

An IPM Checklist for Planning & Implementing Pest Control on Art & Artifact Collections

There are really only four questions to answer or issues to consider:

I. Is Pest Control Necessary?

A pest is an unwanted organism—animal, plant, bacteria, fungus, virus, etc.

What pest problem do you have? bats, mice, birds, rats, mold (fungus), insects

What collections in your museum are affected? basketry, ceramics, frescoes, glass, metals, paper, paintings, stone, structure (building itself), textile (wool/camelid, cotton), wood (softwood, hardwood)

Some pest problems (like fleas) may bother the staff or collection's owner, but pose no threat to artworks or artifacts. Sometimes such insects as ladybugs or such animals as geckos are inconsequential, or even beneficial, to the home or museum environment.

Many types of collections are not attacked by pests, but their housings may be susceptible to infestation. Certain collections in certain climates are usually safe; certain collections in certain climates are at risk; some collections are attacked most often.

II. Will Pest Control Be Effective?

Is there a chemical or nonchemical treatment that you are currently using?

Does the pest problem persist?

Does the pest problem return? the next week, month, season, year

Where is the pest problem?

Where does the pest come from?

What does the pest like to eat?

What is the life cycle of the pest?

What does it need to survive? food needs, harborage needs, preferred light levels, preferred temperature levels, preferred humidity, preferred living arrangements (space)

For example, some cockroaches in the United States prefer a space $\frac{3}{16}$ inch wide; they like cracks and crevices and the dark; they will eat anything organic; they like starchy food; and corrugated boxes are attractive to them.

Integrated pest management uses chemical and nonchemical methods to reduce and eliminate pest problems in the following steps:

1. Inspection

Building structure. Does the structure invite pests into the museum via the roof, eaves and ledges, doors, windows, air vents, wall crevices, drains (inside and outside), floor, attics, basements?

Cleaning. Do maintenance schedules or housekeeping policies—about food, food supplies, equipment, museum supplies, trash removal, desks and table space cleaning, flowers, indoor and outdoor plants, closets, closed spaces, floor cleaning—make the collection a better place for the pests to live?

2. Diagnosis and Reporting

Catch examples of your pest (kill but do not squish) using sticky (unbaited) traps; sticky (baited) traps; pheromone traps; or black light traps (not good for your eyes). Collect examples of pest damage and leavings. Identify the pest; go to an entomologist (also see References). Learn its preferred diet, life cycle, and habitat. Record the location and date the pests were found to determine what areas of the collection are infested.

Note: Some insects will not be attracted to baits or traps. The "carpet beetles" that attack wool in the United States and Europe like only the dead insects already in the old traps. Other insects will die on your desk or shelf and be easy to find, like the *Stegobium*

paniceum L (drugstore/spice beetle) and the *Lasioderma Serricornis* F (the cigarette beetle). Cockroaches will hide and be caught in sticky traps if the traps are placed in dark corners or damp places and if cockroaches are present. *Do not carry out pest control on a pest that does not exist!*

3. Planning Pest Management Strategy

Match the pest control to the pest and match the treatment to the particular pest: to where it lives and what it eats, to the museum, to the people who work in the museum, and to the object.

Mechanical and physical control. Decide how to change your museum structure—vents, drains, screens, doors, plants, or windows. For example, to keep birds away, remove vines and bushes from exterior walls; to keep cockroaches away, remove leaves and grass clippings.

Cultural control. Decide how to change people's work (or eating) habits in the galleries, offices, library, and storage rooms. For example, do not leave food or wrappers in wastebaskets overnight; do not leave dirty dishes in the sink.

Sanitation. Decide how to make living in the museum more difficult for the pest. For example, make sure all windows have screens; to stop cockroaches from coming up around pipes, caulk all openings.

Biological control. Decide if another organism will solve the problem. For example, a cat in the garden might help catch mice.

Chemical control. Try local treatment, specific to the habits of the insect. For example, spray cracks and crevices for cockroaches; then set baited traps in dark corners.

4. Implementing the Strategy

Inform everyone in the museum why changes need to be made and how they can help (i.e., by changing their habits).

Keep a record of what you have done—the date it was done and where it was done.

Be certain to investigate any chemical you plan to use: that it is legal and the least invasive or least toxic method available. For example, cigarette companies find the pheromone traps provide significant control of the cigarette beetles in their factories.

Be certain that methods are properly applied. For example, a pheromone trap attracts insects, so place it at a slight distance rather than in the middle of susceptible collections; thus bugs will be attracted away rather than toward the collection.

Know what dosage (concentration) to use and in what form (liquid, powder, oil-in-water emulsion, etc.).

Know how long a treatment lasts at the temperature and relative humidity of your climate, in the sunlight, or in the dark.

Be certain that it will not affect trees, plants, etc. Know how safe it is to humans (see below).

5. Evaluate the Results

Again, inspect. Monitor with sticky traps, baits, pheromone traps, or black light traps; document numbers, location, and date. Check on a regular basis (every week or every month). Survey a sample of the susceptible collection. For example, look in a different cabinet every month to inspect a different group of textiles every time.

III. How Toxic to Staff (and to Visitors) Will the Pesticide Be?

Toxic means poisonous.

Dermal toxicity refers to poison absorbed through the skin. For example, dry materials (dusts, wettable powders, granules) can be absorbed into your skin, especially on a hot, humid day.

Oral toxicity refers to poison ingested. For example, it can occur while eating or smoking or from putting your hands or your food on sprayed surfaces.

Inhalation refers to poisons breathed through your nose. For example, breathing the vapor of the pesticide (not the carrier, but the pesticide itself can cause harm.)

Acute effects are measured as LD₅₀ meaning the lethal dosage for 50 percent of the animals tested. Sometimes they are measured as LC₅₀ meaning the lethal dosage in the air for 50 percent of the animals tested. The lower the LD₅₀ or the LC₅₀, the more poisonous the pesticide.

Chronic Effects are how poisonous a pesticide is to an animal or human after small, repeated doses over a long period of time. (LD₅₀ and LC₅₀ are not a measure of chronic toxicity.)

A fumigant is a poisonous gas that kills when absorbed or inhaled. Most are highly toxic but have no residual effects.

A pesticide is a chemical or other agent that will destroy a pest or protect something from a pest. 1. A residual pesticide is a pesticide that can destroy pests or keep them from causing damage for long periods of time after it is applied (days, weeks, or months). 2. A short-term pesticide is one that breaks down almost immediately after application into nontoxic by-products.

Most chlorinated hydrocarbons (Aldrin, Dieldrin, DDT, Lindane, Chlordane) are banned in the United States and Europe. Some of these chemicals have been found in collections in museums in Europe. They are residual pesticides that have chronic effects on people and animals. Until recently, they have been widely available in Europe (in grocery stores) and in the United States. As pesticides they worked very well, but they proved to have long-lasting toxic effects.

Caution: Carbamates (Sevin, Furadan, Lannate) and organophosphates can attack a chemical in your body called cholinesterase; your nervous system will be affected. These chemicals should not be sprayed on surfaces where people might work (desks or tables in storage rooms, etc.).

IV. Will Pest Control Harm the Art Object?

It is not difficult to find out about commercial or industrial materials such as cereal grains, fruits, cinder blocks, woods, spices, and metals. Whether a museum object will be harmed is more difficult to determine. In discussing and describing infested objects with a professional pest control operator (PCO) or entomologist, use material class terms (leather, wool, softwood) and be careful to mention all composite materials (protein glue, brass fittings, silver threads).

What is best for one museum's collection will not necessarily be the best for another unless the pest, climate, conditions, and collections are exactly the same.

References

Farm chemicals handbook. 1997. Willoughby, Ohio: Meister Publications. (Available on hard copy, disc, or CD rom.)

Insect control guide. 1997. Willoughby, Ohio: Meister Publications. (Available on hard copy, disc, or CD rom.)

Mallis, Arnold. 1990. *Handbook of pest control*, 7th ed. Cleveland, Ohio: Franzak and Foster.

Story, Keith. 1985. *Approaches to pest management in museums*. Washington, D.C.: Conservation Analytical Laboratory, Smithsonian Institution.

—Mary Ballard, Conservation Analytical Laboratory, Smithsonian Institution