Integrated Pest Management for Urban Hotels:
How to Reduce Pestilence and Create Healthier Facilities for Guests and Staff

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This guide is intended to help hoteliers learn about the latest pest control practices and products that minimize pest infestations and health risks to guests and staff. Specific recommendations are provided for bed bugs, rats and mice, cockroaches, ants and flies. Recommendations are also made for hiring and working with pest control contractors.

I. What is IPM?

"Integrated Pest Management (IPM) is a systematic strategy for managing pests which considers prevention, avoidance, monitoring and suppression. Where chemical pesticides are necessary, a preference is given to materials and methods which maximize public safety and reduce environmental risk."[1]

IPM requires participation of the hotel management and staff—not just the pest control contractors. The parties collaborate in eliminating the food, water and shelter needed by pests to survive. When functioning well, the hotel and the contractor communicate regularly, have clear responsibilities, collect and react to data and educate staff. This collaboration leads to less pervasive use of pesticides, less spraying and less human exposure.

IPM practices are now commonly used inside buildings by pest management companies, though not always in a comprehensive and consistent way.

II. The Benefits of IPM

There are three factors propelling the use of IPM in hotels: it is a logical and effective method for reducing pest problems, it reduces exposure to chemicals that have an adverse impact on human health, and many customers and staff prefer hotels that demonstrate environmental concern.

Does exposure to pesticides result in health problems? According to the U.S. EPA[2], "because they are designed to kill or otherwise adversely affect living organisms, pesticides may pose some risk to humans, animals, or the environment. Some pesticides are more hazardous than others…"

According to the Pesticide Action Network, North America (www.panna.org/docsTrespass/ChemTresExSumEng(screen).pdf), "many of the pesticides we carry in our bodies can cause cancer, disrupt our hormone systems, decrease fertility, cause birth defects or weaken our immune systems. These are just some of the known detrimental effects of particular pesticides at very low levels of exposure. Almost nothing is known about the long-term impacts of multiple chemicals in the body over long periods… But the claim that pesticides are necessary is rapidly eroding in light of the growing success of …alternative controls for household pests."

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[1] Integrated Pest Management: Guidelines for Structural Pests, Developed by the Structural Work Group of the Massachusetts IPM Council, 2000.

[2] http://pesticides.custhelp.com/cgi-bin/pesticides.cfg/php/enduser/std_adp.php?p_faqid=5110&p_created=1213719719&p_sid=pRFrZvAj&p_accessibility=0&p_redirect=&p_lva=&p_sp=cF9zcmNoPSZwX3NvcnRfYnk9JnBfZ3JpZHNvcnQ9JnBfcm93X2NudD0yMDEsMjAxJnBfcHJvZHM9JnBfY2F0cz0mcF9wdj0mcF9jdj0mcF9zZWFyY2hfdHlwZT1hbnN3ZXJzLnNlYXJjaF9ubCZwX3BhZ2U9MQ**&p_li=&p_topview=1.

Clearly, some people, including infants, elderly and asthmatics are more sensitive and vulnerable to pesticide exposure than others. So are pets. Also, it is important to consider pesticide exposure in hotels in its proper context. Each of us carries hundreds of synthetic chemicals in our bodies from many sources (www.chemicalbodyburden.org/). The exposure we receive in hotels adds to that accumulation of chemicals, sometimes unnecessarily.

Pest control practices can have a positive or negative effect on hotels' reputations. The Habitat Suites hotel in Austin boasts about their use of non-toxic practices in a media article[3] and on their website (www.habitatsuites.com/about.htm). Conversely, Connecticut hotels and restaurants were embarrassed when Ecolab was forced to pay a $583,000 penalty for improper use of pesticides in their facilities (www.ct.gov/dep/cwp/view.asp?Q=331728&A=2794). Of course, the worst publicity a hotel can receive occurs when guests notice a pest infestation.

III. Common IPM Practices

Hotels that follow IPM principles prevent pests by excluding them, practicing excellent sanitation, reducing clutter, storing food securely, and with protocols that lead to rapid identification of infestations. They address pest problems with baited traps, gels and pucks; insect growth regulators; repellants; and non-volatile baits. Pesticides are used in ways that minimize contact with humans.

An important aspect of prevention is to inspect and monitor for pest outbreaks. Sticky traps help identify insects inside entrances and in places where food is stored, served and disposed. Ultraviolet lights and synthetic pheromones can be used to lure flying insects to the traps. Dogs are sometimes used to identify bed bugs in hotels.

Once problems are identified, it is important to record and communicate this information. The specific pests should be determined, because targeted treatments tend to be more effective and cause less pesticide exposure than general treatments. Information should be recorded by location and number of pests. Communication standards should be followed for each type of pest. For example, bed bugs must be reported immediately, whereas hotels do not need to react as swiftly to a few fruit flies on the loading dock.

Treatments vary by pest, and will be discussed in more detail in the next section. After eliminating pest infestations, hoteliers and contractors should determine the source of the outbreak and how to reduce the likelihood of future problems.

IV. Managing Pests with IPM

This section provides information about the most common pests in Boston area hotels and strategies to address them. It is intended to help hoteliers prevent infestations and better manage their pest control contracts. It is not a comprehensive discussion of how to prevent and eliminate each creature.

- **Bed Bugs**: Bed bugs are a more expensive and challenging problem than other pest problems right now. The approach for addressing them is not as advanced as it is for other pests, at least partly because their re-emergence is recent. There are several strategies for eliminating bed bugs, but it is not yet clear which ones work best and are most cost effective.

[3] www.dentonrc.com/sharedcontent/dws/fea/travel/thisweek/stories/DN-greentravel_0722tra.ART.State.Edition1.1b7a493.html

The National Pest Management Association reported, "A 71% increase in bed bug infestations in the states since 2001."[4] The hotel sector is particularly impacted, because travelers bring bed bugs with them and because visitors react strongly to this nuisance. According to a Travel Reviews study, "when asked what red flags would prevent them from booking a property… 95 percent said bed bugs."[5]

Hoteliers cannot prevent bed bugs, because they arrive with their guests. However, they can use encasements on their beds and box springs to prevent the bugs from getting into and out of their favorite hiding place. They can also seal cracks, crevices and their floors to make it harder for these bugs to hide.

It is particularly important to identify bed bugs quickly, before they spread and bite more guests. Housekeeping staff should be trained to identify these pests; and engineering staff could inspect hiding places that are out of sight to the housekeepers. Bed bug eggs are microscopic, young bugs are as small as a poppy seed and adults are the size of an apple seed. They leave fecal spots on sheets and in their hiding places that are small, dark red and round. Occasionally, they leave an odor. They are also identified by their light brown shed skin. Photos of bed bugs, fecal spots and shed skins are on http://bedbugger.com/photos-of-bed-bugs-and-signs-of-bed-bugs/.

Roughly 85% of bed bugs are found in or near beds, including the mattresses, box springs and headboards.[6] The other 15% are usually found in fabric or wood surfaces, such as upholstered furniture, in carpets, along baseboards, behind wallpaper, etc. But they could even be in cell phones or computers. Some are found making their way to other rooms.

Many hotels use specially-trained dogs to identify infestations. A study found that they were 97% effective.[7] Don Rivard, former President of the New England Pest Management Association, says that the dogs trained to identify only bed bugs are more effective than dogs trained to detect several different scents. He also notes that dogs detect bed bugs up to six feet off the ground, but often miss those that are high in the drapery.

A commercial detection kit (http://cimexscience.com/index.cfm?fuseaction=Welcome.Default) has recently become available, too.

There are various strategies for eliminating bed bugs. Experts recommend that hoteliers use a combination of measures to address this problem. Pesticides alone have several limitations. Bug bombs, also known as total release foggers, do not reach all of the insect's hiding places, and cause bugs to flee to other parts of the hotel. Also, some bed bugs are now resistant to commonly used pesticides, and such resistance is becoming more common.

An IPM approach starts with a thorough inspection of the area; washing and drying affected bedding at high temperatures; using a specially-dedicated vacuum and attachment on beds and all potential hiding areas; thoroughly cleaning the mattresses and all nearby items; encasing the

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[4] www.pestworld.org/press-releases/continued-rise-of-bed-bug-populations-is-hightlighted-nationally-in-new-research-study-with-upcoming-federal-summit

[5] www.hotelschool.cornell.edu/research/chr/news/newsroom/item-details.html?id=4040452

[6] How to Manage Pests, Statewide IPM Program, Agriculture and Natural Resources, University of California, 2009, www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7454.html.

[7] Ditto.

mattresses so that remaining bed bugs will not escape and will eventually die; and sealing cracks in nearby walls, window frames, doors and the floor.

Some hotels use heat to kill the remaining bed bugs. Most use a commercial service. Large hotels might find it worthwhile to purchase a heating unit themselves. The units are expensive and it takes considerable training to learn how to operate them. However, hotels with their own units have the flexibility to schedule this work to their best advantage. To be effective, it is necessary to heat the infested rooms to 130 degrees for three hours or 140 degrees for two hours.

A similar strategy is to apply dry steam directly to areas that might harbor bed bugs.

It is also possible to kill bed bugs with cold temperatures. One source said that rooms must be kept at below freezing temperatures for several days. Another asserted that it is necessary to keep infested items at 0°F for one to two weeks. Some pest control companies offer spot treatments of a direct cold CO2 spray to kill bugs in hard to reach places, including electronic equipment.

Pesticides, when necessary, should be applied to bed frames and hiding places, but not to mattresses and bedding, to avoid exposure to guests and staff.

Pyrethrin and pyrethroid insecticides have the advantage of working quickly, but some bed bugs are resistant to them. Other insecticides take several days to kill bed bugs. Non-toxic sprays and liquids are on the market, but I could not find an independent study that evaluated their effectiveness.

It makes sense to monitor rooms that have been treated to assure that all of the pests have been eliminated. One way to do so is to use the Climbup Insect Interceptor (www.insect-interceptor.com/) around the legs of beds and couches.

Research is underway on pheromone-baited traps. When available, they will be an important advance in bed bug management.

- **Rat and Mice**: The IPM approach to rats and mice starts with making hotels unattractive to them. The traditional method of control, using toxic baits, is a last resort, because many rats and mice are resistant to them, the vermin may die in inaccessible places which lead to odors and insect infestations, and people might come into contact with the toxins.

  To prevent rat and mice infestations hotels should keep food, grass seed, dry pet food, bird seed and similar items in containers. Garbage and recycling bins should be well contained and emptied frequently. Vegetation should be at least a foot from the building, and dense groundcover should be segmented to deny cover to vermin. Seal holes in the building and screen the facility's vents. Seal air conditioning units, too. Repair sewer pipes and place wire mesh in the drains. Eliminate free standing water in or outside the building. During infestations, consider draining the facility's fountains.

  High-risk areas should be monitored regularly. Once detected, it is important to determine whether the vermin are rats or mice, and which kinds of mice are present. The treatment differs for each species.

Traps are the preferred IPM treatment for mice, and sometimes they work for rats, too. The traps should be mapped and checked daily. When other methods are unsuccessful and the rodent infestation is severe, then rodenticide should be considered. However, safety precautions should be taken. Tamper-resistant bait stations should be used to protect humans and pets. Bait stations should always be secured and clearly labeled.

- **Cockroaches**: Cockroach control requires a multi-faceted approach. These insects are often sited near food, but they may harbor nearby. Housekeeping, engineering and food service staff can be instrumental in reporting infestations and assuring that cockroaches' access to food, water and harborage is limited.

  Visual inspections are used to identify cockroach habitat and to prioritize the areas to be treated. Some of the visual inspections should occur after dark, when cockroaches are active. The insects' favorite locations include corners of floors or ceilings, near all sources of water, in equipment engines, in closets and cupboards, hiding behind picture frames and mirrors, by loading docks, near trash containers and recycling bins, and in cracks and crevices.

  Sticky traps used in these locations augment visual inspections. Where cockroach populations are low, the sticky traps alone might resolve the problem.

  Once hoteliers know where the cockroaches are located, they can remove their sources of food and water. The area should be thoroughly vacuumed to take out the insects, their egg cases and fecal material. This usually kills the insects, but vacuuming up a tablespoon of cornstarch will assure that they suffocate. Next, the area should be washed. Vacuuming and washing will reduce the allergens and bacteria associated with these pests. When cockroach infestations occur in kitchens, hoteliers should consider steam-cleaning equipment and appliances that were exposed to the insects.

  Nearby cracks should be caulked or painted shut. Doors and windows should be weather-stripped and holes in screens sealed to reduce entry point. Clutter should be reduced in order to eliminate hiding places.

  Excellent sanitation and food storage will reduce the population of most kinds of cockroaches, but persistence is important. "German cockroaches can remain alive for approximately 2 weeks with no food or water and for 42 days if only water is available."[8] Brown-banded cockroaches can live on soap and other substances that humans do not eat.

  Consider upgrading the storage of unrefrigerated food. Cockroaches can get into seemingly well-sealed containers, but can't access food stored in jars with snap-top lids or rubber seals and gaskets.

  Cardboard boxes can be accessed by roaches. Some shipping containers harbor them. Such containers should be unpacked away from food kitchens and food preparation centers.

  Staff should be asked to store their own food properly. When remodeling a kitchen area, hoteliers should consider getting cockroach-proof appliances and fixtures.

[8] **Least Toxic Methods of Cockroach Control**, D. M. Miller and P. G. Koehler, Entomology and Nematology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, 2003, http://edis.ifas.ufl.edu/IG105.

It is very difficult to remove sources of water from cockroaches, because they can drink from almost any moisture, including toilet bowls. However, this is an important strategy for addressing infestations. Keeping kitchens dry when not in use, fixing drips, drying areas of condensation and other measures can be helpful.

Barriers help keep cockroaches from entering the building and travelling through it. Cockroaches can scale outside walls, so any penetrations should be sealed. Cockroach runways through the building, like plumbing pipes, electrical conduits and heating ducts should be sealed, too.

If these approaches do not eliminate the insects, then insecticides should be considered. Note that the German cockroach, one of the most common varieties, has become resistant to several kinds of pesticides, though not to boric acid, diatomaceous earth and silica gel. Insecticides should be applied in cockroach harborage and passageways, such as cracks and crevices, beneath sinks and stoves, in back of refrigerators, beside baseboards, and in electrical outlets and cabinets. They should not be sprayed, both because that increases human exposure and they often repel the insects, rather than killing them.

Baits are another part of an effective strategy. They work well when combined with sanitation, because insects with fewer food choices are more likely to take the bait. Also, baits reduce human contact with the chemical agents. It can be tricky to place the baits where cockroaches find them. A trial and error approach is sometimes necessary.

Insect growth regulators are sometimes used once cockroach numbers have been reduced. Juvenile cockroaches exposed to this substance become sterile when they reach adulthood. This method is therefore slow to show results, but effective and not very toxic to humans.

After cockroach numbers are under control, the area should be monitored using sticky traps.

- **Ants**: Ants enter hotels in search of food, water or shelter from hot or flooded conditions. It is usually impractical or impossible to eliminate ants outside the hotel. However, one can reduce the nearby ant population by eliminating outdoor plants that attract honeydew-producing insects such as aphids and soft scales, and trees with sweet fruit or nectar. Also, it is wise to keep plants and mulch at least several inches from the building.

  Ant infestations are easy to spot inside the facility, but it can be difficult to determine where the ants come into hotels and their pathways. Yet, to eliminate the infestation and prevent future ones, it is important to develop this map.

  Caulking ant access points, and nearby potential entryways, is an effective measure. Inspectors should plug pathways around baseboards, cupboards, pipes, sinks, and electrical wires and outlets. Weather-stripping should be used to block entrances around doors and windows.

  Excellent sanitation in kitchens, restaurants, food storage areas and other places with food is an important aspect of addressing ant problems. Use the same food storage strategies noted above in the cockroach section. Also, during ant infestations, keep sugar, honey, syrup and pet food refrigerated.

If certain food must be left out, or if you have indoor plants that attract ants with their nectar, you could protect them with a moat of water with a little detergent. The detergent assures that the ants drown.

Lone ants in the hotel should be killed immediately, as they might be scouts who are looking for food for the colony. Lines of ants should be vacuumed up, along with a tablespoon of cornstarch to assure that they suffocate.

If you find ant nests in a potted plant, take it outside and submerge it for twenty minutes. The ants will leave. If a plant is too cumbersome to take outside, surround it with a wider pot with soil in it. Put a stick in the infested pot that can act as a bridge to the outside pot. Then flood the potted plant with water. The ants will take the bridge to the outside pot, which you could then take outside.

If an ant infestation persists after taking the measures above, then chemical treatment should be considered. The least toxic method is to spray ants with detergent and water. Then, they can be swept up and disposed.

Baits are generally more effective and incur less exposure to toxins than sprays, because ants bring them back to the colony where they kill other ants. Only use baits when there is an infestation, because they might attract ants into the hotel. For that reason, dispose of the bait when the infestation has ended. Consider placing the baits outside the facility, to draw ants out of the building. Put them in the vicinity of the nests or the pathways, but not where children or pets can access them.

Baits do not always attract the targeted ants because ants seek different kinds of food depending on their needs at the time; and because the placement of the bait might be sub-optimal. Also, certain subspecies like some baits better than others. Hence, it makes sense to classify the ants before selecting the type of bait.

Boric acid, diatomaceous earth and silica aerogel are insecticides that are effective when applied to cracks, crevices, in wall cavities and behind or beneath cabinets. The latter two substances are sometimes combined with pyrethrins.

- **Flies**: There are many species of flies. Here, I will address the most common nuisance flies--the ones that breed in garbage and manure. These flies have four stages of life, and can be most easily eliminated in the larval stage. Pesticides offer only temporary relief, because they are targeted at adult flies, leaving larva to grow into pupa and then erupt in a new generation of adult flies. Also, flies often develop resistance to pesticides.

  Flies lay their eggs in moist places, such as food waste in dumpsters, animal feces, in kitchen drains and in moist soil that contains garbage. Reducing these breeding sites is the most important part of fly control. Other strategies include eliminating the odors that attract flies, keeping them out of the hotel with screens and other barriers and killing flies that do get in with traps, fly swatters and fly paper.

  Food waste should be removed from garbage disposal units, sinks and floors. It should be separated from other garbage to the extent possible, drained and placed in sealed plastic bags. Containers should be rinsed or bagged before recycling them.

It is preferable to place dumpsters as far from the facility as practical. The dumpsters should be upwind of the doors that lead to rooms with food, so that flies in the dumpster are not lured into the hotel. Dumpsters and garbage cans should have tight-fitting lids and no holes. They should be cleaned regularly to remove garbage residues that attract flies. Pay particular attention to odors coming from the dumpster, because flies smell them from a long distance. Use a mixture of borax and water to reduce this odor.

Flies rest on walls and ceilings, and leave specks that attract other flies. A borax and water solution will eliminate these odors, too. If fly problems persist in the summer, consider more frequent pick-ups of garbage, food waste and recycling during this period.

Screens and weather-stripping are effective barriers that keep flies outside. There are several ways to kill flies that manage to get inside the hotel. Electrocuting light traps work well in food preparation and storage areas that do not have bright light coming in from windows. Place the lights near sources of odors, such as cooking areas, because the scents also attract flies.

Flyswatters can be effective for killing a few flies. It works best to aim them about 1.5 inches behind the fly. They should not be used in food preparation areas, because they might contaminate food with the body parts of flies. Flypaper will provide some relief, and could be used in areas not visited by guests.

Light traps are discouraged outdoors, because they kill more beneficial and harmless insects than flies. Outdoor fly traps with cones suspended over baits should be used carefully, because they could inadvertently lure flies from the surrounding area to the hotel. They also have limited appeal to urban hotels, because the attractants have a strong smell.

If nothing else works, then fly baits and sprays could be used in conjunction with the strategies noted above.

V. Finding a Contractor

Not long ago, IPM use in commercial buildings was considered an alternative strategy. Don Rivard remembers being told to use gallons of pesticides per job, and make sure that the customer smelled them. That way, the customers felt like they received good value for their money.

Now, IPM is much more common. Pesticides are often applied by the gram rather than the gallon, and placed only where pests reside. Since IPM is a set of principles and not a rigid prescription, it is easy for companies to say that they practice it. However, some companies and practitioners practice IPM more rigorously than others. Some pest management professionals are not trained in current IPM practices, and use pesticides liberally, even when alternatives exist.

When hoteliers establish a pest control contract, how will they know that the company and its staff practice IPM principles? Unfortunately, there are no widely accepted IPM certifications for pest control professionals. The one existing certification, Green Shield (www.greenshieldcertified.org), has not been widely adopted yet. Currently, there are no Green Shield certified companies that serve the Boston commercial building market.

So, when hoteliers hire a pest control company, they should ask questions about how they approach pest prevention and treatment, their methods of operation and the reports they produce. The hoteliers should clearly communicate their preference for IPM practices and reduced pesticide exposure for staff and guests.

VI. Working with a Pest Management Contractor

As noted, hoteliers who collaborate with their contractors and actively manage this service are more likely to achieve excellent results. Don Rivard suggests that hoteliers: require that the reports be legible and that they understand them; ask the contractors questions about their practices; meet with them periodically to discuss issues and how the parties can cooperate; assure that their traps are up to date and properly located; that records are kept regarding trap locations; and that problems are resolved promptly.

IPM requires more effort and persistence than the liberal use of pesticides. However, hoteliers who practice it are repaid with fewer pest outbreaks, a more sanitary facility, reduced risk and less human exposure to toxic products.

VII. Resources

IPM for Schools: A How-to Manual, United States Environmental Protection Agency, www.epa.gov/opp00001/ipm/schoolipm/index.html.

Guidelines for Prevention and Management of Bed Bugs in Shelters and Group Living Facilities, New York State IPM Program and Cornell Cooperative Extension, www.nysipm.cornell.edu/publications/bb_guidelines/.

Healthy Hospitals: Controlling Pests Without Harmful Pesticides, Kagan Owens, Beyond Pesticides and Health Care Without Harm, 2003, www.noharm.org/details.cfm?ID=864&type=document.

Ten Step Guide to Implementing an Integrated Pest Management Program, Hospitals for a Healthy Environment.

Killing Them Softly: Battling Bed Bugs in Sensitive Accounts, Pest Control Technology, Michael F. Potter, Alvaro Romero, Kenneth F. Haynes and Erich Hardebeck, January 19, 2007, http://pctonline.com/articles/article.asp?ID=2822&IssueID=226.

How to Manage Pests: Pests of Homes, Structures, People, and Pets; Rats, UC IPM Online, www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74106.html.

Least Toxic Methods of Cockroach Control, D. M. Miller and P. G. Koehler, Entomology and Nematology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, 2003, http://edis.ifas.ufl.edu/IG105.

Solving Nuisance Ant Problems without Pesticides, Northwest Coalition for Alternatives to Pesticides, www.pesticide.org/ants.html.

How to Manage Pests: Pests of Homes, Structures, People, and Pets; Ants, UC IPM Online, www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7411.html.

How to Manage Pests: Pests of Homes, Structures, People, and Pets; Flies, UC IPM Online, www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7457.html.