

8.3

Controlling Biological Contaminants

Biological contaminants are particles or gases that originate with something that is—or once was—alive. Sometimes, as in the case of pathogens, the entire organism is the contaminant; in other situations the contaminant is produced by the organism—directly or indirectly. Organisms that are the source of biological contaminants may reside inside the building or outside. The contaminants may be released in the building, be tracked in on the feet of people or pets, or be carried in with infiltration or ventilation air. Biological contaminants that may cause physiological problems for people include odors, irritants, allergens, toxins, and pathogens. People in the building are not the only ones at risk. Organisms or contaminants released by them may decompose or corrode building components and damage electronic equipment.

Opportunities

Deal with existing problems first. Moisture problems are the precursor to nearly all pest, fungal, and environmental bacteria problems. If there are moisture problems in the building, these should be first on the list of priorities for correction. Mold should not be growing inside buildings. If there is mold or fungal growth, respond quickly and safely to clean it up and prevent a recurrence. The next priority is pest animals. The Executive Memorandum on “Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds” (April 16, 1994) requires the use of integrated pest management, or IPM, practices when they are cost-effective and practical. Many Federal agencies developed and adopted IPM policies for their buildings and landscapes before and since this memorandum. If an IPM program is not in effect, begin to develop and implement one.

Technical Information

Living things in buildings fall into two categories: invited and uninvited. This is an important distinction, because the primary control mechanisms are quite different. The invited are the building’s occupants. Contaminants released by these occupants must be controlled with personal hygiene, cleaning, filtration, and dilution by outdoor air. The uninvited biological organisms we may have to deal with, however, include the following:

- Mammals – rats, mice, bats, raccoons and skunks;
- Birds – pigeons, starlings;

- Reptiles – lizards, snakes;
- Arthropods – roaches, ants, termites, wasps, bees, carpet beetles, mites, spiders;
- Fungi – penicillium, aspergillis, cladosporium, fusarium;
- Bacteria – environmental and pathogenic; and
- Viruses – pathogenic.

The contaminants released by these organisms consist largely of the following: dander (skin or scale flakes), feces, urine, spores, hyphae, metabolites, and viable bacteria or viruses. Allergic response to alien protein in these contaminants is probably the most frequent effect encountered. The most dangerous effect is exposure to pathogens that can be passed by airborne transmission. Electronic equipment is sensitive to contaminants, especially the acidic ones found in feces and urine. Pollen is not usually lumped with biological contaminants in buildings, but it can get into buildings and commonly causes allergic responses.

Tracked-in dirt is a significant source of biological contaminants. Fungal spores are the most abundant contaminant in this category—large enough to have settled outside but small enough to become airborne for a time when disturbed indoors. Exclusion is the first line of defense for tracked-in contaminants.

The smallest biological contaminants enter by means of outdoor air. They consist primarily of fungal spores, insect parts, pollen, and metabolic gases. Generally, an especially strong outdoor source is required to cause an indoor problem, such as downwind of a composting facility or a swamp—though pollen is a seasonal problem in many areas. Contaminated outdoor air may be actively drawn in through the intakes of the ventilation system, or passively drawn in through infiltration as a result of depressurization caused by mechanical equipment, the stack effect, or wind.

CONTROLLING BIOLOGICAL CONTAMINANTS

Several strategies must be used to minimize exposure to biological contaminants while also minimizing exposure to biocides. Controlling contaminants released by organisms inside the building is accomplished using IPM methods for the animals and moisture control for the fungi and environmental bacteria.

Integrated pest management for animals consists of the following steps:

1. Keep them out.

- Landscape the building to eliminate easy pest access to the building (overhanging tree branches, shrubbery in direct contact with the building, etc.).
- Seal the exterior walls, foundations, and roofs against pest entry.
- Seal gaps around wiring and plumbing that provide passage between food, water, and living habitat.

2. Reduce food and water sources.

- Establish and enforce a food policy and a cleaning policy that minimize food scraps in the building.
- Repair rain and plumbing leaks quickly.
- Keep soil moisture and groundwater out of the building.
- Prevent condensation on cool surfaces, such as windows (better-insulating glazings and edge spacers may be required).

3. Reduce pesticide exposures.

- Respond to pest problems when they occur, rather than providing regular applications.
- Select least-toxic pesticides that target the problem species.
- Use treatment methods that target individual species and nests.
- Avoid spraying pesticides when possible (traps and baits are preferred).

Fungal contamination should be addressed as follows:

1. Identify problems.

- Determine the extent of moisture damage and fungal contamination.
- Figure out the moisture dynamics causing the problem.
- During the initial investigation, ensure appropriate containment and protection of workers.

2. Dry the affected area.

3. Implement an effective long-term solution.

- Eliminate moisture sources through roof repair, flashing modification, installation of a drainage layer beneath cladding, and control of soil moisture entry.
- Develop a long-term fungal cleanup plan.
- Implement containment and worker protection procedures.
- Discard materials that are not worth saving.
- Decontaminate materials that can be saved.
- Implement repairs and program changes to prevent a recurrence of the problem(s).

- Tracked-in contaminants are among the simplest to control. Up to 85% of tracked-in contaminants can be caught at the entry using effective track-off mats that are cleaned daily. Vacuuming with machines that indicate when dust has been collected greatly reduces the amount of contaminants on hard-surface floors and in carpet.

References

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Contacts

General Services Administration, National Capital Region Building Services, Integrated Pest Management; (202)708-6948; see Web site at ncr.gsa.gov/Services/RealEstate/building.asp.

U.S. Environmental Protection Agency, Indoor Environments Division, Mail Code 660 4J, 401 M Street, SW, Washington DC 20460; (202) 564-9456; www.epa.gov.

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