'Novel approaches to pesticide removal from museum objects', in *Mitigation of Pesticides on Museum Collections*, MCI, Smithsonian Institution, Washington DC (forthcoming in 2008).

## Web Resources on Biocides and Collections

(all named links were accessed September 2008)

### General information

[NMAI Pesticide Web-pages](#): the National Museum of the American Indian has a whole section of its website on the issue of Pesticide residues in museum collections, including sections on: which pesticides have been used in the past; analytical techniques used to detect pesticides residues; repatriation and loans; a Bibliography; and Web Links.

### CONSERVE O GRAM

[http://www.cr.nps.gov/museum/publications/conservedgram/cons\\_toc.html](http://www.cr.nps.gov/museum/publications/conservedgram/cons_toc.html)

Leaflets that can be downloaded in PDF format providing general information on a wide variety of different subjects connected to the preservation and care of collections. The leaflets listed here relate directly to collections and pesticide issues.

2/1 [Hazardous Materials Health and Safety Update](#)

2/3 [Arsenic Health and Safety Update](#)

2/4 [Dichlorvos \(Vapona\) Update](#)

2/10 [Hazardous Materials in Your Collections](#)

2/14 [DDT Health And Safety Update](#)

2/16 [Chronology of Pesticides Used On National Park Service Collections](#)

2/16 [Additional Graph of Pesticide Chronology](#)

2/17 [Physical Properties And Health Effects of Pesticides Used On National Park Service Collections](#)

2/19 [Guidelines for the Handling of Pesticide Contaminated Collections](#)

*NITON Sample Analysis Via Energy Dispersive X-Ray Fluorescence (EDXRF)*. Web publication on Niton web site [http://www.niton.com/how\\_xrf\\_works.asp](http://www.niton.com/how_xrf_works.asp)

Poulin, J. 'Science of Conservation: Pesticides in Museum Collections' *CCI Newsletter*, 33. May 2004 [online]. Accessed August 17, 2007. Available at: [http://www.cci-icc.gc.ca/publications/newsletters/news33/science\\_e.aspx](http://www.cci-icc.gc.ca/publications/newsletters/news33/science_e.aspx)

Spencer, B., N. Caldararo, L. Davis, P. Palmer. Conference summary: the contamination of museum materials and the repatriation process for native California. 2000. <http://bss.sfsu.edu/calstudies/arttest/sum.htm>

SPNHC, The Society for the Preservation of Natural History Collections

<http://www.spnhc.org/> has published the papers from Collection Forum volume 16-20

### Resources for Health and Safety Information and Information on pesticides

Agency for Toxic Substances and Disease Registry (ATSDR), 'Toxicological Profile for Arsenic (Draft for Public Comment)' <http://www.atsdr.cdc.gov/toxprofiles/tp2.pdf>

<http://palimpsest.stanford.edu/bytopic/health/>

Information on health and safety issues

Martin, G., M. Kite "CoSHH Does Work " V&A research and conservation website 46 (2004)[http://www.vam.ac.uk/res\\_cons/conservation/journal/number\\_46/coshh\\_works/index.html](http://www.vam.ac.uk/res_cons/conservation/journal/number_46/coshh_works/index.html)

EXTOXNET Pesticide Information Profiles (PIPs). A cooperative effort of University of California-Davis, Oregon State University, Michigan State University, Cornell University, and the University of Idaho. <http://extoxnet.orst.edu/pips/ghindex.html> and <http://extoxnet.orst.edu/faqs/pesticide/pestfate.htm>

Persaud, D. Hayton A. Jaagumagi R. and Rutherford G., "Fill Quality Guidelines for Lakefilling in Ontario," <http://www.ene.gov.on.ca/envision/gp/5040e.pdf>

U.S. Department of Labor  
Occupational Safety & Health Administration  
OSHA

<http://www.osha.gov/>

Web resources on occupational health and safety regulations and related subjects

National Institute for Occupational Safety and Health  
NIOSH

<http://www.cdc.gov/niosh/homepage.html>

Web source on occupational health and safety regulations. Provides also links to health hazard evaluation etc.

Material Safety Data Sheets

<http://www.msds-online.com/>

Toxnet

<http://toxnet.nlm.nih.gov/>

This free-of-charge search interface provides access to the TOXNET system of databases on toxicology, hazardous chemicals, and related areas.

TOXNET is sponsored by the National Library of Medicine, through the Toxicology and Environmental Health Information Program of its Specialized Information Services Division."

PAN Pesticides Database

<http://www.pesticideinfo.org/Index.html>

Pesticide Database Web site, your one-stop location for current toxicity and regulatory information for pesticides. The PAN Pesticide Database brings together a diverse array of information on pesticides from many different sources...

University of Nebraska at Lincoln

<http://pested.unl.edu/>

Web site with many links and further information to all subjects concerning pesticides and pests.

Center for Disease Control and Prevention

<http://www.cdc.gov/>

Conservation OnLine

Resources for Conservation Professionals

<http://palimpsest.stanford.edu/>

Good source for obtaining information on resources and web links in connection with subjects related to Conservation and Collections care.

Arts, Crafts, and Theatre Safety

<http://www.artsandcraftstheatersafety.org/>

health and safety counseling for art workers and hobbyists, professional safety, ventilation and industrial hygiene advice

### **Resources on Integrated Pest Management**

Integrated Pest Management (IPM) is a recommended strategy for controlling and preventing pest infestations in Museums and collections. This approach relies primarily on non-chemical means (such as controlling climate, food sources, and building entry points) to prevent and manage pest infestation.

The National Park Service Integrated Pest Management Manual

<http://www.colostate.edu/Depts/IPM/natparks/natpark.html>

The National Park Service Museum Handbook

<http://www.cr.nps.gov/museum/publications/handbook.html>

CONSERVE O GRAM

[http://www.cr.nps.gov/museum/publications/conservoogram/cons\\_toc.html](http://www.cr.nps.gov/museum/publications/conservoogram/cons_toc.html)

1/7 [Useful World Wide Web Resources](#)

3/6 [An Insect Pest Control Procedure: The Freezing Process](#)

3/7 [Monitoring Insect Pests with Sticky Traps](#)

3/8 [Controlling Insect Pests: Alternatives to Pesticides](#)

3/9 [Anoxic Microenvironments: A Treatment for Pest Control](#)

Northeast Document Conservation Center NEDCC

[www.nedcc.org](http://www.nedcc.org)

[Integrated Pest Management](#), Technical Leaflet

Integrated Pest Management

A Selected Bibliography for Collections Care

<http://palimpsest.stanford.edu/byauth/jessup/ipm.html>

Smithsonian Center for Materials Research and Study Integrated Pest Management Check List

<http://www.si.edu/scmre/relact/pests9.htm>

Website of the Integrated Pest Management Working Group, a group of collection managers, conservators and other professionals interested in issues surrounding the implementation of integrated pest management in museums and other collection-holding institutions <http://www.museumpests.net/>

