

COCKROACH

CONTROL GUIDE

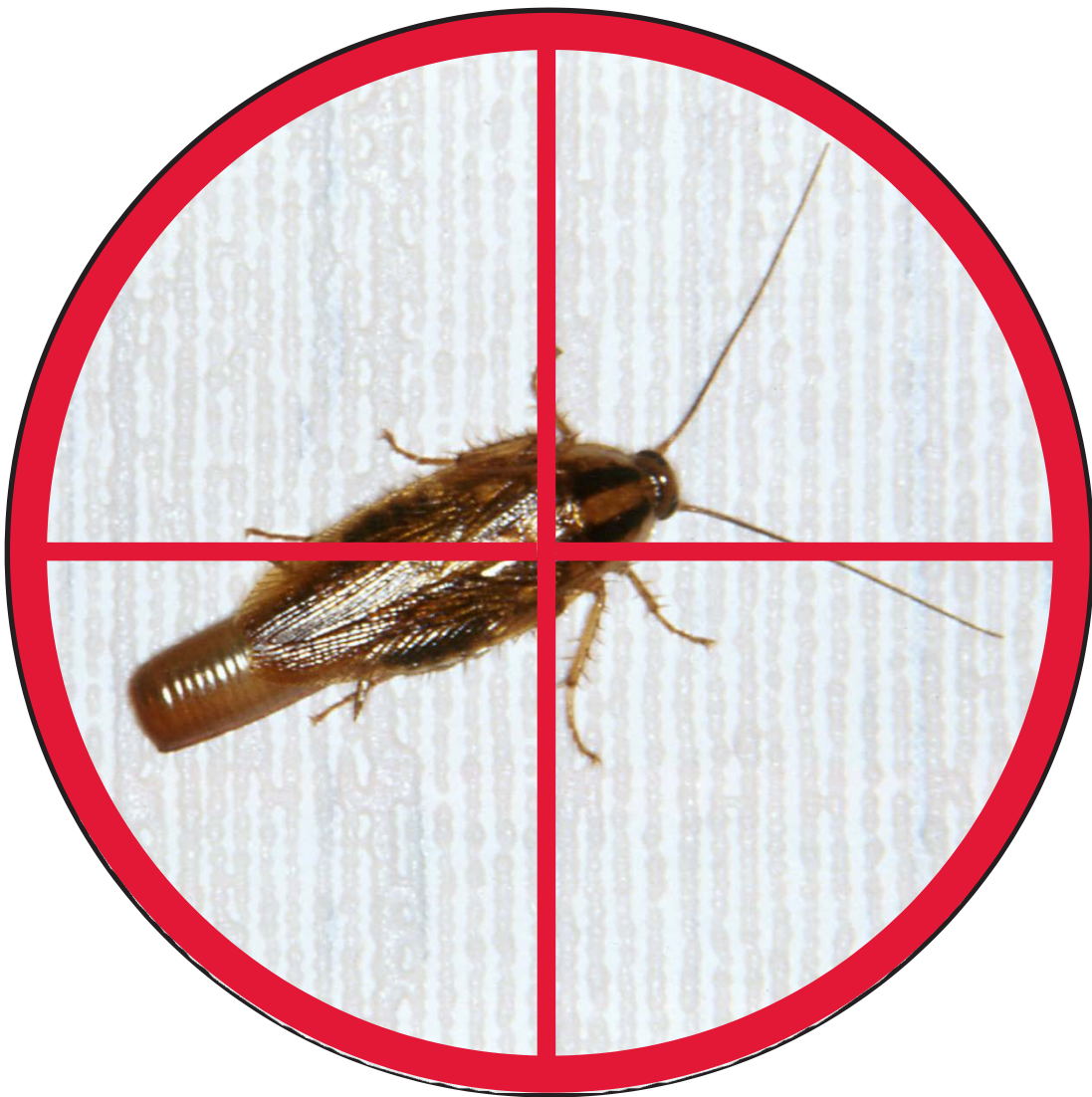


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Introduction

The presence of cockroaches in the home causes distress to home and apartment dwellers, and food businesses. Part of the distress is because many people dislike any “bugs” in the home. In addition, there is a false belief that cockroaches only live in dirty homes, so there is a negative stigma attached to having them. Many people are embarrassed to admit they share their living quarters with cockroaches.

The simple truth is cockroaches live in dwellings belonging to all ethnic groups and all economic classes of people. Sloppy housekeeping does not automatically mean a person will have an infestation; likewise, immaculate housekeeping does not exempt you from having cockroaches. Because they are usually brought into non-infested residences through human activities, even clean homes can get cockroaches.

However, a clean and tidy home or business will not sustain as many cockroaches as an identical one which is cluttered and dirty, because there is less food for the cockroaches to eat and fewer hiding places. Other factors like humidity, drippy faucets and other water sources are very important in influencing infestation levels. You can learn how to modify these factors to suppress your cockroach infestation as explained later.

Cockroaches and Human Health

Food Poisoning. Did you know cockroaches have been implicated in cases of *Salmonella* food poisoning? They can also carry *Staphylococcus*, *Streptococcus*, coliform and other bacterial pathogens on their bodies.

The main reason cockroaches harbour and transmit disease pathogens is they will eat just about anything, including discarded food in our kitchen trash can and cat faeces in the litter box. After feeding, disease bacteria can remain in the cockroach digestive system for a month or more. Later, human food or utensils can become contaminated with cockroach faeces. Cockroaches can mechanically transfer germs by crawling over bacteria-laden substances and later walking over dishes and eating utensils.

Allergies and Asthma. Some people are allergic to cockroaches. In infested home, proteins in crushed cockroach body fragments and faeces become a component of house dust. After inhaling dust in a cockroach-infested home, sensitive children and adults develop allergic symptoms similar to those of hay fever: runny nose, itchy eyes and sneezing.

Some people who are allergic to cockroaches may develop asthma, which can be a life-threatening medical condition. Asthma is a chronic lung disorder characterized by obstruction of airways. Symptoms of asthma include coughing, wheezing and difficulty in breathing. The most severe asthmatic attacks can lead to death.



Cockroach allergen, found in cockroach body fragments and faeces causes asthma in sensitive individuals.

Cockroach-Induced Asthma. Although asthma may have several potential causes, cockroach allergens in the indoor environment are a major asthma trigger. Research has shown 23 to 60 percent of urban dwellers with asthma were allergic to cockroaches. About 50 percent of asthma cases are caused by allergies. Studies have shown most asthmatics who are allergic to cockroach allergens will have an asthma attack after a single inhalation of allergens. Other potential asthma triggers include dust mites, animal dander, mould and tobacco smoke.

People with asthma may react to more than one allergen so identifying and reducing exposure to all allergens are needed to manage asthma effectively.

For people who are sensitive to cockroach allergens, steps to reduce or eliminate cockroach populations will help reduce exposure to allergens and may prevent asthma attacks.

Can I Control Cockroaches Myself?

You may be asking yourself, “Can I treat my home or business for cockroaches, or do I need a pest controller?” A pest control service can be useful for part of your cockroach control program, especially if you have a severe infestation and/or do not want to handle insecticides. The safe use of insecticides also requires proper protective clothing and may require some specialized equipment.

The main advantage of doing-it-yourself is the cost savings. Another advantage is you know your home or business better than a stranger does. For instance, you know where the harbourage areas are, and, because you are there more often, you are better able to monitor progress and evaluate control efforts. In addition, insecticide treatments are only one aspect of cockroach control, and some pest control firms may not emphasize other important tactics needed for effective control.

Did you know most insecticides registered for cockroach control are general use insecticides? General use insecticides can be used without special training, although it is still important to read and follow label directions. Some manufacturers have labelled their cockroach control insecticides “for use only by certified applicators,” which means you cannot use them unless you have taken training and passed a licensing examination. Most professional-use products are marketed to pest control professionals so these products will not be found in supermarkets, hardware or discount stores where you might first go to purchase them.

Multiple Tactics Approach

Because cockroaches are very adaptable, the most effective type of cockroach control includes using several methods at the same time to reduce cockroach populations. Agricultural pest management specialists have used this approach for years. This multiple tactics approach is called *Integrated Pest Management* or IPM.

The basic components of IPM are:

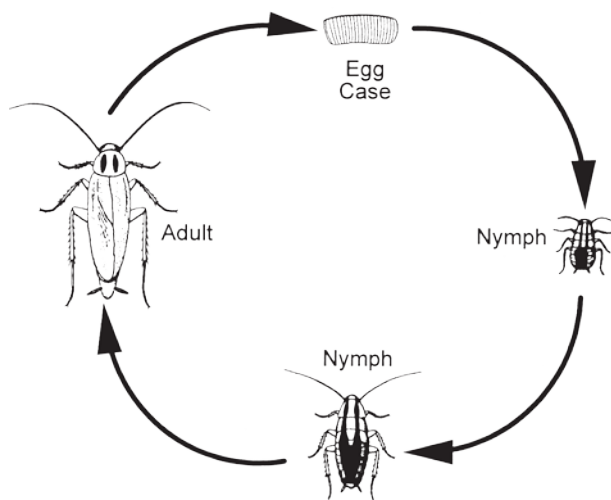
- 1) Identify the pest.
- 2) Understand the biology and behaviour of the pest.
- 3) Determine if control is needed.
- 4) Identify all appropriate control measures for the specific situation, including non-chemical and chemical measures.
- 5) Implement safe and effective control tactics.
- 6) Evaluate the control efforts.

When managing cockroaches, this IPM approach includes monitoring suspected infestation areas before treatments to find out the pest species and where the infestation is located.

Regardless of whether you decide to do-it-yourself or hire a pest control company to help you with the insecticide treatments, this handout will present the basic control tactics needed to suppress cockroaches in your dwelling or business premises. If all control tactics are used, significant reductions in a cockroach population can be made. Eradication is even possible.

Know Your Enemy

The first step in insect control is to know what pest you are dealing with. Each cockroach species prefers a different area in a residence or premises, so identification is important for best control. A cockroach infestation has individuals of different sizes, including reproducing adults with wings (usually) and immature individuals without wings. Unlike some insects, butterflies for example, immature and adult cockroaches live in the same habitat and eat the same foods.



German cockroach life cycle, similar to other cockroach species.

Immature cockroaches, called *nymphs*, are smaller than *adults*, and hatch from *egg cases* the adult female deposits. As the nymph grows, it sheds its “skin” or *exoskeleton* so it can get larger. Each nymphal stage is larger than the previous one, and the adult emerges after the last nymphal stage. Figure above shows the life cycle (egg, nymph and adult) of the German cockroach. Although only two nymphal stages are shown, the German cockroach has at least six.

All stages can be identified, but features of adults are larger and more distinctive, so we will concentrate on identifying adults. Identification is not difficult, but you must recognize features on the cockroach body.

Cockroaches are very primitive insects. Their ancestors lived 200-350 million years ago in the Carboniferous Period, even before the dinosaurs. This geological period is sometimes called the “Age of Cockroaches” because they were so abundant. At this time, the climate on the earth was warm and moist, ideal conditions for them to thrive. Although climatic conditions are cooler and less humid now, present-day cockroach species are surprisingly similar to those preserved in fossils from the distant past.

In general, cockroaches adapted to living with people, need four things to successfully live in a home. They need water, food, shelter and warmth. When we go about our daily activities (cooking, eating, bathing), we provide these requirements, which is why cockroaches survive so well with us. Cockroaches generally will not survive very well in a vacant home. Different cockroaches have slightly different requirements, which will be helpful in knowing where to inspect and later, focus your control efforts.

The cockroach is exceedingly hardy. It thrives on only crumbs and can survive a couple weeks without food or water. Cockroaches often live in cracks and crevices so small we can easily overlook them. Because they are such good survivors, it is essential to have a basic understanding of the cockroach life cycle, behaviour and habitat before attempting any control tactic. Information about how long cockroaches live, and the number of eggs they produce is called their *life cycle*. Habits or things they do during their entire life cycle can be thought of as *behaviour*. The place where cockroaches live and eat is called their *habitat*.

Identify Your Cockroach

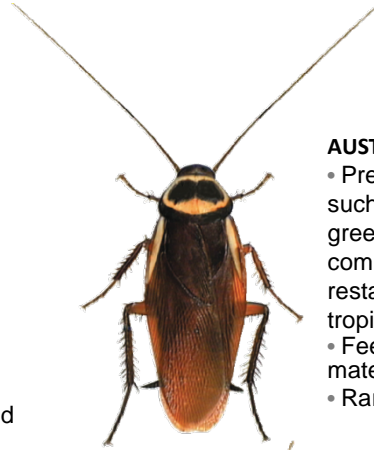


MALE

FEMALE

GERMAN

- Most common cockroach species
- Can breed in great numbers
- An indoor species preferring dark shelters near food and moisture
- Strongly resembles the native bush cockroach, an exterior species in NZ
- Carries disease organisms and can cause allergic reactions in people



AUSTRALIAN

- Prefers hot, humid conditions such as those found in greenhouses and parts of commercial buildings like restaurants and areas with tropical plant decor
- Feeds primarily on plant materials
- Rarely infests homes



GISBORNE.

- Arrived in Gisborne from Western Australia in 1949. Wingless adults 30-35mm long. Now widespread in NZ.
- Lives outside, often associated with timber or bark chips but regularly enters buildings
- Does not usually infest food, but is objectionable

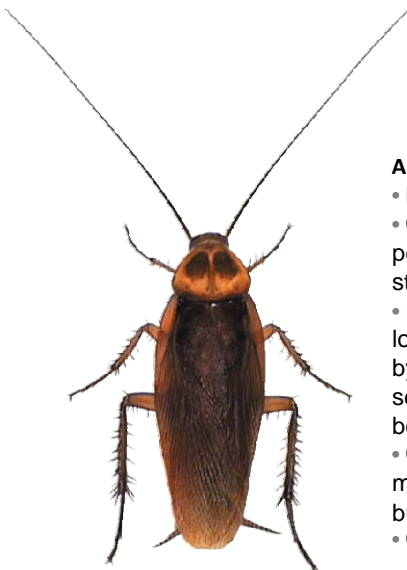


MALE

FEMALE

BROWN BANDED

- Named for the yellowish brown bands running across its forewing
- Prefers starchy foods and requires less water than other cockroaches
- Can be found in all parts of a facility and prefers hiding places up off the floor
- More recently found in NZ and not yet widespread



AMERICAN

- Largest cockroach species
- Considered a perimeter pest, but occasionally enters structures.
- Prefers warm, damp locations and can be found by the thousands in sewers, steam tunnels and boiler rooms
- Can fly, and thus migrate between buildings
- Can survive outdoors well



BUSH

- Native species that lives outside often under the bark of trees
- Sometimes comes inside with firewood or other timber
- Does not survive inside or infest food

Locate Problem Areas

How Did I Get Them?

Cockroaches are easily transported from infested dwellings to new places. The cockroaches you have may have “come with the house or apartment,” or you may have brought them with you from the last place you lived. Maybe you brought a gravid (pregnant) German cockroach (or an egg case) home in a grocery bag or to your business in a cardboard box. If you work in a cockroach-infested building, you could easily transport them home if you take anything home with you. Cockroaches can often crawl under the door or enter through cracks in the foundation. Repairs on the sewer system may result in displaced American cockroaches coming into buildings.

Cockroaches also move easily from one apartment to another. It is common for apartment tenants to blame their neighbours for their cockroaches, and in some cases, they may be justified. If a cockroach population in one unit gets large, cockroaches will migrate into nearby units for food and new places to live. Other factors can also cause cockroaches to move. Insecticide treatments may trigger movement to nearby apartments. If the neighbour moves out and the unit is empty, cockroaches will move to find water and food.

Because cockroaches are so easily transported, it is hard to **NOT** move them to your next residence if you move. Cockroaches can live in the little spaces of corrugated cardboard, so just moving boxes can transport them with you. One suggestion is to unpack boxes outdoors or in a garage. Or, use plastic tubs instead of boxes to transport your belongings in.

Where Are They Living?

The first step is to assess the situation. Inspecting and monitoring are important parts of any pest control strategy. By locating the cockroach infestation first, your controls can be more economical, more effective and less time consuming.

The first and most obvious way of detecting live cockroaches is with a visual “night watch”—observing live cockroaches when the lights are turned on unexpectedly. Another method is to examine suspected areas with a flashlight.

In the course of your inspection, you will be looking for live cockroaches, dead cockroaches, cast skins or cockroach parts. Also look for empty or intact egg cases and roach specks or faecal smears. The inspection will help you identify the cockroach, where the infestation is located, the size of the infestation and conditions favouring cockroach survival.



German cockroaches and faecal specks on the door frame, under a calendar.

Inspection Equipment

Proper equipment is essential for conducting an inspection. For inspecting your home or business, the following three items are recommended:

1. A flashlight to illuminate dark areas where cockroaches like to hide.
2. A mirror with extension arm (such as a dentist's) to help see hidden areas, like behind sinks, under refrigerators and appliances.
3. Monitoring traps.

The Inspection

Visual Examination. We will use the inspection of a home or apartment for German cockroaches as an example of how to carry out any cockroach inspection. The principles will be similar for other cockroaches.

It will be helpful to get answers for the following questions. Where did you first see cockroaches? Where do you see them now? Ask others living in the home the same questions.

Consider past or present professional pest control efforts in your home or business. If the previous pest control tactics included the use of insecticides with a strong repellent effect (this includes most of those currently used today), the cockroach infestation may have moved from its original location. In this case, you should spend some time exploring locations where insecticides were not used, like false ceilings and other areas above your head.

Before beginning a detailed examination of the area, take an overall look at the premises, inside and outside. Build a picture of traffic patterns for people. In particular, where is food brought in? Where is it prepared? Where is it eaten? How are leftovers and other garbage disposed of? Is the trash emptied in a timely manner? Perhaps the cockroaches hitchhiked into the kitchen with food supplies. Consider food storage and related activities, such as recycling bins and cardboard boxes. Could these be encouraging the problem? If introduction with food is confirmed, try to identify where the cockroaches originally came from.

Could cockroaches have been brought into the premises by someone who works in infested buildings? Are there college kids who frequently move between apartments and home? These are easy ways to move cockroaches into residences from infested buildings.

In business premise, the cockroaches may have first entered from outside or from adjoining units. You should check possible entry points such as around water and drain pipes under the sinks, sewer pipes, and gas supply pipes, conduits for electricity or crevices in walls connecting with other infested areas.

Identifying the origin of the cockroaches is valuable from the long-term viewpoint to prevent re-infestation.

German cockroaches like warm, dark locations near food and water.

A single slice of pizza, left on the counter overnight is a feast for cockroaches.

It is helpful to note all those factors favouring German cockroach survival once they have gotten into your home. Since cockroaches need food, look for food sources, such as fresh fruits or vegetables and pet foods. Also, look for food spills or build-up of food material in or under counter tops, stoves and refrigerators. Look in mops and brooms, inside the rims of the floor drain, around the wheels of mobile trolleys and other similar places. You should also check less obvious food sources, like rodent bait stations, for signs of cockroach activity. Cockroaches aren't killed by rodent baits.

Cockroaches need water as well as food, so check for condensation or leaks providing a water source. Don't forget to consider less obvious sources of water such as planters, pet water dishes and fish tanks.

In addition to food and water, cockroaches need daytime hiding places in which to rest and breed, and these harbourages must be identified during the inspection.

German cockroaches prefer dark crevices close to moisture. They like bare wooden surfaces, cardboard or paper because these surfaces are easier to climb and because porous surfaces retains their aggregation pheromone.



Cockroach droppings in stacks of mail in letter holder

They will also be found in stacks of paper, grocery bags, letters and other paper items. Pay particular attention to fixtures made of wood, such as storage shelves, wooden tables and cabinets.

Also check behind and under appliances, in the corners of rooms at floor or ceiling level, behind pictures and around the legs or wheels of carts as well as in appliance voids. Don't forget to inspect suspended ceilings.

Sometimes cockroaches become trapped in such things as spider webs, light fittings and partially empty beverage bottles. Look for every clue you can when identifying the problems.



Cockroaches in the tight space of a door jam.

In general, the harder it is to gain access to a potential harbourage, the more likely it is to be infested.

Primary Control Strategies

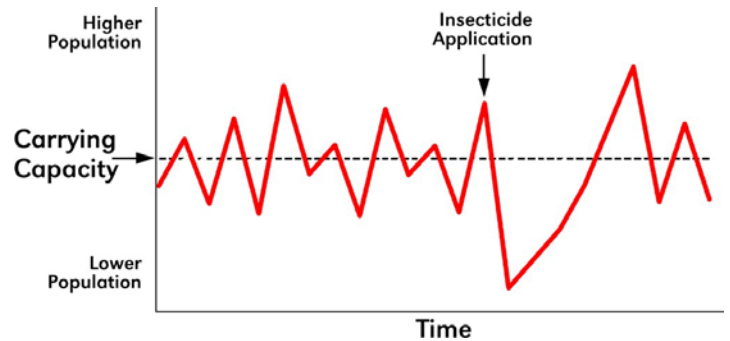
Cockroach infestations do not appear out of thin air, even though it may seem that way. German cockroaches are nearly always imported into the structure by human activities. What happens when a cockroach is introduced into a new building? By way of illustrating our discussion, let us look at this situation from a cockroach's viewpoint. We will call our cockroach *Ms Roach*.

Ms Roach, a female German cockroach bearing a fertile egg case, has been living for the past two weeks in the produce section of a supermarket. After a night of foraging, she crawled into a five-kilogram bag of potatoes. Her bag of potatoes was carefully selected this morning by Mrs. Porter who bought the potatoes to make German potato salad for the Ladies Society pot-luck luncheon on Saturday. After a bumpy ride in the back of the car, Mrs. Porter carried the sack of potatoes into the house and set it on the pantry floor. Ms Roach isn't comfortable in the sack of potatoes, so when the activity quiets down, she starts looking for a hiding place. Because Mrs. Porter has a neat pantry area, Ms Roach cannot find a very good hiding place. She finally settles behind a box of laundry detergent. Tonight she must search out a more permanent place to live. If she finds a better place, she will mark the newly-found shelter with an aggregation pheromone before she leaves to look for food or water. Marking this place will help her find it again.

If Ms Roach cannot find a suitable shelter, she will travel from place to place finding temporary places to hide. She will be stressed and have to deposit her egg case in an unsuitable place. Few of her 30+ offspring will survive and an infestation cannot get started. If she cannot find a food and water source, she will also die after a week or two.

The lesson in the story is this: every habitat, whether it is a house or apartment kitchen, bathroom, basement or

commercial kitchen has a capacity to support a certain number of cockroaches. This is called the *carrying capacity* for the specific cockroach species living there.



The carrying capacity of the environment is based on resources provided by the environment and required by the animal. Every kitchen has the capacity to harbour a cockroach population

Biological forces always aim to maintain the population at this level, regardless of measures taken to reduce the population, like pesticide applications.

After an insecticide application, the remaining cockroaches will have less competition for food and hiding places (resources). Their reproductive rate will increase and, in no time, the roach population will rebound.

The key to effective control is to lower the carrying capacity of the environment by eliminating the resources needed by cockroaches. These needed resources are water, food and shelter.

Like any animal, cockroaches need these resources to thrive and reproduce. Only small amounts of water and food may be required. The resources in every habitat determine whether or not an infestation can be established and the potential infestation level.

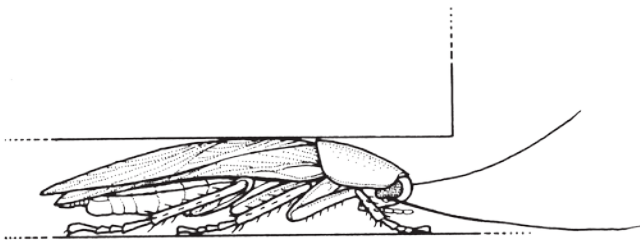
Let's discuss each of these required resources individually.

Essential Resources: Water, Food and Shelter

Water. Cockroaches have a waxy coating on their body to prevent moisture loss, but they still need water. One drop of water per day is all a cockroach needs. Any water or moisture will do; they can get water from condensation on pipes, small leaks, moist sponges, soaked wood and moistened food. Different cockroaches have different water requirements. Of those cockroach species we are discussing, the German cockroaches need moisture most frequently.

Food. Cockroaches eat almost anything: crumbs, hair, fingernail clippings, spots of grease, soiled clothes, pet fur and dead insects (even dead cockroaches). Very small, immature cockroaches stay in hiding places and eat droppings of older cockroaches. If food becomes scarce, cockroaches will cannibalize their own young and eat egg cases. Studies have shown cockroaches eat a balanced diet whenever they can. Food high in protein or is moist, is very attractive to cockroaches. If you are leaving pet food in the dish overnight, you are feeding your cockroaches. And, feeding them well!

Shelter. Cockroaches live in cracks and crevices during the day. They prefer wood and paper in their living quarters rather than metal surfaces. Their flat body allows them to squeeze into places where they can touch the surfaces above and below at the same time. Cockroaches can squeeze into cracks 1.5mm or larger. Cockroaches like warmth produced by electric motors, condensers and ovens and may live inside appliances, especially if there is water nearby.



Cockroaches live most comfortably in tight places.

Reduce Water Availability

For German cockroaches, limiting the availability of water will quickly stress them and make control efforts more effective. It is the first step you should take in your control program.

Plumbing Problems. Examine all the sinks in your home. Do your faucets leak? If so, you need to repair them. Inspect the base of the faucet and run the water. Does the base of the faucet leak? Replace the washer. Then, examine the faucet opening and see if there is a screen present; if not, install one. This screen breaks up the flow of water into a steady stream. But, it also helps to prevent thirsty cockroaches from getting into the faucet to get water.

Make sure there are no leaks in the plumbing underneath the sink especially when the water is off. Repair any leaks, no matter how small. Carefully look for a whitish residue at all connections. This whitish residue is a sign of slow water leakage. Clean the residue, tighten the connection, and check it daily for a week or two to make sure the leak is sealed.

Cold water pipes may sweat from condensation, especially during humid weather in the summer. There is enough moisture on sweating pipes to sustain cockroaches. Pipe insulation will help solve this problem. Make sure you use non-absorbent insulation because if it absorbs water, it may grow mould and attract cockroaches. Be sure to seal the insulation thoroughly. Be careful not to create hiding places for cockroaches between the insulation materials and the pipes.

All drains should be covered with a fine mesh screen. Cockroaches do not normally enter a structure through a drain but will readily enter drains in search of water. Most kitchen sink strainers will not keep cockroaches from going down the drain. Use a strainer with small round holes, instead of slits. Bathroom sink and tub overflow holes must also be kept clean and washed out occasionally.

Other Water Sources. Before storing moist sponges or dish rags overnight, rinse them with an ammonia water solution. This prevents cockroaches from using this source

of moisture. You may want to seal sponges in a sandwich bag overnight.

Check plant pot dishes, and make sure there is no standing water in the dishes. Also, place a layer of gravel over the soil in plant pots to cover exposed moist soil.

Petroleum jelly and mineral oil mixed together and applied to the inside rim of the bowl and around the tank of all toilet bowls will prevent cockroaches from using them as a source of water. This mixture should be reapplied weekly.

Always clean and dry dishes, pots and pans immediately after each use. Never leave dishes in the sink with water in them.

Remove pet water dishes overnight and replace each morning.

If your dwelling has excessive humidity, consider purchasing and using a dehumidifier to reduce the humidity. Empty the tank frequently to prevent its use as a water source by cockroaches.

At least once a month, check the drip pan under the refrigerator . Clean and dry the pan before replacing it.

The drip pan of a frost-free refrigerator is attractive to German cockroaches. There is warmth from the compressor and plenty of food and moisture nearby

Remove Their Food Supply

Stored Food. Cockroaches eat just about anything. All food items must be kept in a sealed container. Once a package of food is opened, make sure it is tightly resealed. If the original package doesn't reseal tightly enough, place the food product in a tightly-sealed container.

Cockroaches can easily chew through paper, cardboard or thin plastic containers, so food items packaged in these materials should be transferred to cockroach-proof containers before being stored in the home. No open food should be left out overnight. Candy, popcorn, fruit and pet

foods must be placed in containers for overnight storage. It is hard to completely deprive cockroaches of food, but limiting food makes it easier for other control methods to work effectively.

Food Waste Management. While food products are an important source for cockroaches, food waste (garbage) is readily consumed by cockroaches. A garbage disposal is very helpful in reducing waste in the home. However, the garbage disposal must be used daily or whenever waste is deposited, and it should be flushed with a cleaning solution after each use. If a garbage disposal is not available, remove garbage to an outdoor, sealed container before evening. If this is not possible, waste food can be placed in cockroach-proof containers like glass jars with air-tight lids.

Clean all surfaces in food preparation or eating areas, including counters, tables and floors with a cleaning solution after each use. Dishes, bowls, utensils and glasses should be immediately cleaned.

Grease is a special problem and can be hard to clean. Cockroaches feed on the film of grease on oven hoods and walls next to where frying pans have been used.

Clean all spills. Spilled food residue will attract cockroaches. Sponges, cleaning pads and brushes must be thoroughly cleaned after use. Soiled clothing should be placed in an area not readily accessible to cockroaches, such as a sealed plastic bag or a tight fitting hamper (without ventilation holes).

Initial Cleaning Efforts. Most of us tend to put off deep cleaning jobs (like ovens, behind stoves and refrigerators) until we have a good reason to do them. If you have cockroaches, there should be an incentive to make this extra effort. In fact, there is a good possibility those difficult cleaning areas are contributing to your cockroach infestation. When you clean, you may see cockroaches. Have the vacuum cleaner handy and vacuum them up.



Clean thoroughly to remove food particles, cockroaches and cockroach specs.

Before you begin any control efforts, pull out refrigerators, stoves, freezers and clean behind and beside them. Wash the outside of the appliance. Remove the back of appliances and vacuum dusty areas around motors. (Be sure to unplug appliances when doing this.) Remove items from cupboards, vacuum and clean thoroughly. Wash floors. Clean under burners and the stove top. Be sure not to forget the inside and outside the oven and the broiler area, if you have a gas stove. It is important to remove grease. (Cockroaches eat grease with gusto!)

Cockroaches and Rodents

Cockroaches and mice often coexist in the same dwelling. Both cockroaches and mice are nocturnal and live in dark, hidden locations. Cockroaches eat mouse faeces and mice, in turn, may eat cockroaches. Cockroaches eat mouse baits (pellets, blocks) without adverse results. If you are using bait to control mice, you may be feeding cockroaches. Re-organize and eliminate any clutter. Any portable items providing harbourage should be sealed in cockroach-proof containers or heavy plastic bags.

Eliminate Hiding Places

Remove Clutter. Remember, cockroaches prefer to be in tight, small places. These areas are where they feel



A German cockroach and faecal specks near a stack of papers in a heavily infested, very cluttered apartment.

secure, rest, mate and breed. Most cockroaches only need a 1.5mm space, so even small cracks and crevices provide ample harbourage. Also, cockroaches prefer porous surfaces like wood, paper, cardboard, insulation, and cloth. Stainless steel, aluminium, plastic laminates, ceramic tiles or baked enamel surfaces are less preferred. If you change the habitat, try to use materials cockroaches dislike. When soft, porous materials are layered (such as corrugated cardboard), it forms a cockroach breeding area. Do not keep stacks of paper bags, sacks, cardboard boxes, rags or pieces of wood in locations where cockroaches may be present. One of the biggest mistakes is the practice of storing paper bags between an appliance and the wall because it establishes a layering effect next to a warm area. This paper bag storage practice is an excellent cockroach breeding site.

Examine all areas, in the kitchen, bathrooms, laundries, basement and storage closets, especially near where cockroaches were found in traps set by your pest controller.

Seal Them Out! After you eliminate clutter, search the entire room, and find all cracks, seams and crevices larger than 1.5mm. Do not overlook cabinets and furniture. These areas need to be sealed so the cockroaches have no places to hide. Commonly neglected areas are behind mouldings, small holes in cabinet doors, around rubber gaskets, around water



Use caulk to seal cracks and crevices and void areas to eliminate these cockroach hiding places.

pipes, in hollow tube legs of kitchen tables, where cabinets or walls meet each other, or around built-in appliances.

Caulking is an easy, economical way to seal most of these cockroach hiding places. There are three types of caulk:

1. *Latex* caulk is usually cheap, but latex eventually will crack and shrink.
2. *Acrylic* caulks are better than latex, but they still shrink over time. In addition, cockroaches may chew into latex or acrylic caulks.
3. *Silicone* caulks are the best! They are more flexible, waterproof and can't be chewed through.

Before you caulk those crevices, make sure the edges of the space being sealed are clean and dry. Smooth the caulk so it forms a tight seal. Also, use enough caulk to fill the width of the space and about 5mm deep. You

will need to use enough caulk so it will last. Use a silicone caulk that paint will adhere to. For spaces greater than 10mm, consider using foam fillers and caulk over the foam. If caulking all the cracks or seams in your home seems to be a major undertaking, use monitoring sticky traps to determine locations where cockroach infestations are established and focus caulking and sealing efforts in those areas.

If cockroaches are infesting the cracks or seams, apply a cleaning solution and desiccation dust to these areas before caulking. Insecticide dusts can be used in void areas, but make sure you discuss this with your pest controller before you do this. After you completely seal this area, cockroaches can no longer use it as a hiding place.

Even high-grade silicone seals need to be checked and cleaned regularly. If the edge of the seal begins to flake or peel, clean out the caulk with a knife, and remove the entire section of caulk. Then, clean and smooth the section with abrasive material, like sandpaper, and reapply the caulk.

Don't Overlook These Places

There are some important areas in a kitchen which are often overlooked as a source of water, food or shelter. Ignoring these "secret" places can counteract the effectiveness of other management tactics.

Refrigerators:

- Door gaskets should be checked and replaced if hard, stiff or cracked. (Yes, roaches can live under refrigerator gaskets.)
- Vacuum the coil and compressor; wash and dry the bottom drip tray.
- Check insulation around motors and clean or replace as needed.

Dishwashers:

- Check and repair all leaks.
- Remove bottom panel and clean regularly.

- Check insulation for cleanliness and replace if needed.
- Check door gaskets and seals; replace them if they leak.
- Make sure food residue is removed from inside the dishwasher daily.

Stoves:

- Clean the stove regularly and thoroughly. Don't forget to clean under the burners.
- Use heatproof sealants to caulk cracks.
- Check insulation for possible infestations. You may need to replace it. (Cockroaches can live and breed in the insulation if they can gain access inside the walls of the stove).

Electrical Locations:

- Examine and caulk around electrical fixtures, outlets and switches. For your safety, turn off the electricity.
- Use a foam sealant if an infestation exists inside the electrical conduit.

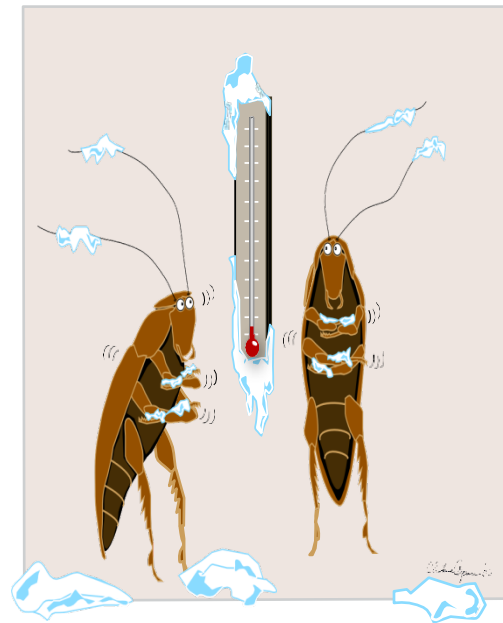
Metal Cabinets: Even though cockroaches do not prefer metal, they will live in metal cabinets, if they have no other options. Metal cabinets are usually constructed with small openings which allow cockroaches to get inside the doors. Examine cabinets carefully. Seal hinges, latches, seams and holes in the bottom and/or top of the doors.

Small Appliances: Cockroaches can enter small appliances through small holes and cracks. The most likely infested appliances is the microwave oven, since it may not be cleaned regularly after use and food particles may build up. It should not be necessary to throw appliances away. Instead, take the appliance apart or use a cold treatment.

Drawers: Pull out each kitchen drawer and examine the cavity. When the drawer is closed, small void areas are created which provide cockroach harborage.



kitchen drawer has been removed to expose a cluster of cockroaches hiding in the void area created when the drawer is closed. Vacuum these cockroaches.



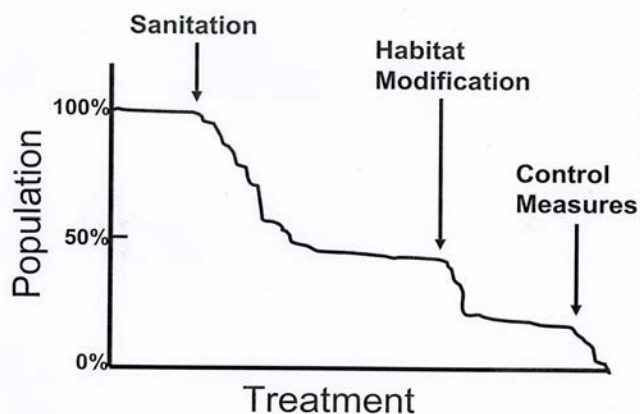
Placing cockroach-infested appliances in the freezer is a non-toxic method of killing the cockroaches!

Insecticide Basics

We have already learned the importance of reducing water, food, and eliminating harbourage (cracks, crevices, clutter) for cockroaches. These primary control strategies should be done *before* doing any insecticide applications. Figure below shows a graph of how sanitation (food and water) and habitat modification can potentially reduce a cockroach population. It doesn't take a rocket scientist to understand it is easier to deal with a small population than a large one.

Before using chemicals, don't forget about the sanitation tools discussed earlier. A multiple tactics approach will give best control.

Studies have shown poor long term control when insecticides are used as the only method of control, compared with a more integrated pest management, multi-tactics approach. Reliance on sprays or baits provides only temporary relief and repeated applications may become necessary to control the rebounding cockroach populations. Scientists call this situation the *insecticide treadmill*.



Cockroach populations can often be drastically reduced by sanitation (eliminating food and water) and eliminating harbourage (cracks, crevices and clutter). Reducing the population makes control easier.

What if an Insecticide Poisoning Occurs?

Get medical advice quickly if unusual or unexplained symptoms appear during the application or later the same day. Insecticide poisoning symptoms are often similar to flu symptoms (headache, fatigue, dizziness, nausea, stomach cramps, and diarrhoea). A person who may have been poisoned should not be left alone. Do not let anyone get dangerously sick before calling a physician or going to a hospital. It is better to be too cautious than too late. Take the insecticide container (or the label) to the physician. The key is *rapid* treatment, as time continues to elapse after exposure, the chances for survival decrease.

If the common emergency telephone number is unavailable in your area, immediately call 111 whenever an insecticide poisoning is suspected. Concurrently, the call may be connected to the nearest poison control centre. They will be able to provide specific directions on procedures to follow until emergency personnel arrive. If the common emergency telephone number is not available in your area, contact:

1. The Poison Centre - 0800 764 766
2. The nearest hospital
3. A physician

Always wash exposed skin of the victim with a detergent and plenty of water. Skin irritation can result from continuous exposure if not treated. If clothing has been contaminated, particularly by an insecticide readily absorbed dermally, remove it immediately.

Do not hesitate to contact medical authorities if any symptoms of insecticide poisoning occur. It is better to be safe than sorry.

Most of the insecticides used to control cockroaches are much less toxic than the insecticides used for other applications. When applied properly, they are unlikely to cause any problem for the user. However, use all insecticides safely. Read the insecticide product label completely and comply with all directions given.

Pets are sometimes at risk for insecticide poisonings. If you suspect your pet may have been exposed to an insecticide, contact your veterinarian immediately.

