

(C. Cepuran)

Figure 6-1. Placing cockroach-infested appliances in the freezer is a non-toxic method of killing the roaches!

Chapter 6

Low Risk Control Strategies

Low-risk control tactics pose a reduced hazard to the applicator and/or the home inhabitants and pets, while at the same time are effective in controlling cockroaches. If additional insecticide controls become necessary, see Chapters 7-9.

You're Trapped! I Gotcha!

Trapping. Under certain conditions, traps can be used to control cockroaches. Refer to Chapter 4 for the optimal locations of your traps. Trapping can be successfully used if:

- you have a small cockroach infestation.
- all harborages have been sealed. (If there are fewer hiding places, they are more likely to be trapped.)
- you maintain good sanitation practices.
- you place enough traps close to the infestation centers.
- you use proper trap management.

Baited sticky traps should be placed next to walls, under appliances and in hidden areas. Don't forget to put traps up high, in cabinets, above false ceilings, as well as on the floor. You will need to move traps often and replace traps as needed.

Cockroach pheromones. The German cockroach aggregation pheromone, found in fecal pellets, is a combination of chemicals produced by cockroaches that attracts other cockroaches to the area. Pest management professionals have known for years that cockroaches are attracted to ideal harborage areas. Dr. Austin Frishman, a respected cockroach expert, called them "fecal focal points." It is now known the more cockroaches that live in a habitat, the more attractive it becomes to other cockroaches. This is because of the presence of aggregation pheromone.

This pheromone has been synthesized and extracted from cockroaches, and is available for use in the management of cockroaches. When added to sticky traps, the traps catch more cockroaches. When added to products such as boric acid and



(Photo courtesy Chris Arne, J.C. Ehrlich & Co.)

Figure 6-2. This sticky trap caught a female German cockroach carrying an egg case. The nymphs later emerged from the egg case.

diatomaceous earth, more cockroaches are drawn to the insecticides and more cockroaches are killed.

Heat 'Em or Freeze 'Em

Because they are cold-blooded organisms, insects do not survive very well in extreme cold or hot temperatures. Each insect species has certain temperature and humidity conditions where it thrives. Although there are some differences between species, it should come as no surprise our domestic cockroaches are best adapted to temperatures we maintain in our homes. They do not develop or reproduce when temperatures are too cold (below 45° F) or too hot (above 115° F).

Hot and cold temperatures can be very effective in killing cockroaches, but the adverse temperatures must be maintained for a period of time. Hot and cold treatments are most effective when they "shock" the cockroaches' system. If cold temperatures are gradually lowered, insects have physiological mechanisms that allow them to survive the cold.

But, if you take a jar of cockroaches from room temperature and put it into a sub-zero freezer, the insects will be dead within a half hour. They just cannot adapt that quickly.

Because cockroaches cannot survive temperatures above 115° F to 120° F, it is possible to use heat to eradicate cockroaches from restaurants and food service establishments. After heat-sensitive equipment is removed from the building, the temperature is increased to about 140-150° F for five to six hours. It may not be possible for the homeowner to increase the heat that much inside the home. But if a small, infested appliance has many small crevices and can withstand 150° F heat, a similar procedure can be used. The procedure is simple — place the heat-proof appliance in an oven, and after several hours at 150° F, the roaches will be dead.

Cold can also be used to kill cockroaches, but it takes a prolonged exposure to low temperatures to kill egg cases. Appliances or furniture can be left in a garage when temperatures are below 0° F for several days. If moving, leaving possessions in a truck or van will do the same thing. Infestations in wall voids or indoor cavities can be subjected to extreme cold by using a CO₂ (carbon dioxide) gas canister. This will freeze a localized area.

Infested small appliances can be fumigated with CO₂. Place the small appliance in a plastic bag or other airtight container and inject carbon dioxide gas. Allow freezing to occur. If a small item can be subjected to freezing, it can be placed in a freezer for several hours (or overnight) to kill the cockroaches.

Vacuums Cockroaches

Any vacuuming device—a household vacuum, shop-vac or dust buster—can be modified to remove cockroaches. Place a narrow tube on the end of the vacuum hose to extract cockroaches from cracks and crevices. When an infestation is isolated in a small area, you may be able to completely eliminate adults, nymphs and egg cases with the vacuum method. Even if the infestation is large, vacuuming helps in preparation for other control methods. It cleans out old and new egg cases, loose fecal materials and living and dead cockroaches.



Fig 6-3. Vacuuming cockroaches and egg cases is a simple non-toxic control method.

Vacuums will not kill live cockroaches, so you will need to place the bag in a freezer or seal it in a cockroach-proof container for disposal. Never leave a vacuum that has been used for cockroach control unattended without properly disposing of the bag because cockroaches will quickly escape.

Bite the Dust!

There are substances, called desiccants, that literally dry out any item or animal that contacts them directly. The body of an insect, like that of other animals, is filled with liquid substances, like blood and digestive secretions. A waxy, protective coating on the outside of their bodies prevents moisture loss. Desiccants kill cockroaches by destroying this waxy layer. The three most effective desiccants for cockroach control are diatomaceous earth, silica aerogel and boric acid.

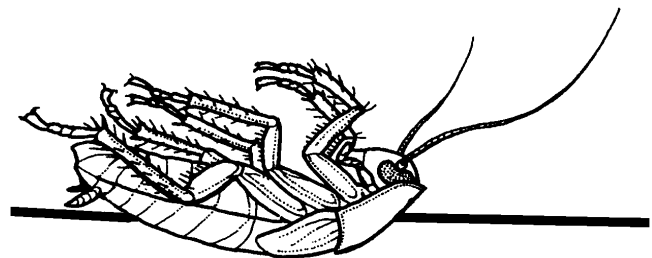


Figure 6-4. Cockroaches exposed to desiccants die from dehydration.

Diatomaceous Earth. Diatomaceous earth is mined from the fossilized silica shell remains of diatoms, microscopic sea animals. Diatomaceous earth is virtually non-toxic to humans. However, care should be taken to avoid inhaling diatomaceous earth, as it can cause irritation to eyes and lungs. Because it has an abrasive quality, diatomaceous earth degrades the waxy layer of the cuticle causing the insect to dry out and die.

Note: Some grades of diatomaceous earth contain small amounts of crystalline silica which is known to cause silicosis (respiratory disease caused by breathing silica dust) and cancer. The risk of cancer depends upon duration and level of exposure. Pesticide-quality diatomaceous earth and silica aerogel are amorphous (non-crystalline) silica, which *does not cause silicosis or cancer*.

Silica Aerogel. Silica aerogel is a non-abrasive, chemically inert substance used as a dehydrating agent because the small particles absorb moisture and oils. Sometimes small bags of silica aerogel are inserted in electrical equipment packages to prevent the accumulation of moisture during shipping or storage. Silica aerogel is also used in the florist trade. Caution should be taken when handling silica aerogel to avoid inhaling the dust.

The silica aerogel particle has a static charge that enables it to stick tightly to the cockroach body. Once on the body, the aerogel absorbs the waxy protective coating, which desiccates and kills the cockroach. Silica aerogel has also been formulated with insecticides. One formulation, Drione®, contains silica aerogel, pyrethrins and piperonyl butoxide, an additive that increases the impact of the pyrethrins.

Boric Acid. Boric acid is derived from borax and is usually combined with an anti-caking agent. Cockroaches ingest boric acid when they preen themselves after they have walked through the powder. Cockroaches die because boric acid is a slow-acting stomach poison. Because boric acid also absorbs the cockroach cuticle wax, they may also die from dehydration.

Although boric acid is relatively safe to humans and other mammals, it can be harmful if accidentally ingested and must be kept away from food, children and pets. Care must be taken not to breathe in the dust when you apply it. Like other

desiccants, it should be used in places where it will not move around. Because it has no chemical active ingredient, it remains active indefinitely. Recent studies have shown that humidity and moisture have no effect on the effectiveness of boric acid.

Boric acid is also formulated as an aerosol, a liquid (which dries and leaves a film), and a bait (discussed in Chapter 7).

Using Desiccants. Place the desiccant in a duster or a flexible bottle with a small, narrow nozzle (less than 1/4-inch) and apply a very thin coating of the material. Desiccants are more effective when only a dusting is used. Many small puffs of dust are better than one large application.

Even in dry locations, the material will eventually absorb moisture from the air. Use small amounts and re-apply often. These dusts can harm motors and electrical equipment, so avoid using them near appliances.

Insect Growth Regulators (IGR's)

Modern science has brought new weapons into the realm of insect control. Insect Growth Regulators (IGR's) are extraordinary because they alter growth and development of cockroaches, but they are much less toxic to humans and other non-target organisms. Their effects have been observed on growth and development of nymphs, but some effect fertility of adults. The IGRs described have been tested against cockroaches and are very effective and available for use. In general, they are quite safe to use.

Because IGR's don't directly kill cockroaches, they are often mixed with an insecticide, which kills some of the cockroach adults and nymphs. The nymphs not killed by the insecticide will be affected by the IGR and either be unable to reproduce when they become adults or unable to grow properly. Both result in eventual death.

Hydroprene (Gentrol®). Hydroprene is an IGR registered for cockroach control in apartments and homes. It is formulated as a concentrated liquid or aerosol designed to be absorbed into the cockroach body. Hydroprene does not kill cockroaches. However, affected cockroaches are darker in color and the wings of affected adults



(C. Ogg)

Figure 6-5. Cockroaches exposed to insect growth regulators, like hydroprene and pyriproxyfen, develop crinkled wings.

are crinkled and deformed as shown in figure 6-5. Hydroprene controls cockroaches because it acts like a birth control treatment. Adult cockroaches having deformed wings will be infertile. Hydroprene is nearly non-toxic to humans and vertebrate pets and lasts for 90-120 days before re-treatment is needed. Gentrol® can be purchased as a single treatment, but it can also be purchased pre-mixed with residual insecticides in liquid or crack and crevice aerosol formulations.

Pyriproxyfen (Archer®, Nylar®).

Pyriproxyfen is an IGR with similar activity as hydroprene. It does not kill cockroaches directly, instead the nymphs exposed to pyriproxyfen develop into infertile adults. Like hydroprene, it is slow acting but extremely non-toxic to people and animals. Pyriproxyfen is available as concentrated liquid, pre-mixed with residual insecticides in liquid or crack and crevice aerosol formulations, and in total-release foggers (see Chapter 7).

Noviflumuron. Noviflumuron, like hydroprene, does not directly kill cockroaches, but instead prevents them from shedding their exoskeleton. Because the cockroach cannot grow, it dies. Noviflumuron is similar to two other IGR's, diflubenzuron and hexaflumuron. All three of these compounds have been used successfully to control termite colonies. Recent testing has shown noviflumuron to be effective against German cockroaches and we will likely see products containing this or a similar active ingredient on the market soon.

Natural Enemies: Predators, Parasites and Pathogens

The use of natural enemies or biological control of domestic cockroaches leaves something to be desired, at least at the present time. There are some vertebrate animals that will feed on cockroaches, including hedgehogs, frogs, turtles, geckos and mice. Cockroaches also have a few invertebrate natural enemies, including mites, helminths (roundworms) and centipedes. We are fairly certain most folks living inside their home would be as unacceptable as a cockroach infestation.

There are some tiny parasitic wasps (genera: *Evania*, *Hyptia*, and *Tetrastichus*) that lay their eggs in egg cases of some cockroaches, including the American, oriental and brownbanded species. Brownbanded cockroaches seem to be most heavily parasitized. When the wasp eggs hatch, the wasp larva eats the embryonic cockroaches and completely destroys them so no cockroaches will hatch. The tiny wasps exit through one end of the egg case. If you see an egg case with a small hole in the end, it has been parasitized.

Scientists have shown that releasing thousands of these tiny wasps in a cockroach-infested dwelling can destroy large numbers of egg cases. At this time, however, this tiny wasp is not a practical method of controlling cockroaches in homes.

Microbes. Abamectin (Avert®) is a natural toxin produced by a soil-inhabiting fungus, *Streptomyces avermitilis*. It has been formulated as a bait and a dry flowable dust. Abamectin baits work very slowly, but can be used to reduce small to medium-sized infestations. Abamectin acts as both a stomach poison if ingested, and a contact insecticide when it becomes attached to the cockroach body.

“Green” Pesticides: It’s Not Easy Being Green!

In the last few decades, there has been a great deal of interest in everything green. Green is used to describe methods, practices and chemicals that are safer for people, animals and the environment.

Green is often used to indicate that “natural” products are to be used when controlling pests such as cockroaches. In response to this green revolution, many new insecticides have been developed. The plant oil extracts and the ingredients oxypurinol and xanthine, mentioned in Chapter 7, are important examples. These, and other similar ingredients, are considered to have minimum risk by the Environmental Protection Agency (EPA). The complete minimum risk list can be found on the EPA Web site at: www.epa.gov/oppbppd1/biopesticides/regtools/25b_list.htm.

Many minimum risk and other “green” pesticides can be found in cockroach control products available to the consumer. Most of them show little or no ability to kill cockroaches. Others

have limited effectiveness as a contact spray.

Several plant essential oils (clove oil, mint oil, neem tree seed oil, oil of thyme, phenethyl propionate and oil of rosemary) show some contact toxicity on cockroaches. They are usually marketed as “green,” “environmentally friendly” or “plant based” and are available as dust, aerosol and concentrated formulations.

Another plant oil, limonene, extracted from citrus peels, shows slight contact toxicity to cockroaches. There is no residual effect. Very high vapor concentrations caused mortality in lab test conditions, but no mortality occurred when it was fed to German cockroaches.

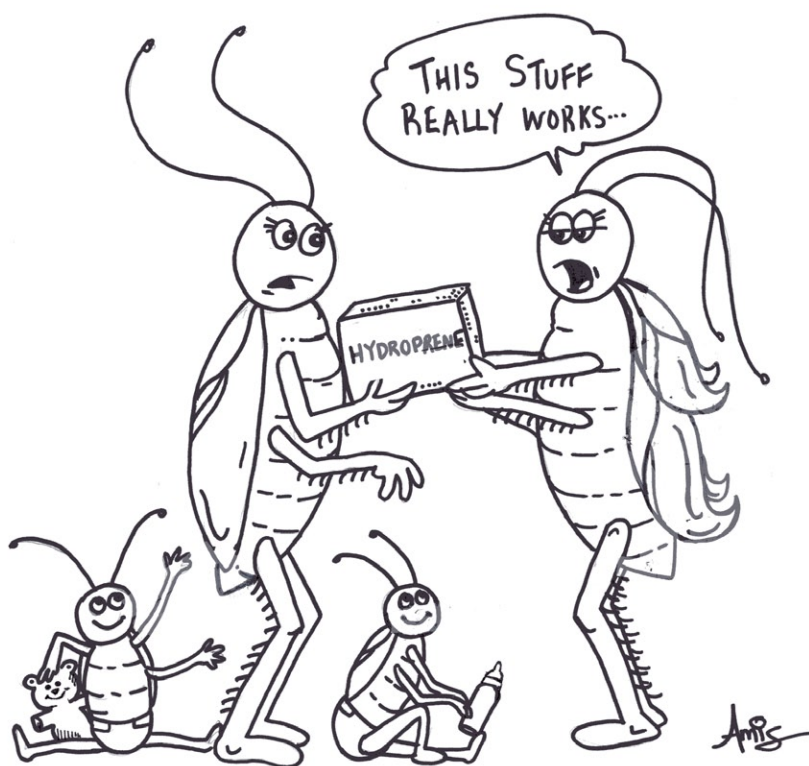


Figure 6-6. Hydroprene is an insect growth regulator. Exposed roaches are sterile and cannot reproduce.