



Integrated Pest Management

Prepared by:

Michael Waldvogel, Ph.D.
NC Cooperative Extension Service
North Carolina State University

197

In this section of food safety training, we will discuss some of the common pest problems that can be found in food service facilities. We will also discuss the steps you should take to develop a safe and effective pest control program.

foodsafety

Problems Caused By Pests

- Customer perception
- Damage to food, supplies and facilities
- They can contaminate food and preparation surfaces
- They can spread diseases such as *Salmonella*.



Integrated Pest Management 198

Pests create problems to us for many reasons:

Customers see a cockroach or hear about a “cockroach problem” may leave and never come back. Others may avoid your establishment. Pest feeding and nesting activities can damage food, supplies and facilities. Pest activity and their fecal droppings (and sometimes their urine) can contaminate food and food preparation surfaces and equipment. They may spread disease organisms, such as *Salmonella*.

NOTE: Point out picture of cockroach damage to lasagna noodles.

foodsafety

A pest management program should:

- Rely less on pesticides
- Emphasize sanitation and exclusion of the pests.
- Train employees
- Use a licensed pest control operator (PCO)



Integrated Pest Management 199

Pesticides are often temporary solutions to pest problems. IPM (Integrated Pest Management) uses both chemical and non-chemical methods to control your current pest problems and to prevent future problems. IPM emphasizes sanitation and exclusion (“pest proofing”) first. Then, you should work with a trained pest management professional to determine your next best course of action. Whenever possible, start with the most effective non-toxic and least-toxic pest control methods.

foodsafety

Common Pest Problems



The slide features four photographs of common pests. Top-left: A brown rat is shown on a circular metal grate. Top-right: A housefly is perched on a green leaf. Bottom-left: A group of cockroaches, including a large brown one and several smaller ones, are shown against a light blue background. Bottom-right: A cluster of ants is gathered around a piece of yellowish food on a white surface. The slide includes a 'foodsafety' logo in the top left, the title 'Common Pest Problems' in green, and a footer with 'Integrated Pest Management' and the number '200'.

The most serious and consistent problems are usually caused by insects, such as cockroaches, flies, stored product pests, and ants, as well as by rodents (both mice and rats).


foodsafety

Cockroaches

Can be introduced into the establishment through boxes, bags, and workers' personal items.



German cockroach female with egg case



University of Nebraska


Integrated Pest Management 201

Cockroaches are THE most common pests in food service facilities. They are active mostly at night. They prefer places that are: **Warm** (80° F or higher) and **Moist** - 55% humidity or higher (*which is another reason to keep relative humidity at or below 50%*). Cockroaches like to hide in cracks and crevices and they frequently take advantage of “free rides” in delivery boxes, bags and personal items.

NOTE: The picture on the right is a female German cockroach with an egg case that contains 35+ eggs. She will drop this egg case almost anywhere about 24 hours before the eggs hatch. The picture at left shows four very common types of cockroaches: (A) American cockroach, (B) oriental cockroach, (C) German cockroach (a common problem species) and (D) brownbanded cockroach.

foodsafety

Cockroach Feces and Egg Cases



Noticeable oily odors

Egg cases and feces

Integrated Pest Management 202

Cockroaches leave coarse pepper-like fecal droppings (seen at right), as well as fecal smears that dry on surfaces (left - arrows). Other signs of cockroach activity are the presence of egg cases (arrows at right) under and inside drawers, cabinets, equipment and other hiding areas.

NOTE: the manual mentions an “oily” smell. However, this smell is usually with very large cockroach populations which is a more common problem in residential settings than in most food service facilities.

foodsafety

Critical Areas for Cockroaches



The slide features three photographs illustrating critical areas for cockroaches in a kitchen. The top-left photo shows a close-up of a sink drain with a white mesh cover, with a black arrow pointing to a small pile of food scraps. The top-right photo shows a person wearing a white shirt and green gloves cleaning the area under a refrigerator. The bottom-right photo shows a kitchen counter area with various items, including a white container and a metal tray.

Integrated Pest Management 203

Cockroaches are attracted to spilled food and water or beverages. Equipment, such as microwave ovens and electric grills need to be checked carefully. Inspect and clean all food preparation equipment and surfaces (such as the area above the refrigerator shown in the upper right picture). Remove food scraps from drains.

foodsafety

Use glue traps to monitor cockroach activity



Integrated Pest Management 204

Early detection of cockroaches is critical to successful IPM. Sticky traps similar to the ones shown here, can be placed in areas where you suspect or expect that there cockroach activity. This type of monitoring program will help you target your control efforts where they are most needed.

NOTE: in the trap at the lower right, you can see an adult female cockroach, plus her 'babies' that hatched from her egg case and became stuck in the glue.

foodsafety

Chemical Control of Cockroaches



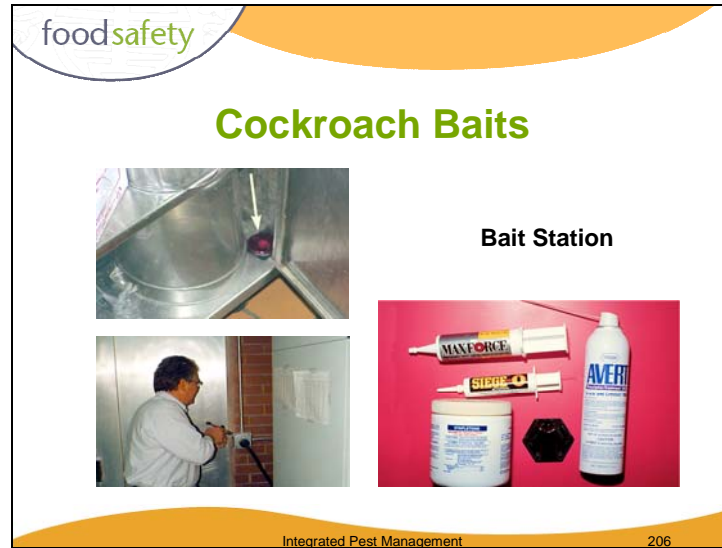
Crack and crevice treatment and spot treatment

- Target use of insecticides to reduce amount used
- Avoid contaminating food, prep surfaces and equipment
- Apply insecticides after business hours



Integrated Pest Management 205

Liquid and dust forms of insecticides can be used when necessary, e.g., to reduce large cockroach populations quickly particularly in areas that are somewhat inaccessible. Residual insecticides (chemicals that remain effective on treated surfaces for weeks or months) should be limited to 'crack & crevice' or 'spot' (2 sq. ft. areas) applications. Whenever pesticides are used indoors, you must avoid contaminating food, food preparation surfaces and equipment. Only trained pest management professionals should apply pesticides in your facility and preferably only when the building is closed.



Baits are among the best choices as least hazardous insecticides for cockroach control. These products come in several forms (granular, dusts, gels and stations or trays, as shown on the right). Read the product labels carefully for the instructions on their proper use in food service facilities.

Here are examples of good placement of cockroach baits. Since roaches tend to congregate in dark corners, they are more likely to find baits such as this bait tray (upper left) on the bottom shelf of a storage cabinet. The gel type of baits (lower left) can be placed inside electrical boxes and other areas where cockroaches tend to hide.

NOTE: Although these baits are less hazardous, that does not imply that this work should be done by anyone other than a trained pest management professional. Effective baiting also means knowing how and where to use these baits. You still need to avoid contaminating food and work surfaces with the bait.

The slide features a white background with orange decorative wave shapes at the top and bottom. In the top-left corner, the 'foodsafety' logo is displayed in a light blue circle. The title 'Rodent Problems' is centered in a bold green font. Below the title is a bulleted list of three points. At the bottom, the text 'Integrated Pest Management' and the number '207' are visible.

foodsafety

Rodent Problems

- Rats and mice (usually mice are the more common problem)
- Damage/contaminate food and property
- Can spread diseases through their feces and urine or by contact with surfaces


Integrated Pest Management 207

Rodents are another big pest problem in food service areas. They can damage or contaminate food, supplies and property. They can spread diseases through their feces and urine.

Slide 208

foodsafety

Rodents nest outdoors in areas hidden by tall grass, landscaping, “clutter” or down in sewers.



Integrated Pest Management 208

The slide features three photographs illustrating rodent nesting sites. The top-left photo shows a sewer opening in a yard with tall grass and landscaping. The bottom-left photo shows a building foundation with landscaping. The right photo shows a cluttered storage area with cardboard boxes and other debris.

Outdoors, rodents frequently nest or hide in areas that are hidden by tall grass and shrubs particularly along building foundations. Garbage and other improperly discarded “clutter” will attract rats and mice. Storm and sanitary sewers provide rodents (particularly rats) with water and a “highway” for moving undetected from one area to another.

foodsafety

Mouse Nesting Sites



Integrated Pest Management 209

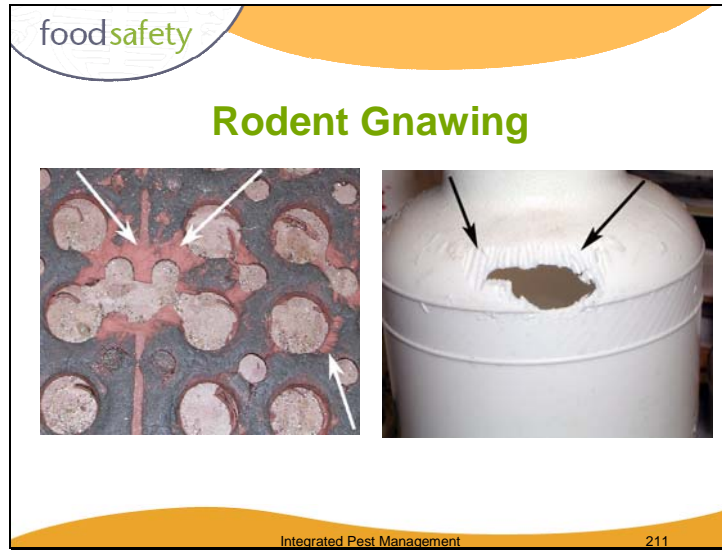
Mice will often nest indoors (more often than rats will). Check boxes, furniture (such as filing cabinets and storage closets), and wall voids for signs of mouse activity.

NOTE: in the picture on the right, the arrows point to areas where mice had chewed into the boxes when they stacked against the wall.



Look for holes in the ground that may lead to their burrows. The examples here are of a rat burrows behind a building (left picture). Rats may wear a trail through grassy areas (as shown at right) where they run constantly between their burrows and food sources.

NOTE: One way to tell if a burrow is "active" is to fill in hole with soil or stuff some newspaper down into the hole. If the soil or newspaper is pushed out, then the burrow is still "occupied."



A rat's teeth constantly grow, so it will gnaw on objects to keep its teeth filed down or to chew its way through boxes or even walls. Look for gnawing marks on wood or other objects.

NOTE: the photo on the left shows damage from rats gnawing on a rubber floor mat in a kitchen.



Rats tend to run along walls (rather than out in open areas) and they will leave “rub” marks (left - arrows) on the surfaces along which they travel. Look for these rub marks along pipes and electrical conduits and at walls and cabinet bases.

Rodent droppings usually $\frac{1}{4}$ " to $\frac{3}{8}$ " long and tapered at both ends. Look for them on the floor or on top of boxes particularly items stacked against walls.

foodsafety

Excluding Rodents

Foam sealants alone will not stop rodents.



Use metal hardware cloth to seal large openings.



Integrated Pest Management 213

Rats can fit through openings as small as a 25mm and mice can squeeze through 13mm gaps. Foam sealants for keeping out cold (or hot) air, but they will not stop a determined rodent that may be attracted for food odors from your facility. Place heavy metal screening cloth over vents or other openings to prevent rodents from getting indoors.



Mechanical traps are the best choice for indoor rodent control. Lethal traps include sticky traps (right) and regular snap traps (upper left). Mechanical rodent traps include “live traps” as shown here (lower left). Traps must be checked daily and rodents or their carcasses removed as soon as possible.

NOTE: If you are inspecting the traps rather than using a professional, you should wear disposable or washable gloves when handling traps and or dead rodents.



Poison baits can be used outdoors and indoors. However, if baits are used indoors, rodents may die in a wall void, under appliances or in some other inaccessible place. Keep track of rodent feeding activity on these baits. Placement is critical. Rodents prefer to travel along walls, so place the stations where rodents are likely to find them (as shown in the two pictures above). One important point to remember: if you bait in public areas (i.e., accessible to people or animals), then you must place the baits in a secure bait station (i.e., the station cannot be picked, shaken and the bait dislodged). The station in the upper left corner is attached to the wall.

NOTE: Picture at bottom shows the use of block baits that are placed on metal rods within the trap so the baits cannot be removed by a rodent or dislodged if the station is shaken. This is the safer method to bait.

foodsafety

Proper Use Of Rodent Baits



No **Yes**

Integrated Pest Management 216

If you bait indoors, NEVER use pellet baits (as shown on the left). Mice may carry the bait away and drop it somewhere else (“bait translocation”) where it could contaminate food or water. Always use the paraffin (“wax”) “bait blocks” as shown on the right. The bait is more difficult for the mouse to remove from a bait station.


NOTE: The bait station on the right shows the blue bait block. The small brown objects are seeds dropped by the mouse. The point is to show that if mice could bring seeds and drop them indoors, they can just as easily carry away the pellet bait in the photo on the left and then drop it somewhere else.

foodsafety



Common Fly Pests

“Filth” flies -- house flies and blow flies

Others -- fruit flies, drain flies, fungus gnats



U-Nebraska-Entomology University of Nebraska Department of Entomology



Univ. of Florida James L. Coats

Integrated Pest Management 217

Let's turn our attention to flies. “Filth flies” are the most common fly problems associated with food-handling facilities. They include house flies and the green, blue or coppery colored blow flies commonly seen around garbage cans. Fruit flies (lower left) are found near damaged or discarded fruits and vegetables. Drain flies (lower right) breed in floor/sink drain, as well as the drip lines for air conditioners, freezers and ice-makers. Fungus gnats can also be found where indoor plants are overwatered.

foodsafety

Fly Control



The slide features three photographs. The top-left photo shows a kitchen sink area with a drain. The bottom-left photo is a close-up of a drain on a tiled floor. The right photo shows a beverage dispensing station with a Coca-Cola logo.

Integrated Pest Management 218

Sanitation is very important to fly control and prevention. Keep food prep areas clean and dry. Clean up spills around beverage dispensing stations. Routine drain cleaning prevents debris from building up and reduces the likelihood of problems with drain flies or fruit flies. Check your refrigeration and icemaker drip lines several times each year and clean them when necessary.

foodsafety

Exterior Trash Cans and Dumpsters



- Empty trash cans and dumpsters regularly.
- Keep areas around them clean.
- Keep dumpster lids and doors closed.

Integrated Pest Management 219

Trash receptacles particularly those located in customer areas and near doors (photo at right) need to be emptied regularly throughout the day so they do not attract flies to the building. Keep the areas around trash cans clean. Keep dumpsters and other garbage cans closed. Dumpsters should be emptied regularly (preferably twice weekly). Areas around dumpsters and trash compactors should be kept clean so that you attract fewer flies (and other pests).

NOTE: When dumpsters are cleaned, make sure they're returned with the drain plugs in place (lower left picture).

foodsafety

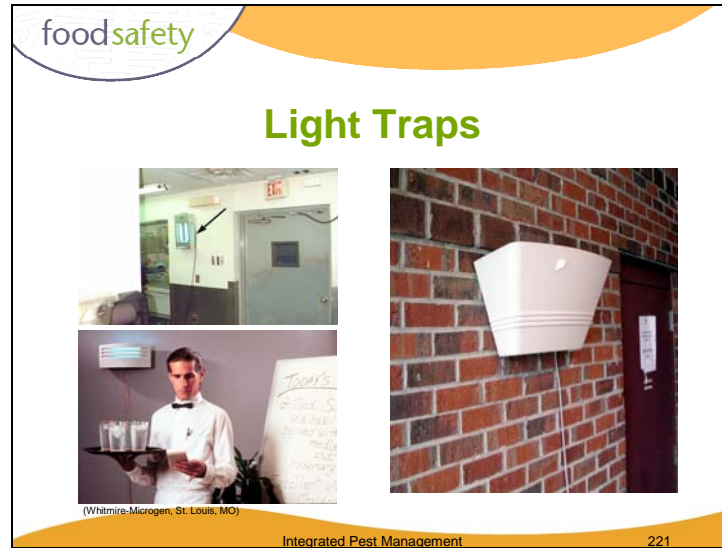
Keep Flies Out



The slide features three photographs illustrating fly control measures. The top-left photo shows a blue screen door installed in a doorway. The bottom-left photo shows the exterior of a building with a screen door. The right photo shows a red door on a brick wall with a fly fan mounted above it.

Integrated Pest Management 220

Exclusion is an important component of a fly control program. Keep doors closed as much as possible. If doors must be open (e.g., during deliveries or to improve air circulation during hot weather), then use screen doors or air curtains (“fly fans”). Fly fans (right) are mounted above exterior doors (either inside or outside), such as those by loading docks, equipment cleaning areas or rear entrances to kitchens. When the door opens, a switch activates the fan that produces a “curtain of air” that keeps flies from entering. Make sure that your air curtain works properly, i.e., it turns on when the door opens and the louvers direct the air downward (not angled inward).






Lights traps are helpful indoors and outdoors to trap flies. They should be mounted preferably 4-6 feet off the ground, but out of the way of employee activities. Indoors, place these traps where they will *not* be visible from outside. Otherwise, they might attract flies to the building. Bulbs should be replaced yearly and the replacement date noted on the trap.

NOTE: The traps shown here are not the “zapper” type which should not be used indoors where airborne “exploding” insect body parts can contaminate food or food-prep surfaces.

foodsafety

Stored Product Pests

 <p>Flour beetle</p>	<p>Flour Baked items Spices Pastas Dried fruit Powdered milk Shelled nuts Bird seed Grass seed Rodent baits</p>	 <p>Cigarette beetle</p>
 <p>Sawtooth Grain beetle</p>		 <p>Indianmeal moth</p>

Integrated Pest Management 222

Other important pests in food service are those that attack stored foods. The Indian meal moth (a small moth with coppery-colored wings) is probably the most common stored products pest found in North Carolina. Flour and grain beetles are other important stored product pests. All of these insects attack a wide variety of foods.

Items such as flour, spices, pasta and cereals are particular favorite foods of these beetles and moths. However, you also need to think about “non-food” items that may be in or near your building. Birdseed is often infested with beetles and moths. Rodent baits use grain as an attractant. Insects can feed readily on these baits without being harmed by the chemicals in the bait. This is not usually a problem unless the bait is placed in storage areas and left unchecked for months (or years).

NOTE: Most rodent baits contain chemicals that affect blood clotting. Insects have very different blood components compared to rodents and other mammals. For that reason, insects are not affected by these chemicals.

foodsafety

Stored Product Pest Control



Keep food storage, prep and serving areas clean and easy to inspect.

Discard or return infested items.

Store susceptible items in sealable, food-grade containers.

Integrated Pest Management 223

- Pesticides are rarely needed to control stored product pests if you follow these suggestions:
- Keep your storage areas clean, particularly the floors under shelves or pallets. Spilled food becomes a reservoir for these pests. Clean up spills quickly.
- Inspect your deliveries carefully. Discard (or return) infested or suspect items.
- Store susceptible items in sealable containers.

foodsafety

Use a Pest Logbook



A means of two-way communication

Integrated Pest Management 224

Successful IPM programs use Pest Logbooks.

1. The log allows you and your employees to note pest sightings. This helps your PCO deal more effectively with specific pest problems.
2. The PCO can also record the locations of monitoring traps and bait stations.
3. The log also provides you with a record of recurring pest problems. In some cases, this information may allow you to trace certain pest problems back to other problems in the building or to deliveries from a particular supplier.
4. In turn, the PCO can use the log to point out improvements that YOU need to make in your facility sanitation and maintenance programs.


The slide features the 'foodsafety' logo in the top left corner. The main title is 'Pesticides Can Be Hazardous' in green text. Below the title is a simulated pesticide label with the following text: 'EPA Reg. No. 3125-283', 'Two 2.5-Gallon Jugs per Case, 30-Gallon Drum, 6-Gallon Multi-Trip Container', 'STOP - Read The Label Before Use', 'KEEP OUT OF REACH OF CHILDREN', 'DANGER' (with a red underline and arrow), a skull and crossbones symbol, 'PELIGRO', 'POISON' (circled in red), and 'PRECAUTIONARY STATEMENTS HAZARDS TO HUMANS AND DOMESTIC ANIMALS'. Below the label, there is a bilingual instruction: 'Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.' and '(If you do not understand the label, find someone to explain it to you in detail.)'. To the right of the label is a bulleted list of safety points. At the bottom of the slide, it says 'Integrated Pest Management' and '225'.

Pesticides Can Be Hazardous

EPA Reg. No. 3125-283

Two 2.5-Gallon Jugs per Case,
30-Gallon Drum
6-Gallon Multi-Trip Container

STOP - Read The Label Before Use
KEEP OUT OF REACH OF CHILDREN

DANGER  **POISON**

PELIGRO

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(If you do not understand the label, find someone to explain it to you in detail.)

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS

- Liability issue
- Do not let untrained employees apply pesticides
- Preferably - use licensed pest management professionals
- Keep copies of the MSDS for all pesticides used in your facility.

Integrated Pest Management 225

To summarize this topic, remember a few important points.

Pesticides can be very useful, but they can also be extremely hazardous if they're misapplied. In sensitive areas, such as a restaurant, or cafeterias in schools, hospitals and nursing homes, applying pesticides should be a job for trained professionals.

foodsafety

Demand a Pest Management Program

- Emphasize:
 - Good sanitation practices
 - Proper maintenance of the facilities
 - Inspection, monitoring, baiting and trapping for pests, such as cockroaches, rodents and ants
- Limit spraying to situations when necessary and *only* when facility is closed.

Integrated Pest Management 226

Most importantly: Pest Management starts with YOU. A well-maintained, well-organized facility is less like to have serious pest problems. The rest of your pest management program takes a cooperative effort between you and your pest management professional. Your pest control program should emphasize inspection and monitoring, not simply weekly or monthly sprays. Less toxic control measures such as baiting and trapping should be your first line of defense whenever possible. Limit the use of pesticide sprays to situations when they are absolutely necessary and only when customers and employees are not present.