WEST COAST RODENT ACADEMY

March 3 & 4, 2021

University of California Cooperative Extension

South Coast Research & Extension Center

Thank you to our sponsors!

BASF
We create chemistry

VM PRODUCTS

BAYER

SPONSOR

LIPHATECH

Bell LABORATORIES, INC.

XCLUDER
RODENT AND PEST DEFENSE

SPONSOR

Cooperators

Target Specialty Products

TARGET SPECIALTY PRODUCTS

Veseris

VESERIS

CATCHMASTER
Stick with the Best!

kness Pest Defense
Your best defense.

Agenda 2021

West Coast Rodent Academy - Two-day Virtual Event

Wednesday March 3, 2021

3 hours of live lecture from 7:30-11:00 AM PST and bonus recorded YouTube channel

7:30 AM **Rodent Biology, Behavior and ID** - *Niamh Quinn, Ph.D, Human-Wildlife Interactions Advisor, UC ANR Cooperative Extension*

8:30 **PMP Safety: Health Significance of Commensal Rodents** – *Laura Krueger, MPH, BCE, PCA, Vector Ecologist, Orange County Mosquito and Vector Control District*

9:30 Break

9:45 **Inspection Inside and Out** - *Gregg Gransie, Technical Sales Representative, Target Specialty Products*

10:15 **Exclusion – Where Do I Begin?** - *Warren Hanussak, Account Executive, Veseris*

10:45 Adjourn to Bonus Session

11:00 AM-12:00 PM **Bonus Module: Technology for Rodent Management-**

- Efrain Velasco, Lloyd Pest and Termite Control
- Ashley Freeman, Bell Laboratories
- Scott Broaddus, Bayer

12:00 AM Adjourn

Commensal Rodent Biology and Behavior

Niamh Quinn, Ph.D., Human-Wildlife Interactions Advisor, University of California Cooperative Extension

Learning objectives

1. Rodent identification
2. Learn about rodent biology
3. Identify how to use behavior to help manage rodents

Identification

Behavior

Reproduction

Physical Abilities

Health Implications of Commensal Rodents in California

Laura Krueger, Vector Ecologist, Orange County Mosquito and Vector Control District, Orange County, CA
Learning

Objectives

1) Identify the most common health issues (including infectious agents, allergens, and ectoparasites) associated with commensal rodents in California

2) List the routes of exposure for infectious agents associated with rodents

3) Identify the rodent species that vector rodent-borne pathogens in California 4) Recognize the most common ectoparasites associated with commensal rodents and how to control them Notes:

Allergens, Pathogens, and Parasites Associated with Commensal Rodents in the Western US*

- Allergens
  - Mouse Urinary Protein
  - Laboratory Animal Allergy
- Body Fluid pathogens (Saliva & Urine)
  - Rat bite fever (*S. moniliformis* and *S. minus*)
  - *Leptospira*
  - Lymphocytic choriomeningitis (LCM)
  - Tularemia
  - Hantaviral Diseases: Sin Nombre virus (*Peromyscus maniculatus)*,* Seoul virus (*R. rattus & R. norvegicus)*
- Food-borne pathogens (Urine & Feces)
  - Salmonella
  - *Staphylococcus aureus*
  - *E.coli* 0157:H7
  - Hepatitis E
- Vector-borne pathogens (Fleas, Ticks, Mites)
  - *Yersinia pestis*, Plague
  - *Rickettsia spp.,* Flea-borne typhus
  - *Borrelia spp.,* Lyme disease, (*Peromyscus* sp.)*
  - *Bartonella spp.*

Commensal rodents include:
- Roof rat
- Norway rat
- House mouse

*indicates disease associated with *Peromyscus* spp. mice

List compiled by Laura Krueger, OCMVCD, lkrueger@ocvcd.org, 10/27/2018

Facts About Roof Rats and Disease Transmission in Orange County

While the potential for disease transmission by roof rats (*Rattus rattus*) is very real, the actual likelihood of dried urine and droppings causing disease is very remote. Of the half dozen or so diseases roof rats are known to carry, most are not suited to the arid natural conditions found in Orange County (O.C.). These pathogens almost always require high humidity and in some cases an aquatic environment to survive outside their animal hosts.

The most common pathway for rodent-borne diseases to the human population is through contaminated food and water. The concern for disease transmission through the dried urine or fecal material found in many attics is largely unfounded.

The best way to avoid infection is to avoid contact and to not stir up pathogens by trying to remove the droppings and soiled insulation unless there is a persistent odor problem. Removal and replacement of insulation, when necessary, should be conducted by a licensed professional that has been made aware of any known rat activity.

Risk assessment by disease:

Rat-borne Hepatitis E Virus –Very common (66%) in O.C. roof rats, however, it is not considered infectious to humans.
Salmonella sp. and ***E. coli*** -- Not transmitted by dried urine or droppings, commonly transmitted through contaminated water or food, both are often found in O.C. roof rats.
Hantavirus (Seoul virus) – Possibly transmitted by dried urine or droppings, remains infectious for 12-15 days, readily deactivated by UV light (sunlight) and bleach, rare (0.3%) in O.C. roof rats.
Plague – Not transmitted by dried urine or droppings, rare (0.2%) in O.C. roof rats. Plague is a flea-borne disease.
Rat Bite Fever – Transmitted through rodent bites and contact with rodent secretions. Five cases in children in OC from 2008-2012, all from pet rats.
Flea-borne Typhus (Formerly, Murine Typhus) – Not transmitted by dried urine or droppings, another flea-borne disease. While common on cats and opossums, the flea responsible for transmission of Murine typhus is rarely found on O.C. roof rats.
Leptospirosis – Not transmitted by dried urine or droppings, can be transmitted through contaminated water or food. Not reported from O.C. roof rats but likely found in house mice. Two human cases have been reported since the 1990s and many cases in domestic dogs.
"Filth Diseases" -- Once roof rats have been eliminated from a home, the chance for disease transmission is dramatically reduced. The potential for mechanical transmission through previous contamination of food still exists. If the integrity of a food item is, for any reason, uncertain, it should be discarded.

Precautions:

Rat Control—The best way to control rats is to eliminate what is attracting them. The Orange County Vector Control District (OCVCD) has a wealth of information on how to accomplish this on the District website www.ocvcd.org.
Clean-up -- Should it be necessary to clean up after a rat infestation it is advisable to reduce the chance of any material becoming airborne by wetting the material with a 10% bleach solution and, if possible, dry it in sunlight. Bleach and sunlight will deactivate any pathogen that may be present.

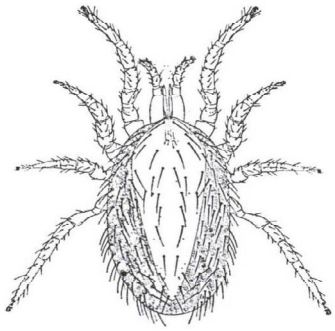
Rat and Bird Mites in Los Angeles County

People living in rat-infested homes or structures where birds are nesting are frequently attacked by mites which migrate from nests into the structure. The bites can cause severe itching and painful dermatitis in sensitive individuals.

Mites are extremely small arthropods which are barely visible unless viewed by a microscope or magnifying glass. Most mites either feed on plants, or attack and feed on other arthropods, but some can be found parasitizing vertebrates. There are three mites in southern California which cause frequent problems because they will feed on humans in the absence of their normal hosts.

The tropical rat mite, *Ornithonyssus bacoti* (Hirst, 1913), and two mites associated with birds, the northern fowl mite *Ornithonyssus sylviarum* (Canestrini and Fanzago, 1877) and the tropical fowl mite *Ornithonyssus bursa* (Berlese, 1888) can become significant pests under certain conditions. When their primary hosts nest in or on structures, these mites will frequently invade structures and their bites can cause irritation and sometimes painful dermatitis.

The tropical rat mite occurs on rats and in their nests and frequently attacks people living in rat-infested buildings. These mites can become serious pests when there are many rats living within the structure, but most often they make their presence known shortly after control measures are started to eliminate the rats (the primary host). When trapped or poisoned rats die or fail to return to the nest, the mites migrate into the living areas of the structure to feed on human or animal hosts. Migrating mites are extremely active and will crawl long distances to secure a blood meal.



The tropical rat mite is extremely small and the color can vary from cream to red or black depending upon how recently a blood meal was taken.

The mites are attracted to carbon dioxide (a product of respiration) and heat, and by these means locate potential hosts within the structure. The mites are ultimately drawn to those areas within the home which experience the greatest amount of human activity. Rooms such as kitchens, family rooms, bedrooms, and work areas maintain the highest concentrations of carbon dioxide and are highly attractive to the mites. Mites are also attracted to frequently used furniture such as sofas, recliners, and beds, and will bite the occupants as they rest or sleep.

The key factor in eliminating tropical rat mites from a home is abatement of the rodent infestation. Rats can be controlled with bait or traps, but baits are not recommended when rats infest dwellings. Rats may die within inaccessible areas such as wall voids or behind kitchen cabinets, and the resulting odor of decay may be present for a week or longer. Snap traps and glue boards should be used in areas of noted activity to control rats indoors. Keep in mind that trapping or otherwise killing rats may increase the activity of the mites as they search for other hosts.

Locate areas of rodent activity and eliminate any stored food caches, fecal pellets and nesting material. Rats frequently build their nests in protected areas such as behind large objects, or inside old furniture or storage boxes. They will use any soft material such as shredded paper, rags, insulation, old clothing, or furniture stuffing to line the nest. As a general precaution, before disposing of the material in a plastic bag, spray the area lightly with a disinfectant such as Lysol, and use disposable paper towels to gather up materials. Seal the bag tightly and dispose of in the trash. Individuals performing such activities should protect the hands with plastic gloves and wear a dust mask to prevent inhalation of dust contaminated with urine or feces.

Mites that have invaded the home can be eliminated by vacuuming carpets and furniture. Pesticide room foggers can be used to temporarily control mites on exposed surfaces. When using pesticides, carefully follow label directions. Before using a fogger in a bedroom, remove all linens from the bed, vacuum the mattress then cover it with a sheet to prevent pesticide from settling on the mattress. Launder the linens. When the treatment is complete and the room can be safely entered, remove and launder the sheet that covered the mattress, and place fresh linens on the bed.

The key to successful control of tropical rat mites is eliminating the rodent infestation.

Mites associated with birds are very similar in size, appearance, and behavior to rat mites. In most instances, problems develop in the spring and during the summer months when birds build their nests and raise their young. In southern California, bird mite problems frequently occur when the house sparrow, the rock dove, (feral pigeon), or the mourning dove build their nests on occupied dwellings. Nests are often constructed below the eaves, in attics, in angles provided by rain gutters and spouts, or in hanging plant holders. Because mites can neither jump nor fly and must travel on continuous surfaces, nests built in trees or vegetation in direct contact with structures also permit mites access to occupied portions of the building.

During the period when the female and her young occupy the nest, mites remain in the nest and on the birds, and their numbers often increase substantially. When the young mature and the nest is abandoned, mites migrate into the structure in search of alternative hosts. Mite invasions as a result of bird nesting activity often produce an excessive number of bites experienced by individuals living within the structure. Occasional mite invasion resulting in intermittent bites sometimes occurs when pigeons congregate on roofs or utilize other portions of occupied structures as daytime resting sites.

If you suspect birds are nesting in or on the structure, search for the nest and dispose of it in a large plastic bag. Seal it tightly to prevent mites from escaping. Signs which indicate a hidden nest are fecal droppings which accumulate beneath the nest site, or dried grass or other nesting material which may be partially visible. Spray the area where the nest is located with a household pesticide to eliminate any mites which may be disturbed when the nest is removed. Control of bird mites which have entered the dwelling is the same as previously mentioned for rat mites.

Sometimes all that is necessary to prevent bird mites from entering a dwelling is trimming tree branches so they no longer touch the sides of the building. If birds were able to nest in the attic, beneath roof tiles, or below the eaves of the home, accessible areas must be sealed or closed off with hardware cloth or chicken wire to prevent future problems. If structural modifications are necessary to prevent birds from roosting on buildings, pest management companies specializing in vertebrate control can provide assistance.

It is important to remember the mites discussed in this bulletin do not burrow beneath the skin. Although extremely small, when they are moving the mites are readily visible on the skin. The mites are easily removed by bathing or showering, and topical applications such as those used to control lice are not necessary. Neither rat mites nor bird mites can reproduce in the absence of their primary host.

Some individuals exposed to invading mites may have no reaction to bites, while others may experience severe itching or painful dermatitis. Topical applications that eliminate the discomfort from itching and irritation may be the only treatment necessary for most individuals suffering from bites. Sensitive individuals experiencing severe dermatitis should consult with a physician.

A Pest Bulletin distributed by:
County of Los Angeles - Department of Public Health
Vector Management Program
5050 Commerce Drive
Baldwin Park, California 91706
(626) 430-5450

ROLE OF PUBLIC HEALTH OFFICIALS

State and local health agencies monitor plague activity throughout the state. Public health officials:

- Work with doctors and veterinarians to identify suspect cases of plague, confirm the diagnosis, and ensure that patients receive necessary treatment.
- Conduct investigations of confirmed plague cases to determine how the person was exposed and to identify others who may be at risk of plague.
- Work with rangers, park personnel, and others to watch for sick or dead rodents or other evidence that plague may be active in a particular area.

If signs of plague are identified, health authorities institute preventive measures including notification of residents and visitors, posting of warning signs, and, if deemed necessary, closing off the area so that flea control measures can be conducted.

Additional information on plague can be obtained from your local health department and the CDPH website, www.cdph.ca.gov.

FACTS ABOUT PLAGUE IN CALIFORNIA

You can minimize your exposure to plague by carefully following the precautions listed in this pamphlet.

California Department of Public Health
Vector-Borne Disease Section
(916) 552-9730
March 2016

EXPOSURE TO PLAGUE

Plague is a highly infectious bacterial disease which affects primarily rodents. Humans and other animals can get plague if they visit or live in areas where wild rodents are naturally infected. People can get plague in several ways. The most important routes of transmission are:

BITES FROM FLEAS OF INFECTED RODENTS

Hungry fleas will leave a sick or dead rodent to bite another animal, including humans.

DIRECT CONTACT WITH SICK RODENTS

Plague bacteria in the blood or tissues of an infected animal can enter through cuts and scrapes in the skin or through the eyes, nose, and mouth.

PET INVOLVEMENT

Cats with plague pneumonia can spread plague bacteria when they cough or sneeze.

PLAGUE AREAS IN CALIFORNIA

Plague is endemic (naturally occuring) in many parts of California. Plague in California occurs in the mountains and foothills shown in shaded areas on the map.

Plague is absent from the southeastern desert and the Central Valley.

Plague is most common in the rural and undeveloped mountain regions, as well as the suburban foothills of some larger cities.

Plague has not occurred in urban and developed areas of California for nearly 100 years.

WHICH ANIMALS CARRY PLAGUE ?

Wild rodents in rural areas are the principal source of plague in California. Urban rats and house mice are not important sources of plague.

The most important wild rodents that can carry plague are ground squirrels, chipmunks, woodrats, mice, and marmots. Plague is deadly to many rodents; therefore, sick or dead rodents are a warning that plague may be in the area.

Other wild animals -- especially rabbits, carnivores (coyote, bobcat, badger, bear, gray fox, and raccoon), and wild pigs -- can also acquire plague but rarely transmit plague to people.

Pet cats are highly susceptible to plague and can pose a direct threat to humans.

A cat with plague will become very ill, may stop eating, will have a fever, and typically develop swollen lymph nodes in the neck area.

Ways to Protect Yourself From Plague

General Precautions

Avoid all contact with wild rodents and their fleas. Do not touch sick or dead rodents; report them to rangers or health authorities.

Use caution when handling a sick cat that has been in a plague area and had contact with wild rodents. Avoid close face-to-face contact. Consult a veterinarian and inform them that the animal has been in a plague area.

Where You Live

Discourage rodents from around homes and other inhabited areas. As much as possible, remove or deny rodents access to any source of food or shelter.

Minimize pet contact with rodents and rodent fleas. Consult your veterinarian for effective flea control methods.

Where You Work or Play

Do not camp, sleep, or rest near animal burrows.

Look for and heed posted warning signs.

Do not feed rodents in campgrounds and picnic areas. Store food and garbage in rodent-proof containers.

Wear long pants tucked into boot tops to reduce your exposure to fleas. Apply insect repellent to socks and pants cuffs.

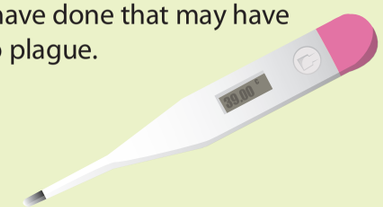
Leave pets at home if possible; otherwise, keep pets confined or on a leash. Do not allow pets to approach sick or dead rodents or to explore rodent burrows. Protect pets with flea control products.

SYMPTOMS OF PLAGUE

The initial symptoms of plague include fever, chills, muscle aches, weakness, and commonly, swollen and tender lymph nodes (called buboes). Buboes most commonly occur in the neck, armpit, or groin. This form is called bubonic plague.

If it is not diagnosed early, bubonic plague can progress to septicemic plague (bloodstream infection) and/or pneumonic plague (lung infection). These forms of plague are more severe and more difficult to treat.

Plague is readily treatable when diagnosed early. You can help with the diagnosis by telling your doctor where you have been and what you have done that may have exposed you to plague.



Identification of Rodent Filth Exhibits

M.L. ZIMMERMAN AND S.L. FRIEDMAN

ABSTRACT: Three main types of rodent filth (rodent excreta pellets, gnawing, and nesting material) are described and identification procedures are listed. Suspect excreta pellets that may be encountered in foods from various animals are described in detail and presented in a dichotomous key for comparison and identification. The physical features associated with the excreta pellets (color, shape, size, weight, surface, and matrix composition) are listed for the insects and animals found in the key. Rodent gnawing and rodent nesting materials are defined and the importance of the paired incisor marks, scalloping along edges and the appearance of the building materials are described. The importance of urine, rodent excreta, hairs and/or parasites when defining nesting material, are discussed, along with the key elements used to recognize the gnawing direction by the rodents. Historical data on rodents and health/safety concerns when handling rodent filth exhibits are addressed.

Key words: identification, rodent, excreta, gnawing, nesting material

Introduction

RODENTS HISTORICALLY HAVE BEEN RESPONSIBLE FOR MORE human illness and death than any other group of mammals (Bjornson and others 1971; Gorham 1981). Examples of rodent-associated diseases include plague from rodent fleas, murine typhus from rat fleas, Leptospirosis (Weil's disease) spread by infected rodent urine, Salmonellosis (food poisoning) from rodent excreta pellets, and Rickettsial pox from bloodsucking mites associated with the house mouse (Bjornson and others 1971; Brown 1969; Gorham 1981; Storer 1952). More recently, outbreaks of hantavirus pulmonary syndrome associated with infected deer mice (*Peromyscus maniculatus)* were recognized in the western United States (Friedman and Zimmerman 1997). Besides their significance as vectors of disease, rodents are very expensive nuisances. They foul and damage millions of dollars worth of the country's food supply yearly (Burt and Grossenheider 1976; Storer 1952).

Rodents belong to the order Rodentia whose members are recognized by two pair of prominent chisel-like incisor teeth and the lack of canine teeth (Storer 1952). Rats and mice belong to the family Muridae (Brown 1969; Burt and Grossenheider 1976; Wilson and Reeder 1993). The most common cosmopolitan rodents associated with man are the house mouse (*Mus musculus*), the roof rat or black rat (*Rattus rattus*), and the Norway rat (*Rattus norvegicus*) also known as brown, house, or sewer rat (Gorham 1981; Storer 1952; U.S. Food and Drug Admin. 1960). Brown (1969) reported that these three imported rodents are more destructive to man and his property than are the native rodents in the United States. These imported rodents, native to Asia, have spread throughout the world. Today, the house mouse is found all over the world from the tropics to the arctic region. The roof rat and Norway rat were carried to the Americas through ports of entry. The Norway rat is especially common along the East Coast of North America. In mixed populations, the Norway rat will dominate over the roof rat and will eventually drive it out. Roof rats are good climbers and are usually found in high places like grain elevators, whereas Norway rats' activity occurs at ground level. Another common commensal pest of food storage and food processing facilities is the lesser bandicoot rat (*Bandicota bengalensis*), also called the bandicoot or the Indian mole rat (Frantz and Davis 1991). Although found only in South and Southeast Asia, it is considered an important agricultural pest and evidence of these rodents is sometimes found in foods imported into the United States.

Organizations such as the U.S. Food & Drug Admin. (FDA), state and local governments, and private industry, including pest control companies, employ a host of professionals to deal with the identification, spread, and control of these pests in our food supply. Rodent filth submitted to the FDA laboratories for identification/confirmation may arrive from three sources: collected as filth exhibits during establishment inspections, recovered as extraneous material during routine surveillance sample analysis (imported and domestic products), and/or submitted as foreign objects via consumer complaint samples. In some cases, the environmental conditions in which the evidence was collected may have involved poor lighting, nonexistent temperature control, and possible moisture problems. Sometimes the rodent filth submitted for confirmation turns out to be dirt or other foreign material. Under these circumstances, the so-called rat/mouse, rodent, or just plain excreta pellets as recorded in the collection report will need to be verified and confirmed by laboratory analyses (Zimmerman and Brickey 1996). Laboratory analysts must be able to correctly identify rodent filth and report such findings accurately and clearly so that their data can be used by legal personnel and other interested parties to interpret regulatory and health issues (DeCamp 1970; Zimmerman and Brickey 1996). The correct identification is a must in order to prescribe the proper prevention/control measure.

Since rodents are widely recognized as reservoirs of diseases and hosts to numerous arthropod vectors, extra precaution needs to be applied for safety/health reasons whenever rodent filth exhibits are being handled. Care should be taken not to disturb the suspect contaminated area during specimen collection, as some rodent-associated illnesses are spread through the air. The FDA has published several articles concerning the health and safety issues of employees when working with rodent evidence. Publications include the Investigations Operations Manual (U.S. Food and Drug Admin. 1999), Next Generation Newsletter (Olsen and Sidebottom 1996), and FDA Laboratory Information Bulletin (Friedman and Zimmerman 1997). All three of these publications make reference, in part, to avoid aerosolizing of potential airborne viruses, to wear protective clothing including respirators, to handle the exhibits with gloved hands and forceps, and to place the exhibits in identified whirl-pak bags or polycon containers for storage and shipping.

Currently, there is no comprehensive document identifying the steps necessary to identify rodent filth submitted to laboratories for confirmation. The main goal of this paper is to provide a

reference document to facilitate the characterization and identification of the rodent filth exhibits such as rodent excreta pellets, gnawing, and nesting material.

Results and Discussion

Animal Excreta

Solid, metabolic waste excreted by animals is referred to by many terms such as feces, excreta, excrement, droppings, pellets, scat, dung, and manure (Duggan 1944). For purposes of this section, the solid units of discharge ejected from the intestine through the anus will be referred to as excreta pellets (U.S. Food and Drug Admin. 1994). The excreta pellet is by far the most prevalent piece of evidence collected used to describe unsanitary conditions, exceeded only by actual observations of the animal itself. Fresh rodent pellets have been described as soft enough to be pressed out of shape and often exhibit a moist, glistening appearance. Old pellets have dull, dusty surfaces, are usually hard, and will crumble when depressed with a probe (Brown 1969; Frantz and Davis 1991). However, caution needs to be applied in these cases since the surrounding environmental conditions could alter the appearance of the pellets, as could the presence of moisture or dry, dusty conditions. Without additional scientific evidence, reference to the age of the pellet should be avoided.

This section will focus on rodent excreta pellets, specifically rat/mouse. Rodents frequently groom themselves, ingesting hairs during this process; these hairs (some partially digested) show up in the excreta pellets (U.S. Food and Drug Admin. 1960). The laboratory analyst, with the aid of microscopes, can use these hairs to identify the origin of the excreta pellets. For example, the initial identification of a suspect excreta pellet covered with a mucous coating, found to contain embedded striated hairs and a total length of less than 25.4 mm (1-in), would be rodent (Anonymous 1984; Storer 1952; U.S. Food and Drug Admin. 1960, 1994; Zimmerman and Brickey 1996). A hair could then be extracted from the pellet, slide-mounted, and examined microscopically to possibly determine the genus or even species of the rodent that produced the pellet. Rat/mouse excreta pellets are typically identified by the presence of rat/mouse hairs found in their excreta. Rats/mice are the most commonly encountered rodents associated with stored foods, and their presence is indicative of insanitary conditions. Remember that laboratory confirmation may be required to verify the filth evidence as reported by the investigator (DeCamp 1970).

Other forms of excreta may be encountered during inspections or recovered in samples. Birds may find their way into establishments and defecate on the product. Pigeons (*Columba livia*), starlings (*Sturnus vulgaris*), and English sparrows (*Passer domesticus*) have been reported by investigators during establishment inspections (Weber 1979). Bats belonging to the family Vespertilionidae may be found roosting in the rafters of food storage facilities. Domestic cats and dogs (*Felis catus* and *Canis lupus familiaris,* respectively) are sometimes used as control agents in establishments overrun by rodents. Some food products entering the United States from tropical regions may have been exposed to tropical or regional commensal pests such as the house gecko (Gekkonidae) or the commensal shrew (*Suncus murinus*) (Olsen 1984).

After extensive review of available literature on rodent excreta identifications, we have designed a dichotomous key for use with suspect excreta pellets (see Appendix). We have included examples of other typically encountered forms of excreta that may be found in foods (including imports from around the world) in order to provide analysts with a means to compare and correctly identify excreta. Animal excrement is deemed objectionable when recovered from foods and food establishments. However, there may be a need to go beyond identifying an object as just "excreta." The filth significance plays a major role in determining how specific the identifications need to be. For example, rat/mouse excreta and rabbit (Lagomorpha: Leporidae) excreta may give different meanings to the outcome of a regulatory case. The more specific the identifications, the stronger the filth evidence becomes when viewed by the courts. While we hope that this key would facilitate quick identifications, there may be instances where specimens will not fit the key. An attempt has been made to include the attributes found in existing references. We realize that this area is relatively new and that there will be additional discoveries that will change the design of this key.

To begin, compare the solid mass to the key using a stereo microscope. Record measurements and document the physical appearance of the suspect pellets including color, shape (pointed, blunt, spindle, spherical), size, weight, if required as in FDA's Defect Action Levels (DAL's) (U.S. Food and Drug Admin. 1995), surface, and matrix (Anonymous 1984). These documented observations can be matched to the key to aid the analyst in taking the identifications as far as possible. Besides visual characteristics, there are two widely used official methods for chemically identifying suspect excreta. They are the AOAC Official Method 962.20 and the AOAC Official Method 981.22 (AOAC Intl. 1997). Caution must be exercised when determining bird excreta by chemical tests, since house gecko excreta may also yield a positive result.

Rodent Gnawing

Another example of physical evidence that is sometimes picked up by investigators to document the presence of rodents in a firm is rodent gnawed material. "Rodent gnawing" refers to the appearance that rodents visibly gnawed upon the product, its container, or some other physical structure. The job of the analyst is to support their findings through scientific documentation.

The key to documenting rodent gnawing as evidence of insanitation begins with the investigator. Careful handling of the filth exhibits is important for preserving the evidence as seen at the time of collection. Rodents tend to grow and shed their hairs year round so the chances of hairs being recovered from gnawing areas is great (Frantz and Davis 1991; U.S. Food and Drug Admin. 1960; Zimmerman and Brickey 1996).

All rodents are distinguished from other mammals by the location and shape of their teeth. There is a single pair of prominent incisors in both the upper and lower jaws. The incisors are separated from the molars by a decided gap (Brown 1969; Burt and Grossenheider 1976; Frantz and Davis 1991; Nowak and Paradiso 1983). These two pairs of chisel-like teeth grow continuously and are self-sharpening (Storer 1952). Young rats and mice begin to gnaw as early as the second week of life, and will gnaw almost anything. To get to food, they will gnaw any material with a gnawing edge that is softer than the enamel of their teeth (Frantz and Davis 1991). This includes such things as wood, paperboard, cloth sacks, lead pipes, cinder blocks, asbestos, and aluminum (Brown 1969; Storer 1952).

The damage caused by rodent gnawing tends to leave behind typical characteristics depending on the substrate. For instance, when rodents attack cloth or burlap bags, the damage takes on a "shredded, frayed, or ragged" appearance. This is caused by the teeth of the rodent tearing and pulling at the threads. Other typical gnaw marks include paired punctures or scratches on the surface of the material caused by the gripping, holding action of the upper incisors (Gorham 1981; U.S. Food and Drug Admin. 1960). Another characteristic seen on plastic, paper, and sometimes cardboard is a scalloping appearance around the gnawed area. Rodents tend to create openings on various packages or contain-

ers by removing bits and pieces of the substrate through their gnawing and pulling/tearing actions.

Typical of the appearance of rodent-eaten food are the chiseled-out gouges made by the lower incisors, and the accompanying shallow tooth marks of the upper incisors, which are used for holding food while the actual eating is done with the teeth of the lower jaw (Gorham 1981; U.S. Food and Drug Admin. 1960).

Associated with rodent gnawing is the term "rodent-gnawed hole." This is used to define an entryway (opening) created by rodents through their gnawing action on a substrate. Quite often, the entrance is somewhat circular in shape. The direction in which the rodent first began to attack an area can be determined by studying the gnawing pattern. They will gnaw at a particular site, enlarging the opening even beyond what is necessary to pass through. In the case of multiple-layered packaging, the gnaw hole with the largest diameter is the first layer penetrated. In addition, paired incisor marks will be found surrounding this hole, confirming that the hole was chewed and not mechanically torn.

Rodent Nesting Material

Rodent nests are built to accommodate births (Brown 1969). The nests tend to be constructed in secluded areas. Rats and mice gather nesting materials from any convenient soft material such as paper, cloth, burlap, grasses, excelsior, small twigs, fur, and feathers (Brown 1969; Frantz and Davis 1991; U.S. Food and Drug Admin. 1960). Rodents use their incisor teeth to pull apart paper and cloth material. They tear and pull at the threads, creating a shredded, frayed, or ragged appearance (U.S. Food and Drug Admin. 1960).

The size, shape, and location of rodent nests can be used to distinguish between rats and mice. Rat nests are usually bowl-shaped and about 203 mm (8 in) in diameter (Brown 1969; Frantz and Davis 1991). Roof rat nests are placed in any type of shelter, indoors or out, and are easily seen (under sacks or in boxes or drawers) (Storer 1952). Norway rats usually hide nests in such places as under floors, in piles of goods, and in unused packing boxes. Their nests are not always as neat or well formed as other rodent nests (Storer 1952). The house mouse makes compact nests into a round hollow ball similar to a rat's nest but only about 127 mm (5 in) in diameter (Brown 1969; Frantz and Davis 1991; Storer 1952). The mouse nest may also hold more than one family per nest site (Brown 1969).

The criteria used to confirm rodent nesting material includes the appearance of the material, the presence of rodent gnaw marks (described in another section), and other recognizable observations including the presence of urine, rat/mouse hairs, rodent excreta pellets, or parasites such as mites or fleas (Brown 1969).

Conclusion

A STANDARDIZED APPROACH TO IDENTIFYING RODENT FILTH suspected of contaminating the food supply was developed. These procedures provide a framework for ensuring accurate identifications and uniform reporting by regulatory officials and food sanitarians alike. The use of the techniques described will result in a higher level of consumer protection from rodent contaminated food.

Appendix

Key to identifying suspect excreta encountered with foods:

1. Contains white residue ..... Uric acid test for bird excreta
The color of bird excreta will vary but almost always contains chalky white material. The shape varies from liquid to semisolid state with no definitive size range. It may appear as a splatter to a rounded or coiled dropping. There is no mucous coating and the matrix is a mixture of chalky white discharge containing chiefly urine mixed with darker food and watery residues. Feather fragments are frequently encountered. Undigested insect fragments may be seen (Anonymous 1984; Gorham 1981; U.S. Food and Drug Admin. 1960, 1994). Use the AOAC Uric Acid Test to confirm (AOAC Intl. 1997).

1′ No white residue present 2

2. No symmetrical shape. Appears amorphic or damaged. Matrix consists of apparent digested plant material and no visible hairs ..... APT for mammalian excreta
The color of mammalian excreta will vary. The shape varies from amorphic to cylindrical. The overall size may exceed 25 mm (1 in) in length. A mucous coating may be present. The matrix will vary with excreta from domestic farm animals containing undigested plant fragments bound together in a dark colored, gummy mass, coated with mucilage. Cat excreta will usually contain cat hairs (Anonymous 1984; Duggan 1944; Scott 1951, 1957; U.S. Food and Drug Admin. 1960). Use the AOAC Alkaline Phosphatase Test (APT) to confirm (AOAC Intl. 1997).

2′ Shape is symmetrical (spherical, barrel-shaped, cylindrical, or spindle-shaped). Note: Damaged or fragmented suspect excreta can be tested by APT or taken through the rest of the key 3

3. Total length exceeds 25.4 mm (1 in) ..... APT for mammalian excreta

3′ Total length is 25.4 mm (≤ 1 in) 4

4. Shape is spherical. No intact mucous coating present. Matrix consisting of undigested plant material in a less dense, loosely fibrous aggregate ..... Rabbit
The color of rabbit excreta will vary. The excreta are usually relatively small and spherical, 8mm to 10mm (5/16 in to 3/8 in) in diameter. A mucous coating is present but not continuous. The matrix consists of undigested plant material in a loosely fibrous aggregate (U.S. Food and Drug Admin. 1960, 1994).

4′ Shape is cylindrical 5

5. Mucous coating present 6

5′ Mucous coating absent 9

6. Matrix contains mostly insect fragments 7

6′ Matrix not as above 8

7. Matrix contains bat hairs ..... Bat
The color of bat excreta varies. The excreta of commensal bats are spindle-shaped and similar to mouse excreta in size, 2 mm to 6.5 mm (1/16 in to 1/4 in). A mucous coating is present and the matrix consists mainly of insect fragments and bat hairs (U.S. Food and Drug Admin. 1960).

7′ Matrix is a dark amorphous mix of insect fragments with plant material, bagging, paper, and textile fibers. No hairs present ..... Commensal shrew
The color of shrew excreta varies. The excreta of commensal shrews are cylindrical in shape, sometimes bent or twisted with strongly tapered ends. The size range is 4mm to 14.5 mm (3/16 in to 9/16 in). A mucous coating is present. The matrix consists of embedded insect fragments along with plant and textile fibers but no animal hair (Olsen 1984).

8. Matrix varies. May contain partially digested plant matter and fibers. Striated hairs present but not further identified ..... Rodent

The color of rodent excreta varies light brown to black. The excreta are cylindrical with one end blunt and the other pointed or tapered. The size range is 1.5 mm to 20 mm (1/16 in to 13/16 in). A mucous coating is present. The matrix is uniform with partially digested plant material and embedded striated hairs/hair fragments (Anonymous 1984; Storer 1952; U.S. Food and Drug Admin. 1960, 1994; Zimmerman and Brickey 1996).

8′ Matrix as described in couplet 8 and contains hairs further identified as rat/mouse ..... Rat/mouse

Rat/mouse excreta have the same identifying characters as excreta identified to the rodent level with the addition of the embedded hairs/ hair fragments identified as rat/mouse (Brown 1969; Hudson and Davis 1980; Scott and Borom 1967; Storer 1952; U.S. Food and Drug Admin. 1960). Note: Rat/mouse excreta pellets may be identified to species by using hair identification and the additional information given below for each species. Norway rat excreta is spindle-shaped and between 10 mm to 20 mm (3/8 in to 3/4 in). Roof rat excreta is sausage-shaped and curved and slightly smaller than Norway rat. House mouse is spindle-shaped and between 2 mm to 9 mm (1/16 in to 3/8 in).

9. Barrel-shaped with truncate, blunt ends and longitudinal ridges ..... Cockroach

The color of cockroach (Dictyoptera: Blattaria) excreta varies. The excreta are cylindrical with longitudinal ridges and squared-off blunt ends. The size range is 0.5 mm to 4.5 mm (1/16 in to 3/16 in). There is no mucous coating and the matrix consists mainly of cellulosic plant material and sometimes cockroach cast skins (Brown 1969; Gorham 1981; Scott and Borom 1967; U.S. Food and Drug Admin. 1994).

9′ Not as above, more barrel-shaped to cylindrical 10

10. Elongate to barrel-shaped without longitudinal ridges. Ends may vary from pointed to blunt ..... Insects (other than cockroach)

The color of insect excreta varies. The excreta are cylindrical to barrel-shaped. The excreta is usually small, < 3 mm (1/8 in), or larger, depending on the size of the insect. There is no mucous coating. The matrix consists mainly of coarse cellulosic plant material (Gorham 1981; U.S. Food and Drug Admin. 1960).

10′ Cylindrical with tapered ends. Uniformly smooth, without mucous coating and sometimes accompanied by a small spherical white mass that tests positive for uric acid ..... House gecko

The color of house gecko excreta ranges from light to medium brown and is sometimes accompanied by a white mass. The shape of the excreta is cylindrical with tapered ends. The white mass, if present, will be somewhat spherical. The size range for the excreta is 4.5 mm to 12 mm (3/16 in to 1/2 in) in length and the whitish spherical body is usually 1 mm to 3 mm (1/16 in to 1/8 in) in diameter. The surface of the pellet is uniformly smooth with no mucous coating. The matrix of the excreta consists of tightly compressed insect fragments, whereas, the whitish spherical body has a nondescript matrix (Olsen 1984).

10″ Not as above. Other animals may have contaminated the sample or found their way into the establishment for which there are no current descriptions ..... APT for mammalian excreta

References

Anonymous. 1984. Spices, condiments, flavors, and crude drugs: A general method for spices, herbs, and botanicals. In U.S. Food and Drug Administration (ed.), FDA Technical Bulletin Nr 5, Macroanalytical procedures manual. p V-32-V35. AOAC, Arlington, Va.

AOAC Intl. 1997. Extraneous materials: isolation, chapter 16. Official methods of analysis, 16th ed. Gaithersburg, Md. AOAC Intl. 69 p.

Bjornson BF, Pratt HO, Littig KS. Reprinted 1971. Control of domestic rats & mice. Washington, DC. U.S. Government Printing Office. Public Health Service Publication Nr 563. 41 p.

Brown RZ. Reprinted 1969. Biological factors in domestic rodent control. Washington, DC. U.S. Government Printing Office. Public Health Service Publication Nr 773. 32 p.

Burt WH, Grossenheider RP. 1976. A field guide to the mammals, 3rd ed. Boston. Houghton Mifflin Co. 289 p.

DeCamp PW. 1970. A guide for the examination of rodent filth exhibits and related samples. FDA By-Lines Nr 3(Nov):153-164.

Duggan RE. 1944. Method for identification of cow manure in dairy products. J Assoc Off Anal Chem 27(2):331-336.

Frantz SC, Davis DE. 1991. Bionomics and integrated pest management of commensal rodents In Gorham JR (ed.), FDA Technical Bulletin Nr 4, Ecology and management of food industry pests. AOAC. Arlington, Va. 595 p.

Friedman SL, Zimmerman ML. 1997. Modified handling and testing of rodent excreta pellets to prevent the spread of hantaviruses. In Laboratory information bulletin 4096. Rockville, Md. FDA Division of Field Science. 5 p.

Gorham JR (ed). 1981. FDA technical bulletin Nr 1 (2nd ed), Principles of food analysis for filth, decomposition, and foreign matter. Washington, D.C. U.S. Government Printing Office. 286 p.

Hudson LW, Davis RA. 1980. Discriminate functions to aid identification of faecal pellets of *Rattus norvegicus* and *Rattus rattus*. J Stored Prod Res 16:103-104.

Nowak RM, Paradiso JL. 1983. Walker's mammals of the world, 4th ed., vols 1 & 2. Baltimore. The Johns Hopkins University Press. 1362 p.

Olsen AR. 1984. Fecal pellets from a commensal shrew (*Suncus murinus*) and a house gecko (Gekkonidae). J Assoc Off Anal Chem. 67(6):1035-1036.

Olsen AR, Sidebottom TH. 1996. Interim precautions for reducing risks of exposure to hantavirus, p 4-6. In Rockville, Md. FDA Division of Field Science (ed), The next generation newsletter, Jan/Feb.

Scott DB. 1951. Report on extraneous materials in dairy products. J Assoc Off Anal Chem. 34(2):350-354.

Scott DB. 1957. Report on extraneous materials in dairy products. J Assoc Off Anal Chem. 40(2):392-396.

Scott HG, Borom MR. Reprinted 1967. Domestic rodents and cockroaches: Pictorial key to droppings. In U.S. Dept of Health, Education, and Welfare, Communicable Disease Center (editors). Pictorial keys to arthropods, reptiles, birds and mammals of public health significance. Atlanta, Ga. CDC training branch. p 183.

Storer TI. 1952. Controlling rats and mice. Berkeley. University of California. California Agricultural Experiment Station Circular 410. 36 p.

U.S. Food and Drug Admin. 1960. Microscopic-analytical methods in food and drug control. Washington, D.C. U.S. Government Printing Office. FDA technical bulletin Nr 1. 255 p.

U.S. Food and Drug Admin. 1994. Entomologist training. Rockville, Md. FDA Division of Field Science. Laboratory procedures manual, chapter 18. 84 p.

U.S. Food and Drug Admin. 1995. Food defect action levels: Levels of natural or unavoidable defects in foods that present no health hazards for humans. Washington, DC. FDA Center for Food Safety and Applied Nutrition. 27 p.

U.S. Food and Drug Admin. 1999. Hantavirus associated diseases. Rockville, Md. FDA Division of Emergency and Investigational Operations. Investigations operations manual, subchapter 145.4. p 18.

Weber WJ. 1979. Health hazards from pigeons, starlings, and English sparrows. Fresno, Calif. Tomson Publications. 138 p.

Wilson DE, Reeder DM. 1993. Mammal species of the world. Washington, DC. Smithsonian-Institution Press. 1207 p.

Zimmerman ML, Brickey PM Jr. 1996. Forensic evidence development. *In* Olsen AR, Sidebottom TH, Knight SA (editors). Fundamentals of microanalytical entomology: A practical guide to detecting and identifying filth in foods. New York. CRC Press. p 261-267.

We thank James J Madenjian, Entomologist, U.S. Food and Drug Administration, Los Angeles, Calif., for providing additional information on excreta size ranges. We also acknowledge Alan R. Olsen, Entomologist, U.S. Food and Drug Admin., Washington, D.C., for his time and valuable comments while proofing the manuscript prior to submission.

Author is with the U.S. Food & Drug Admin, 900 Madison Ave., Baltimore, MD 21201, U.S.A. Author Friedman is with the U.S. Food & Drug Admin., Center for Veterinary Medicine. Direct inquiries to author Zimmerman (E-mail: mzimmerm@ora.fda.gov)

ATTN: Medical Personnel

This person works with wildlife and may have been exposed to certain zoonotic diseases not routinely considered in the differential diagnoses of febrile illnesses. In case of sickness in this individual, please consider zoonotic diseases including, but not limited to the following:

Anthrax, Arbovirus encephalitis, Brucellosis, Giardiasis, Hantavirus, Hendra Virus, Highly Pathogenic Avian Influenza, Histoplasmosis, Leptospirosis, Lyme Disease, Monkeypox, Mycotoxicosis, Nipah Virus, Psittacosis, Q Fever, Rabies, Rocky Mountain Spotted Fever, Salmonella, Sylvatic Plague, Tularemia, Typhus, & West Nile Virus.

(continued on back)

For more information on the occurrence of these diseases in humans, please contact:

The Centers for Disease Control and Prevention
1600 Clifton Rd.
Atlanta, GA 30333
1-800-232-4636 (1-800-CDC-INFO)
http://www.cdc.gov/

CDC
Centers for Disease Control and Prevention

For more information on the occurrence of these diseases in wildlife, please contact:

USGS National Wildlife Health Center
6006 Schroeder Rd.
Madison, WI 53711-6223
(608) 270-2400
http://www.usgs.gov/nwhc

USGS
science for a changing world

HOW DOES A PERSON BECOME INFECTED WITH SIN NOMBRE VIRUS?

People become infected with SNV by breathing in microscopic particles of droppings or urine from an infected deer mouse.

Some activities that increase the risk of SNV infection are:

- Entering sheds, cabins, barns, or other buildings where deer mice are present.
- Cleaning or working in enclosed, poorly ventilated spaces contaminated by deer mice.
- Handling live or dead deer mice.
- Disturbing or cleaning up deer mouse or nest droppings.

For information about HPS and rodents in your community, contact your local health department or vector control district

California Department of Public Health
Vector-Borne Disease Section
(916) 552-9730 http://www.cdph.ca.gov
March 2016

Rodents and Hantavirus

Hantavirus pulmonary syndrome, or HPS, is a rare but often fatal disease of the lungs. HPS was first recognized in 1993 in the southwestern United States.

Although there are many types of hantaviruses in the United States, Sin Nombre virus (SNV) is the specific hantavirus that causes HPS in the western United States.

WHAT IS SIN NOMBRE VIRUS?

Sin Nombre virus is carried by wild rodents.

In California, only one rodent species is known to carry SNV: the deer mouse (scientific name, *Peromyscus maniculatus*).

Deer mice are similar in size to house mice (4-7 inches from nose to tail). Unlike the solid colored house mouse, deer mice are: grey to brown on top and white underneath, and have large unfurred ears.

Deer mice are found throughout the state in wild and undeveloped areas. They prefer brush, shrubs, and rocks, but will enter homes and buildings for food, shelter, and nesting material.

Infected deer mice appear healthy and normal.

Not all deer mice carry SNV and the proportion of infected mice varies throughout the state. Wild rodents in urban or suburban areas are likely to be house mice or roof rats, neither of which carries SNV. But, because it can be difficult to tell deer mice from other kinds of rodents that don't carry SNV, people should avoid contact with all wild rodents.

Dogs, cats, birds, insects, and other animals do not carry SNV.

WHAT ARE THE SYMPTOMS OF HANTAVIRUS PULMONARY SYNDROME?

The first symptoms of HPS may develop 1-5 weeks after exposure to SNV.

Early symptoms resemble the flu and include fever, headache, and muscle aches, especially in the thighs, hips, back, and shoulders.

Two to seven days after the first symptoms begin, HPS patients develop difficulty breathing. Breathing problems are often severe and require the HPS patient to be hospitalized for intensive care.

Symptoms such as fever, headache, muscle pain, and shortness of breath are common to many different illnesses and are likely to be something other than HPS.

Any concerns you have about your health or possible exposure to SNV should be discussed with your health care provider.

Persons with HPS cannot give it to someone else.

HOW IS HANTAVIRUS PULMONARY SYNDROME TREATED?

There is no specific treatment for HPS. Approximately 30% of HPS patients diagnosed in California have died.

Early medical attention can increase the chance that an HPS patient will survive.

HOW CAN I AVOID GETTING HANTAVIRUS PULMONARY SYNDROME?

Keep wild rodents out of your home.

Infection with Sin Nombre virus can be prevented by keeping wild rodents out of homes and cleaning rodent contaminated areas in a safe manner.

Signs of rodents around buildings include:

- Live or dead mice
- Nests
- Droppings
- Urine stains
- Gnaw marks

Check inside and behind kitchen cabinets, inside closets, around vents, behind appliances, around windows and doors, and around all electrical, water, gas, and sewer lines.

Check around windows and doors, between the foundation and the siding, around electrical lines and water pipes, and in eaves and vents in the roof.

Look for holes or gaps inside and outside the the home. Seal all holes that are larger than 1/4 inch in diameter. Use cement, wire screening, hardware cloth, steel wool, or copper mesh material (such as Stuf-fit).

Reinforce the sealing material with caulk or expanding foam.

Remove wild rodents from inside homes. Place spring-loaded "snap" traps along baseboards and in areas where rodents are entering the home.

Do not use glue or live traps as these may increase your risk of infection. Place traps near areas of rodent activity, but out of the reach of pets and children.

Examine traps regularly and remove trapped rodents promptly.

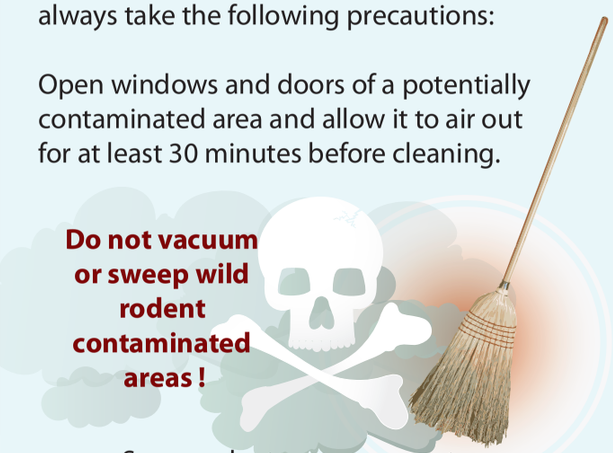
The following measures can reduce the number of rodents in and around buildings:

- Place woodpiles, vegetable gardens, trash cans, and pet food at least 100 feet from the house.
- Promptly remove uneaten pet food.
- Keep food in tightly sealed containers.
- Fix leaks in sprinklers or other outside pipes that might attract rodents as a water source.
- Keep garbage in tightly sealed containers and dispose of at least weekly.

Clean areas contaminated by wild rodents.

Dead rodents, rodent nests, and droppings should be removed and surfaces cleaned before areas are reused. When handling dead rodents or items contaminated by rodents, always take the following precautions:

Open windows and doors of a potentially contaminated area and allow it to air out for at least 30 minutes before cleaning.



Do not vacuum or sweep wild rodent contaminated areas !

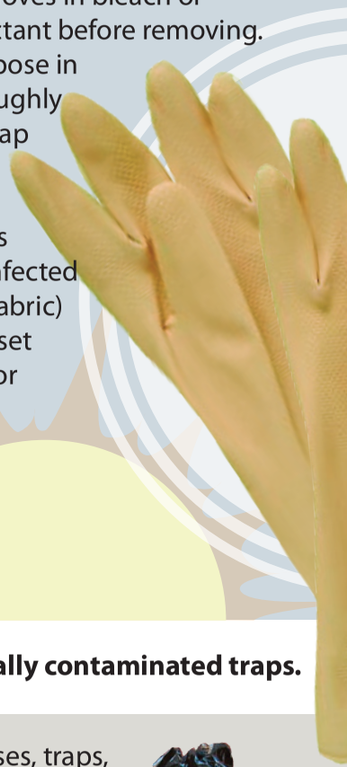
Spray rodent carcasses, nests, droppings, and other potentially contaminated items and surfaces with bleach or disinfectant.

IMPORTANT: Wear latex or rubber gloves and eye protection.

Use a 10% bleach solution or commercial disinfectant (formulated to kill viruses) diluted according to label instructions.

Allow the solution to sit for 5 minutes or according to label instructions before cleaning up with a mop or sponge.

When done, rinse gloves in bleach or commercial disinfectant before removing. Remove gloves, dispose in garbage, and thoroughly wash hands with soap and water.



Contaminated items that cannot be disinfected (e.g., paper, wood, fabric) should be carefully set outside in the sun for several hours.

Sunlight will inactivate the virus.

Dispose of potentially contaminated traps.

Place rodent carcasses, traps, and other contaminated items in a plastic bag.

Tie off the bag, place inside a second bag and tie the second bag as well.

Dispose of bags with other garbage.

Inspection
Gregg Gransie, Technical Sales Rep, Target Specialty Products

Interior & Exterior Inspection

Learning Objectives:

1. Provide an Overview of a proper inspection tools

2. Conduct a sample inspection using sample form

Notes:

Gregg Gransie, Target Specialty Products - Interior Inspection

Service Evaluation

Date:

Name: Phone: Map:

Address: City: Zip:

Clark Representative: License#: Target Pest: Lead Source:

Structure Sq. Ft.: Yard Sq. Ft.: Type of Service: Frequency:

Start Date: First Service: Initial Service Fee:$ Regular Service Fee:$

Pest Found

Interior

Materials

Bathroom

Bedroom

Baseboards

Garage

Kitchen

Attic

Other

Exterior

Follow-up Visits

Patio/Deck

Eaves

Fence Line

Storage Shed

Pet Area

Yard

Trash Area

Other

Special Instructions:

FRM 1470 1/18

Sold ?: ☐ Yes Initial Service date: _____

☐ No Reason _____

Follow Up:

Date: _____ Action & results: _____

Date: _____ Action & results: _____

Date: _____ Action & results: _____

Date: _____ Action & results: _____

****

Initial service: Inside ☐ Yes ☐ No / Outside ☐ Yes ☐ No

Pre-Notify ?: ☐ Yes ☐ No Cycle _____

Pets: ☐ Dogs: 1. Name _____ ☐ Friendly ☐ Aggressive

2. Name _____ ☐ Friendly ☐ Aggressive

3. Name _____ ☐ Friendly ☐ Aggressive

4. Name _____ ☐ Friendly ☐ Aggressive

☐ Cats: Name _____ Name _____

☐ Fish: ☐ Inside ☐ Outside / ☐ Fresh water ☐ Salt water

☐ Bird (s): ☐ Inside ☐ Outside _____

☐ Other _____

Service Codes:

☐ Anytime ☐ Phone First phone # (____) ____ - _____

☐ Special Service Instructions: _____

Nearest Cross Street: _____

Exclusion: Selection and Strategies for Keeping Rodents Out of Structures

West Coast Rodent Academy

Warren Hanussak – Veseris Environmental Sciences

Learning Objectives:

1. Discuss concepts “deny access” and “deny entry”
2. Provide an overview of the materials and methods used to physically exclude small animals from urban dwellings and structures
3. Examine and discuss specific building materials used for exclusion

Notes:

ROOF ACCESS ENTRY POINT: B3 – ROOF OVERHANG (GUTTER DOWNSPOUT)

Roof rats are accessing the roof through a gutter downspout that empties into a rain barrel.

ROOF	B1	Louvers				
	B2	Vent Stacks				
	B3	Roof Overhangs				
	B4	Valleys				
	B5	Chimney				
					B: Subtotal	

EXCLUSION MATERIALS:

- ☐ Metal Gutter Guard
- ☐ Leaf Strainer
- ☐ Down Spout Rodent Guard

HAND TOOLS NEEDED:

- ☐ Screw Driver: Phillip or Flat
- ☐ Cordless Drill
- ☐ Tape Measure
- ☐ 20’ Extension Ladder
- ☐ Tin Snips
- ☐ 8’ A-Frame Ladder

ESTIMATED TIME REQUIRED:

☐ 1 Hour or Less ☐ 1 -2 Hours ☐ 2-3 Hours ☐ >3 Hours

GROUND LEVEL ACCESS **ENTRY POINT: A1 - DOORS**

There is a ½" gap at the base of the exterior side garage door. The metal threshold and the door jamb appear to be intact and tightly secured.

		BUILDING EXTERIOR				
		ENTRY POINT	ACCESS YES	ACCESS NO	EXCLUSION MATERIALS	UNITS
GROUND LEVEL	A1	Doors				
	A2	Windows				
	A3	Chimney				
	A4	A/C Lines				
	A5	Water Pipes				
	A6	Plumbing				
					A: Subtotal	

EXCLUSION MATERIALS:

- ☐ Rubber Door Sweep Kit
- ☐ Xcluder Door Sweep
- ☐ Burrat Door Sweep (Mouse) (Rat)

HAND TOOLS NEEDED:

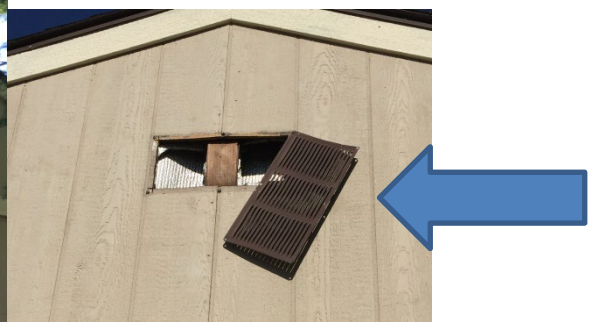
- ☐ Screw Driver: Phillip or Flat
- ☐ Hammer
- ☐ Tin Snips
- ☐ Cordless Drill & Bits
- ☐ Hacksaw
- ☐ Tape Measure

ESTIMATED TIME REQUIRED:

- ☐ 1 Hour or Less
- ☐ 1 -2 Hours
- ☐ 2-3 Hours
- ☐ >3 Hours

ATTIC ACCESS ENTRY POINT: C1 – VENT SCREEN (COVER)

Roof rats are entering the attic from a dislodged exterior louvered vent cover.



				BUILDING INTERIOR	
	ENTRY POINT	ACCESS YES	ACCESS NO	EXCLUSION MATERIALS	UNITS
C1	Vent Screens				
C2	Blocking				
C3	Vent Stacks				
C4	Wiring pass thru				
C5					
				C: Subtotal	

ATTIC

EXCLUSION MATERIALS:

- ☐ 16” x 8” Vent Cover
- ☐ 1/8” Diamond Screen
- ☐ ¼” Hardware Cloth
- ☐ ¾” Lath Screws

HAND TOOLS NEEDED:

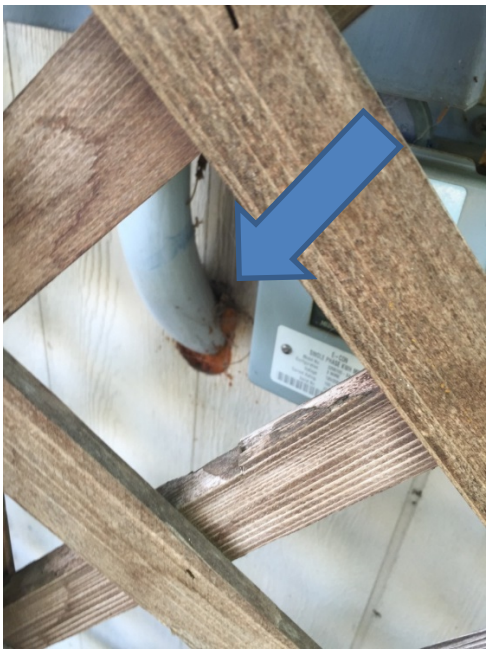
- ☐ Screw Driver: Phillip or Flat
- ☐ Tin Snips
- ☐ Cordless Drill
- ☐ Staple Gun & Staples

ESTIMATED TIME REQUIRED:

- ☐ 1 Hour or Less
- ☐ 1 -2 Hours
- ☐ 2-3 Hours
- ☐ >3 Hours

GROUND LEVEL ACCESS **ENTRY POINT: A6 – PLUMBING (CONDUIT/PIPE)**

Roof rats have chewed through the foam insulation around an exterior electrical conduit penetration and have moved into the wall void.



		BUILDING EXTERIOR				
		ENTRY POINT	ACCESS YES	ACCESS NO	EXCLUSION MATERIALS	UNITS
GROUND LEVEL	A1	Doors				
	A2	Windows				
	A3	Chimney				
	A4	A/C Lines				
	A5	Water Pipes				
	A6	Plumbing				
					A: Subtotal	

EXCLUSION MATERIALS:

- ☐ Insulating Foam Sealant
- ☐ Polyurethane Sealant
- ☐ Bondo All Purpose Putty
- ☐ Rodent Stop
- ☐ Coarse Steel Wool
- ☐ Xcluder Fill Fabric

HAND TOOLS NEEDED:

- ☐ Screw Driver: Phillip or Flat
- ☐ Hammer
- ☐ Tin Snips
- ☐ Staple Gun & Staples
- ☐ Cordless Drill
- ☐ Putty Knife
- ☐ Tape Measure
- ☐ Caulking Gun

ESTIMATED TIME REQUIRED:

☐ 1 Hour or Less ☐ 1 -2 Hours ☐ 2-3 Hours ☐ >3 Hours

HAND TOOLS

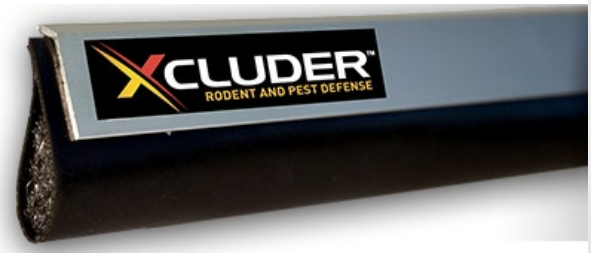
EXCLUSION MATERIALS

RUBBER DOOR SWEEP

BURRAT DOOR SWEEP

Homax Coarse Steel Wool

STEEL WOOL PRODUCTS



XCLUDER DOOR SWEEP

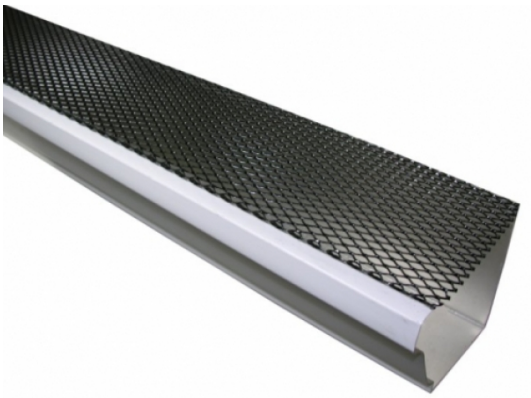
XCLUDER 4” WIDE FILL FABRIC

XCLUDER 1” STRIPS

AMERIMAX LEAF STRAINER

AMERIMAX RODENT GUARD

WIRE



METAL (LOCK ON) GUTTER GUARD

GALVANIZED SHEET METAL

COPPER MESH

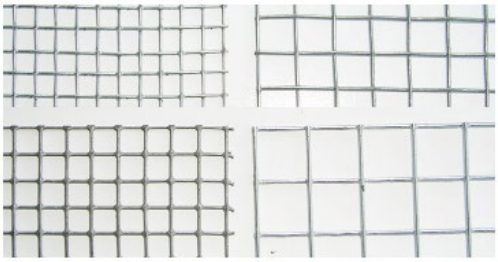
POLYURETHANE SEALANT

INSULATING FOAM SEALANT

SILICONE EXTERIOR/INTERIOR

BONDO (2-PART) FILLER

RODENT STOP



HARDWARE CLOTH

MISSION PEST CONTROL
"Protecting Your Health and Property"

P.O. Box 2890, Laguna Hills, CA 92654-2890

ORANGE COUNTY	SAN DIEGO COUNTY	RIVERSIDE COUNTY
586-BUGS	**722-3105**	**699-9904**

SMALL ANIMAL INSPECTION REPORT AND EXCLUSION ESTIMATE

NAME:_____ PHONE # :_____

ADDRESS:_____ CITY:_____ ZIP:_____

Inspection Site:		Residence (Single family)		Residence (Multi-family)		Commercial		Other
Type of Roof:		Shake		Rock		Comp		Tile
Abutments:		Adj. Units		Deck		Patio Cover		
Evidence of:		Rats		Mice		Birds		

		BUILDING EXTERIOR						BUILDING INTERIOR						
		ENTRY POINT	ACCESS YES	ACCESS NO	EXCLUSION MATERIALS	UNITS		ENTRY POINT	ACCESS YES	ACCESS NO	EXCLUSION MATERIALS	UNITS	
GROUND LEVEL	A1	Doors					C1	Vent Screens					ATTIC
	A2	Windows					C2	Blocking					
	A3	Chimney					C3	Vent Stacks					
	A4	A/C Lines					C4	Wiring pass thru					
	A5	Water Pipes					C5						
	A6	Plumbing									C: Subtotal		
					A: Subtotal		D1	Water Pipes					GARAGE
ROOF	B1	Louvers					D2	Furnace Ducting					
	B2	Vent Stacks					D3	Drywall					
	B3	Roof Overhangs					D4						
	B4	Valleys									D: Subtotal		
	B5	Chimney					E1	Vent Screens					SUB AREA
					B: Subtotal		E2	Plumbing					
											E. Subtotal		

The following conditions conducive to infestation need correction:

- ☐ Pick-up fallen fruit
- ☐ Cut back ivy
- ☐ Remove tree limbs touching home
- ☐ Cover refuse bins
- ☐ Pick-up pet dishes daily & store dry food in sealed container
- ☐ Relocate wood piles

A.	B.	C.	D.	E.	UNITS

Unit Cost X $/Unit

Exclusion Price $

Guarantee (Days) Circle One: 0 30 60 90 120 180

SALES SUMMARY
Estimate Given
☐ Verbal ☐ Written

JOB SCHEDULED: DATE:_____
TECH:_____ TIME:_____

MPC Technician_____ Customer_____ Date_____

WHITE - ACCOUNTING YELLOW - OFFICE PINK - CUSTOMER

MISSION PEST CONTROL

"Protecting Your Health and Property"

P.O. Box 2890, Laguna Hills, CA 92654-2890

ORANGE COUNTY	SAN DIEGO COUNTY	RIVERSIDE COUNTY
586-BUGS	**722-3105**	**699-9904**

SKETCH

NAME: _____ PHONE #: _____

ADDRESS: _____ CITY: _____ ZIP: _____

SCALE: 1":20'

MPC Technician _____ Customer _____ Date _____

Job Estimate:	WHITE - OFFICE BLUE BOOK	YELLOW - TECHNICIAN BLUE BOOK	PINK - CUSTOMER
Rate Exclusion:	WHITE - ACCOUNTING	YELLOW - OFFICE	PINK - CUSTOMER

EXPLANATION OF SERVICES

☐	ANIMAL TRAPPING	NO GUARANTEE
☐	ANIMAL BAITING	NO GUARANTEE
☐	ANIMAL EXCLUSION	6 MONTHS GUARANTEE ON STRUCTURE

Your Service Technician has completed an inspection of this structure to determine the nature and extent of a small animal intrusion.

Any guarantees that may apply for animal exclusion from the living areas of this structure will require the completion of the exclusion repairs recommended on this report.

Your help is necessary to deter unwanted animals from visiting your surrounding landscape. Please read and take corrective action to eliminate any conducive conditions that may be listed on the front of this form.

MISSION PEST CONTROL

"Protecting Your Health and Property"

P.O. Box 2890, Laguna Hills, CA 92654-2890

ORANGE COUNTY	SAN DIEGO COUNTY	RIVERSIDE COUNTY
586-BUGS	**722-3105**	**699-9904**

SKETCH

NAME: _____ PHONE #: _____

ADDRESS: _____ CITY: _____ ZIP: _____

SCALE: 1":20'

MPC Technician _____ Customer _____ Date _____

Job Estimate:	WHITE - OFFICE BLUE BOOK	YELLOW - TECHNICIAN BLUE BOOK	PINK - CUSTOMER
Rate Exclusion:	WHITE - ACCOUNTING	YELLOW - OFFICE	PINK - CUSTOMER

Using New Technologies

Learning Objectives:

1. Using sensors and sensor data
2. Game cameras
3. Other technologies

NEW

iQ PRODUCTS

POWERED BY Bell SENSING TECHNOLOGIES™

iQ PRODUCT LINE UP

Protecta EVO EXPRESS iQ

TRAPPER® 24/7 iQ

TRAPPER® T-Rex iQ

INTEGRATED SENSORS

- Record activity
- Generates time stamps
- Know when & where rodents are traveling

OPTIMIZED MOBILE APP

- Collects data from sensors
- Interprets results by filtering out noise
- Fast recordkeeping

CUSTOMIZED PORTAL

- Define rules
- Review data
- Monitor results
- Communicate with customer

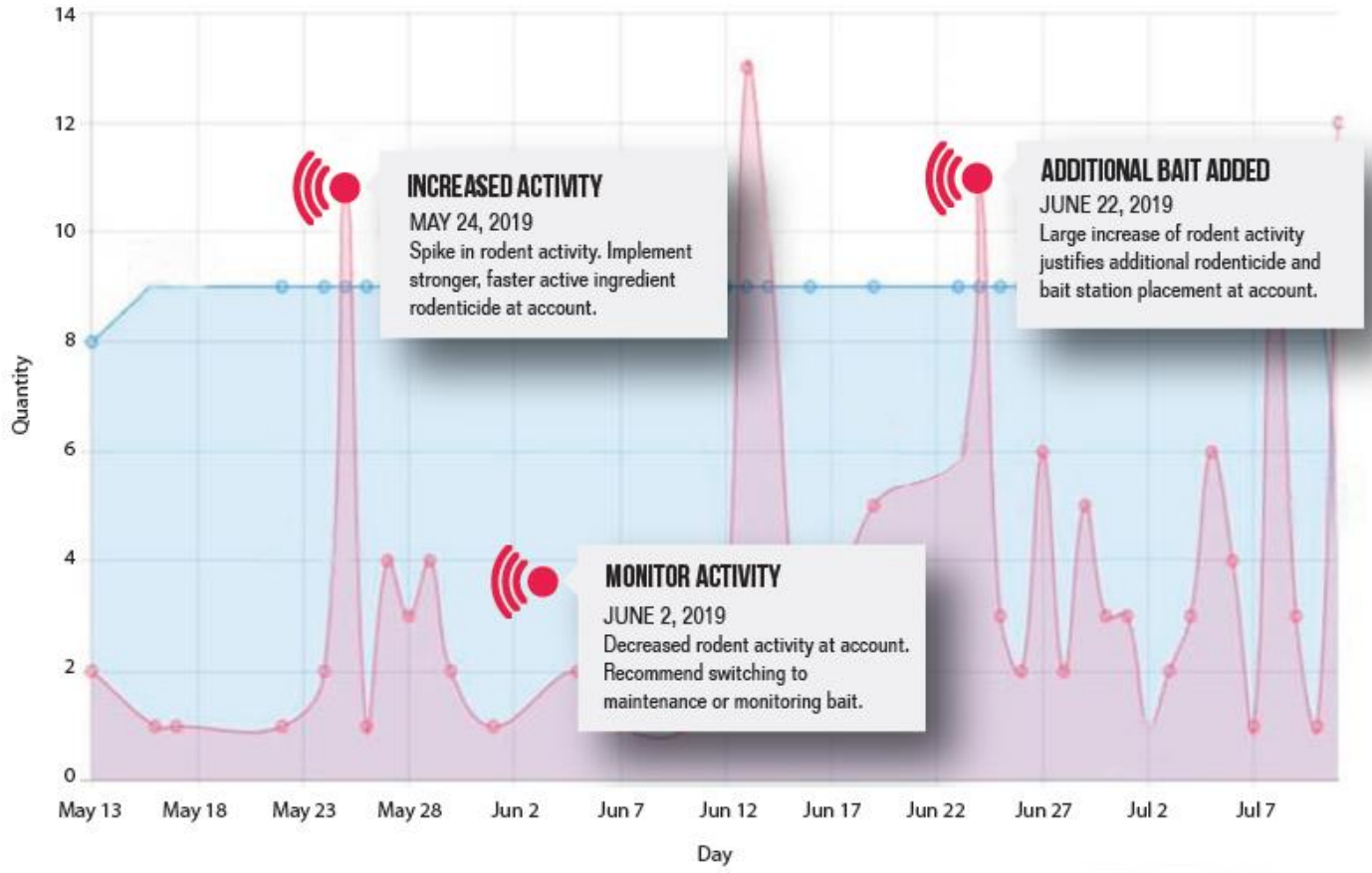
WHAT'S YOUR iQ?

Bell LABORATORIES, INC.

For information about upgrading your rodent control service, contact your Pest Control Distributor or visit www.bellsensing.com

TREND ANALYSIS

Once activity has been uploaded from the APP to the PORTAL, it is simple to review the account history to determine both short-term and long-term trends. Customize the date range and instantly analyze the data to begin problem solving at accounts.



Rodent
Monitoring System

/// Frequently Asked Questions

Bayer is a global leader in product supply to the professional pest management industry. Our involvement in food safety goes beyond the farm, and touches food manufacturing, distribution and retail companies to help protect the public food supply from pests. This is how we live our vision of Science for a Better Life.

Q: Is the Bayer Rodent Monitoring System useful for other types of pests or only for rats?

A: The Bayer Rodent Monitoring System is effective for monitoring mice and rats, including roof rats. The system retrofits onto existing traps, including snap traps and multi-catch traps. It also can monitor activity in exterior bait stations and even provide a “heat map” of rodent pressure.

Q: Can sensors be put in exterior bait stations?

A: Yes. Our second-generation sensor can be used in exterior bait stations in two ways:
1. Sensors can be connected to snap traps in stations and provide capture alerts.
2. They can count and aggregate rodent activity, reporting on a weekly or a monthly basis as needed. This activity can be correlated to bait consumption to inform the service provider when to replenish bait. In the activity mode, heat maps are also available to provide a graphic representation of where rodent activity is highest to inform proactive mitigation of conducive conditions for rodents.

Q: How do the sensors hold up to weather such as high heat, rain, or freezing temperatures?

A: The sensors withstand heat and cold 14°F to 131°F (-10°C to +55°C) and relative humidity of as much as 95%. As for water and dust, the RMS sensors have an IP54 rating.

Rodent Monitoring System

Q: Do you have examples of companies that are benefiting from using the Bayer Rodent Monitoring System during this COVID-19 pandemic?

A: Yes, we do. One pest management professional reported that he was able to monitor his client's facility even when they could not physically perform their typical service. The client saw the value and continued to pay for this service because of the ability to monitor remotely and respond exactly when and where needed. Another pest management professional offered the Bayer Rodent Monitoring System as part of a health and safety service along with disinfecting for a holistic pandemic program.

Q: How does the cost of the Bayer Rodent Monitoring System compare to the cost of in-person trap checking?

A: This depends on the facility and the number of traps being manually checked. The system is particularly well-suited for mid-large scale commercial operations where there may be 80 to 100 or more traps and bait stations to inspect. In such settings, we typically see 50% to 75% less time needed to perform the rodent portion of the service. This time can be reallocated to more thorough Integrated Pest Management Inspections (IPM), which can result in a higher quality service and better outcomes.

Q: How do you charge for the monitors? Do we buy or lease them?

A: Our business model is Device as a Service (DaaS) model, so there is no purchase of the equipment. Everything (sensors, web portal, user app, alerts, reporting, cellular charges, etc.) is included in a monthly subscription fee.

Q: How do you determine the number of units needed? Should there be a sensor on every trap or just the high traffic traps that catch a lot of rodents usually?

A: Most end clients prefer all traps and bait stations to have sensors installed. In this way, all locations are monitored 24/7. Customers also utilize the Bayer Rodent Monitoring System in hard to access/reach areas. This minimizes risk and potential injury for service technicians, and also adds to operational efficiencies. As a part of the initial planning for sensor deployment, Bayer will evaluate rodent capture history to determine if the number of traps and their placement is optimal to support the program.

Rodent
Monitoring System

Q: How do you address or reduce false positives?

A: A false positive occurs when a sensor is triggered and no rodent is present. This most commonly happens if the trap moves during sanitation activities, when there is excessive moisture, or when inventory or raw materials are shifted in the facility. The Bayer system utilizes edge computing to make the monitors smart enough to tell the difference between a move and a true capture.

Q: Can we tell if a trap has been moved?

A: Yes, move messages are distinct from capture alerts. This is important in helping to identify monitors that move too frequently, as this can indicate they are no longer in the proper position to intercept a rodent. These high move locations should be evaluated as they may not be the best placements and could be ineffective in catching rodents. This analysis is performed during and after the two-month pilot period.

Q: How long do the batteries last?

A: Under typical circumstances, 3-4 years.

Q: Does this use my Wi-Fi or Ethernet?

A: No. The system uses a combination of LoRa radio and cellular and is completely stand-alone and encrypted. Its independent network means no IT infrastructure is required on your part.

Q: How far does the signal travel?

A: The LoRa radio signal can travel as much as 12 miles under ideal conditions. However, inside of complex structures that range is reduced. Bayer provides a virtual site assessment to assure optimal coverage. An additional gateway or gateways can be provided during installation if needed.

Q: What if the power goes out?

A: The system functions when power to the gateway is lost, so you never lose a capture message, even during a power outage. Messages within the sensors will be sent as soon as power is restored, alerting you to a possible capture.

Rodent Monitoring System

Q: Will my customer be able to monitor the activity of the traps?

A: This is up to you and your customer. You can set up your customer with their own login and/or set up automated reports, trendlines and capture alerts so they can monitor the activity.

Q: Does the customer know when a trap has been serviced?

A: If your customer has access to the data platform, they will be able to see this information. During service, the pest management professional performs a button press on the sensor. This creates a time-stamped log in the system proving the trap was serviced and at what time. We recommend that 15% of the sensors are checked each month for system checks and regular trap cleaning; this can change if there are particularly dusty conditions that require more frequent cleaning.

Q: Does the customer expect me to respond to every alert?

A: This is up to you and your customer. You can customize your program, including response times, based on a mutual understanding. Many of our customers' programs reflect the circumstances of that facility, in which more sensitive areas receive a more immediate response.

Q: How do you handle traps being damaged? What is your replacement policy?

A: Bayer provides a 5% damage allowance. It is important to analyze trap positioning upon installation of the system. The Bayer Rodent Monitoring System enables a clear line of site to device movements and can help optimize trap positioning. Damaged traps with sensors or without are often not in good monitored locations, and should be relocated or protected with a trap cover. Educating facility staff is also a good idea to protect the integrity of your program.

Q: Does this integrate into other software?

A: Bayer has developed an API to accommodate integrations into pest management and other software platforms. However, all raw data always can be exported at any time into spreadsheet form.

Thursday March 4, 2021

3.5 hours of live lecture – 7:30-11:15 AM PST with a bonus CA rules from 11:30 AM-12:30 and bonus recorded YouTube channel

7:30 AM **Trapping Tips and Tricks** - *Ed Dolshun, Technical Director, VP Business Development, APG*

8:30 **Rodenticides: A Guide to Modes of Action and Best Management Practices** - *Sylvia Kenmuir, MSc., BCE, BASF, Professional & Specialty Solutions (P&SS), Western US*

9:30 Break

9:45 **State of the Rodent Management Industry** - *Robert Corrigan, PhD., RMC Pest Management Consulting*

11:15 Adjourn to Bonus Session

Rules and Regs Bonus for CA PMP's

11:30 **California Rules and Regulations Update** – *Jim Hartman, Deputy Commissioner Sealer, Integrated Pest Management Division, Los Angeles County Dept. of Agriculture*

12:30 PM Adjourn

Ed Dolsun, Technical Director, AP&G

Proper Trapping Techniques Learning Objectives:

1. Proper trap placement for the species you are targeting.
2. Proper inspection for species you are targeting.
3. Creative trapping devices.

Notes:

Rodenticides: Modes of Actions, Formulations and Label language

Sylvia Kenmuir, MSc., BCE, Technical Representative, West - BASF

Learning Objectives: Rodenticide active ingredients and modes of action. Rodenticide formulations and process for selection. Toxicity Risks with ALL rodenticides.

Rodenticides: Modes of Actions, Formulations and Label language
Sylvia Kenmuir, MSc., BCE, Technical Representative, West - BASF

RESOURCES (Not affiliated with BASF)

Amazing resource guides from LiphaTech

https://liphatech.com/wp-content/uploads/2018/02/vet_guide_pmd_case_studies.pdf
https://liphatech.com/wp-content/uploads/2018/02/vet-guide-bromethalin-addendum-pmd.pdf

Resources on Toxicology

NPIC – National Pesticide Information Center

http://npic.orst.edu/ingred/ptype/rodenticide.html

Cornell Health Lab

https://cwhl.vet.cornell.edu/disease/rodenticide-toxicity

ASPCAPRO Tox Brief's
Bromethalin
https://www.aspcapro.org/sites/default/files/0903toxbrief_0.pdf

Cholecalciferol
https://www.aspcapro.org/sites/default/files/n-toxbrief_1201.pdf

Merck Vet Manual's
https://www.merckvetmanual.com/toxicology/rodenticide-poisoning

Rodenticides: Regulatory Update

Jim Hartman, Deputy Agricultural Commissioner/Sealer, Integrated Pest Management Division, Los Angeles County Agricultural Commissioner/Weights and Measures

Learning objectives:

1. The Regulations regarding the use of second generation anticoagulants.
2. Understanding regulations pertaining to the use of bait boxes.
3. Considerations for the proper licenses to possess to perform commensal rodent work.

Notes: