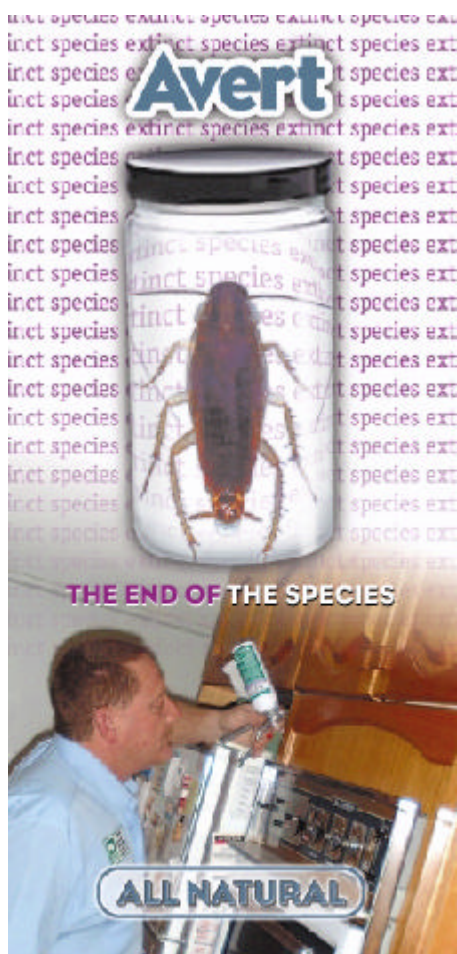


Prescription Treatment* Systems

Avert* Cockroach Gel Bait



The End of the Species

Technical Manual

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* Trademark Whitmire Micro-Gen

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Introduction

With the natural insect toxin abamectin, Avert is the most advanced gel technology available to professional pest managers. Avert works by attracting cockroaches to feed on the gel. Once they have fed on the gel they return to their harbourage where the natural insect toxin then goes to work to kill any cockroach that sampled the gel. They die and then infect other cockroaches.

Avert has an efficient dual mode of action which is why it does not get resistance. It works as both an insecticide and as an insect growth regulator, upsetting nymphal growth, sexual maturity and egg laying. Avert is easily applied by a professional pest manager and can be used around the home without your clients having to leave or clean out cupboards or food pantries, or even cover up foodstuffs.



Baiting is increasingly being accepted as the optimal method for eradicating and controlling cockroach infestations. It requires a different approach though when compared to traditional spray techniques. Whilst there are now a wide range of cockroach baits available in Australia, Avert offers you many significant performance and marketing benefits, at a very competitive price. Abamectin, the active principal in Avert is also the only cockroach bait active that is not currently available to Australian consumer markets.

At first glance baiting of cockroaches might be considered an easy option. Some pest managers offer the concern that their clients may 'opt to do it themselves'. The reality though is that successful baiting programs need a high degree of professionalism in their design and implementation. Modern baits like Avert offer quick control with minimal safety concerns, but require skilled placement.

It is not something your clients can perform instead of you. Baiting requires a detailed inspection, proper planning, strategic bait placement, integrated pest management advice and on-going follow-up. Correct baiting procedures require a thorough understanding of cockroach ecology and behaviour. You need to be able to think like a cockroach to place baits correctly and design a complete eradication program.

This manual covers the biology and behaviour of cockroaches, how to use Avert to gain optimal results and technical details to ensure you and your clients are well informed.

Avert is just part of the Prescription Treatment* approach to pest management developed by Whitmire Microgen in the United States, adapted to Australian conditions by PCT International and brought to you exclusively by PCT International – Sourcing the World to Provide Quality Products to Australian Pest Managers.

Steve Broadbent

Technical Manager – PCT International

What is Avert Cockroach Gel

Avert cockroach Gel is provided to professional pest managers in two different presentations.



1. Avert Cockroach Gel Bait Formula I is contained in a 30g plastic syringe. The plastic reservoir can be used with most commercially available cockroach application guns. A low cost gun is also available through PCT International.
2. Avert Cockroach Gel Bait Formula II is contained in a 120g pressurised container. The container comes with its own applicator. A special trigger pack is also available.

Avert is registered for the control of cockroaches in commercial, industrial and residential situations by professional pest managers as per the label directions for use.

The active constituent in Avert Cockroach Gel is **0.5g/Kg (0.05%) abamectin B1**.

The product may be used indoors or outdoors and controls a wide range of cockroach species including the German cockroach (*Blattella germanica*) and large cockroach species (*Periplaneta spp.*) including organophosphate, carbamate and pyrethroid resistant strains.

It is applied into voids, cracks and crevices and other spaces where insects may be harbouring.

Novel, Natural Technology

*Avert contains the naturally produced insect toxin abamectin, produced by the soil bacterium, *Streptomyces avermitilis* in the most advanced gel technology available to professional pest managers. That's why Avert is the most effective cockroach gel.*

It only requires 3-5g of Avert to treat an average sized home. Since Avert contains just 0.05% abamectin, this equates to less than 0.0025g of active to treat an entire household. In itself this greatly reduces the chemical loading in the environment. This effect though is further supported as we are using a product that does not evaporate or move into areas where it is not placed. Since it is clinically placed in concealed harbourages it is the safest form of cockroach control. Even if it were to end up in the environment, it is a natural substance that is rapidly broken down to harmless inerts.

Avert works by attracting cockroaches to feed on the gel. Once they have fed on the gel they return to their harbourage where they will eventually die and infect other cockroaches.

The advanced formula of Avert is **hygroscopic**. This means that once you place a spot of Avert in a cockroach harbourage it actually takes in water. This means that it remains moist at all times and highly palatable to the cockroaches. So as long as you can see the bait spot, it is still effective for the control of cockroaches. It just keeps on working.

Avert is a dark brown in colour. This colour choice is deliberate. Stringent comparative efficacy trials in the USA showed that this dark coloured formulation was far more palatable to cockroaches than a 'white' bait. This means more feeding and better results. Since best results are obtained by placing the bait deep into cockroach harbourages, where they prefer to feed, it should not be seen by your clients. But, because it is coloured, you can observe your bait placements at all times. This means greater efficacy, greater safety and less bait used on routine treatment calls. (IPM bait stations are also available through PCT International.)

Whilst detailed studies have shown that cockroaches prefer Avert to other food sources, they do not overfeed. You see Avert triggers a feeding inhibition. So, once the cockroach has consumed a lethal dose, it stops feeding and you do not waste any bait. This means bait placements last longer.

Of course Avert is more convenient for your clients too. There is no need to empty cupboards, cover up food or leave the house when a treatment is in progress. There is little disruption to people's normal activities, no odour, no mess, no unsightly residues – and no cockroaches.

In commercial establishments this means that instead of having to service the premises in the early hours of the morning, or late night, you will often have the opportunity to perform your service call at a time more convenient to you.

Avert is registered for use by professional pest managers only. This is to ensure it is used correctly. Best results are achieved through correct placement and a sound understanding of cockroach biology and ecology. A thorough inspection is an important first step in achieving effective control.

Cost Effective Technology

The advanced, highly attractive formulation of Avert makes it your cost effective solution for controlling cockroach infestations.

The following table was based upon approximate prices for different cockroach gels available during February 2001.

Product	Active	Weight	Price
Avert	0.05% abamectin	30g	\$ 30.00
Premise	2.15% imidacloprid	30g	\$ 33.00
Goliath Gel	0.05% fipronil	35g	\$ 68.00
Amdro	2% hydramethylnon	100g	\$ 40.00
Maxforce	1.65% hydramethylnon	60g	\$ 26.00
MRF	5.8% boric acid	35g	\$ 17.00

What makes Avert more cost effective is that less bait is required to do the job. And of course fewer bait spots makes life easier for you. This is demonstrated by the following tables*.

German cockroach

Product	Weight	Drop	No/30m2	Price/m2	Price/m2
Avert	30g	0.25g	6-12	\$ 1.50	\$ 3.00
Goliath Gel	35g	0.035g	30-90	\$ 2.04	\$ 6.12
Amdro	100g	0.25g	30-60	\$ 3.00	\$ 6.00
Maxforce	60g	0.25g	30-60	\$ 3.25	\$ 6.50
Premise	30g	0.1g	30-60	\$ 3.30	\$ 6.60
MRF	35g	0.25g	30-60	\$ 3.64	\$ 7.29

American cockroach

Product	Weight	Drop	No/30m2	Price/m2	Price/m2
Avert	30g	0.5g	6-12	\$ 3.00	\$ 6.00
Maxforce	60g	0.25g	30-60	\$ 3.25	\$ 6.50
Goliath Gel	35g	0.06g	30-90	\$ 3.50	\$ 10.50
MRF	35g	0.25g	30-60	\$ 3.64	\$ 7.29
Premise	30g	0.1g	60-90	\$ 6.60	\$ 9.90
Amdro	100g	1g	30-60	\$ 12.00	\$ 24.00

To be cost effective some of these products need to be applied as tiny spots, as little as just 0.035g per spot! Such tiny placements are often difficult to achieve, perhaps leading to over usage and increased costs. Avert regularly provides you a cost effective solution.

* Maxforce is a trademark of Clorox Australia; Premise is a trademark of Bayer A.G.; Goliath is a trademark of Aventis; Amdro is a trademark of Cyanamid.

Efficacy Trials

Here are some of the exciting results achieved with Avert in both Australia and the USA.

In trials in low socio-economic urban apartment blocks in West Virginia, Avert was trialled against a top selling fipronil gel.

Trial 1 - German cockroaches

	7 days	% Reduction 14 days	28 Days
Avert	96%	97%	98%
Fipronil	82%	93%	93%

Trial 2 - German cockroaches

	7 days	% Reduction 14 days	28 Days
Avert	96%	97%	95%
Fipronil	89%	96%	94%

Australian trials were performed by the Centre for Entomological Research and Insecticide Technology at the University of NSW. The following tables show the per cent reductions after twenty two days.

Trial 3 – German cockroaches

	Males	% Reduction Females	Nymphs
Avert	100%	100%	100%
Controls	26%	28%	22%

Avert was also shown to provide superior control to standard spray treatments as demonstrated in the following results in urban apartment blocks in North Carolina.

Trial 4 - German cockroaches

	2 weeks	% Reduction 4 weeks	12 Weeks
Avert	97%	99%	99%
Chlorpyrifos	88%	89%	76%
Propoxur	88%	77%	83%

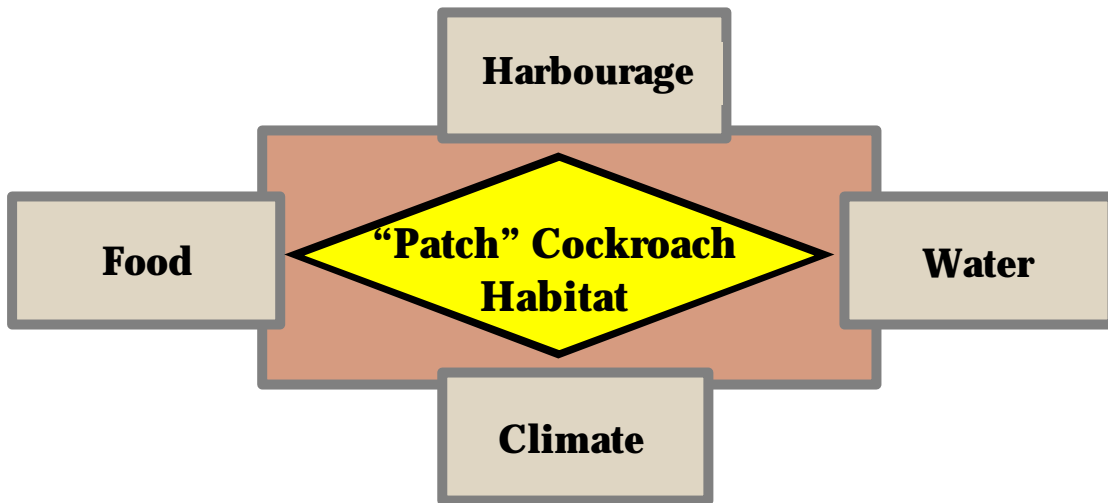
What you can expect from Avert

The practical interpretation of these results is that Avert will be at least as good as, and probably better, than if you used a traditional spray program or a different brand of cockroach gel.

Avert is proven to provide exceptionally quick control of cockroaches, especially nymphs. You can expect to see positive results within 5 to 7 days, with long term maintenance control achieved. Remember, as long as you can see the bait, it is still effective.

Some Important Aspects of Cockroach Biology and Ecology

The Cockroach Patch



The Cockroach "Patch" is the where cockroaches prefer to live. It contains all the ingredients for survival. An ideal patch contains harbourage, food, water and has the right climate. A typical harbourage contains faecal smears, solid droppings, empty egg cases, adults and nymphs.

The objective of our inspections is to find these cockroach patches and place Avert there for the cockroaches. By understanding what a cockroach looks for in its patch we can have a better understanding of how to locate patches and develop better baiting strategies.

Any cockroach population that has been left alone untreated will be 80-90% nymphs. Although adults eat more food, it is usually the nymphs who find it first.

Cockroach Feeding Habits



Cockroaches are omnivorous or polyphagous detritivores. This means they eat many different types of small food scraps, anything organic. They will eat their own droppings, fragments from egg cases and body parts, even their young as they hatch.

They have unspecialised primitive mouthparts which leaves them well-equipped to feed on a wide range of foods. Their stomach is designed to take relatively large meals so they can eat large amounts of food at a time. This is in contrast to other insects which often have specialised mouth parts which limit what they can feed on, eg a mosquito has sucking mouth parts.

They spend most of their time at rest and are most active at dusk (after lights out) or when temperatures are elevated. Similarly if they are deprived of food they will forage more.

We can use this knowledge to our benefit in Avert baiting.

Carry out your inspection of problem accounts just after dark to find where they are feeding most. Remove other food sources from these areas and focus Avert bait placement in these areas. Look for areas with elevated temperatures.

Feeding occurs on a 24 hour cycle which allows for the food to be digested. Food consumption is greatly influenced by the female reproductive cycle. A non-gravid female will feed every day but a gravid female will eat on a 6-8 day cycle.

Food consumption is also influenced by the life stages. Nymphs eat relatively more due to their growth phase.

Cockroaches will actively search for food. Continual short range foraging occurs whilst at certain times some individuals will forage further a field. This is why best results come from close bait placement.

Nymphs feed aggressively just after moulting, however they greatly reduce food consumption as they approach a moult. Females feed actively after dropping the egg case, but feeding slows prior to dropping the egg case.

Cockroach senses



Cockroaches rely to a great extent on contact chemo-reception. This means they need to physically come into contact with the food source. They produce sex pheromones that are transferred through the air and through direct contact with other cockroaches. They display positive thigmotropism (they like to make contact with a solid surface) and negative phototropism (they like to keep out of the light). They also produce a very volatile aggregation pheromone found in faecal materials.

This is why we can expect to find cockroaches gathered together in warm dark crevices. So when they find our bait in these areas they will attract other cockroaches to feed too. Food is initially found by chance or odour. This is why Avert has a smell preferred by cockroaches. The real attraction occurs though when the cockroaches have located the bait and release the aggregation pheromones to attract others to this preferred food source.



Cracks and crevices up to 7mm high are preferred harbourages. Cockroaches have clumped distribution and will therefore gather together. Ideally baits should be placed within 25cm of cockroach groupings for the best chances of the cockroaches locating the bait.

Cockroaches and Water

Moisture is critical for the survival of cockroaches. Without moisture they are easily stressed. Just one or two days is all it takes. Removal of water sources will aid any baiting or control program by placing extra stress on the cockroaches. Since they only need limited amounts of water it is often not practical to remove all moisture sources. Since the Avert Gel is hygroscopic and takes in water it does mean that it provides a good moisture source for the cockroaches and can satisfy their needs.

Cockroaches and Food

Cockroaches eat a wide variety of foods at 24 hour intervals. They are active foragers but tend to travel over short distances making bait placement close to harbourages preferred.

Males and unmated females eat 1-3mg of food per day. Gravid females will consume up to 10.5mg per day. Thus if baiting a well-established population with large numbers of gravid females present it is important to either place more baits or check more frequently for consumption rates.

Climate Preferences

Cockroaches prefer temperatures between 19-23 degrees Celcius but will tolerate ranges from 6-33 degrees Celcius. Cockroach activity and consequently feeding also increased with temperature. Higher humidity is also preferred. Bait placement should be focussed in these preferred environments.

How to Get the Best Results from Avert

The use of gels is fairly simple, but a few important points will help ensure optimum results. Gels need to be applied close to where the cockroaches are already feeding and harbouring.

The first step in cockroach management therefore is to perform a thorough inspection to find where the cockroaches are hiding and feeding. The more thorough you are at this stage the more likely you are to place baits in the correct areas and avoid a recall. Avert only needs to be replaced when it is eaten or removed by cleaning.

Start by asking your clients where they are finding cockroaches.

If you miss an area where cockroaches are harbouring at this stage then you can expect a potential problem in the future. They will not travel out of their patch (see page 15) to search for food. So make sure you identify all the cockroach patches and bait them.



1. Inspect the premises thoroughly and locate all the cockroach patches.
2. Place your Avert bait spots as close as you can to all the cockroach patches. Cockroaches prefer not to travel too far in search of food.
3. Good hygiene is essential in any pest management situation. Encourage your clients to remove any other food materials and to keep treatment areas clean at all times. This reduces the amount of food available and encourages the cockroaches to seek out your Avert baits.
4. Similarly encourage your client to reduce clutter by putting things away neat and tidy. This reduces the number of harbourages available for cockroaches making it easier to locate the patches.
5. Wear disposable latex gloves when using Avert so you do not allow your odour or any chemical smells to contaminate the bait. This will help ensure maximum feeding.
6. Advise your clients to seal around tiles, taps, etc and to replace cracked and broken tiles. This also reduces the number of cockroach patches allowing quicker and more effective control.
7. Do not use chemical sprays near areas you have baited. Many sprays, especially pyrethroids, are very repellent to cockroaches, even at very low levels. Accordingly you may find you contaminate the bait and negate the chances of cockroaches eating it.
8. Place the Avert into cracks and crevices away from where your clients are likely to remove it by their general cleaning programs.
9. Try and use similar bait placement strategies in similar types of patches. This way you can more easily inspect for your Avert bait spots when you revisit the site and avoid needless re-application. For example where there are door hinges, always place a drop above or below the hinge, always place drops in the corner of cupboards, etc.

10. When placing Avert baits remember that the label refers to the full surface area that the cockroaches are likely to traverse. Thus if we have a 30 square metre kitchen we do not just place 12 spots in the kitchen. We need to allow for the full surface area of each and every appliance, bench, cupboard, etc. even a bench has two surfaces meaning twice the area it first appears. And we need to get spots near to where the cockroach patches are.
11. Store food in sealed containers, and clean up any spills immediately.
12. Empty rubbish containers regularly.
13. Clean up pet food as soon as pets stop feeding and keep the area clean. Place bowls on a tray to aid cleaning.
14. Remember, the poorer the levels of sanitation and the more clutter you find, the more bait placements you will require.

Where not to Place Avert Gel

Do not place baits on surfaces that are regularly cleaned or where they may be easily washed off. Keep placements away from insecticide deposits, especially those left by repellent products such as pyrethroids. Do not place baits in contact with human or pet foods or water sources.

After Treatment

It will take a few days to see the results from an Avert baiting program. Avert is a very quick acting gel, but it does not work as quickly as a chemical spray. It will give you better long-term results.

You should start seeing dead cockroaches within 24 hours of bait placement. Dead cockroaches can be removed immediately. Unlike some baits where the manufacturer recommends that the dead cockroaches are left in place, this is not necessary with Avert. This means your client can keep their premises more hygienic right from the start.

In areas of high activity the gel may be consumed after a few days and further placements may be needed. Fortunately cockroaches do not keep feeding on Avert once they have taken a lethal dose so you will not waste bait. In heavy infestations we recommend you schedule a second follow-up inspection for about a week after the initial treatment.

Avert is very stable. It does not harden or lose its attractiveness to cockroaches. Because it can be seen if you shine your torch into the harbourages you will be able to monitor the property on a regular basis and only need to reapply baits when the original bait has been totally consumed.

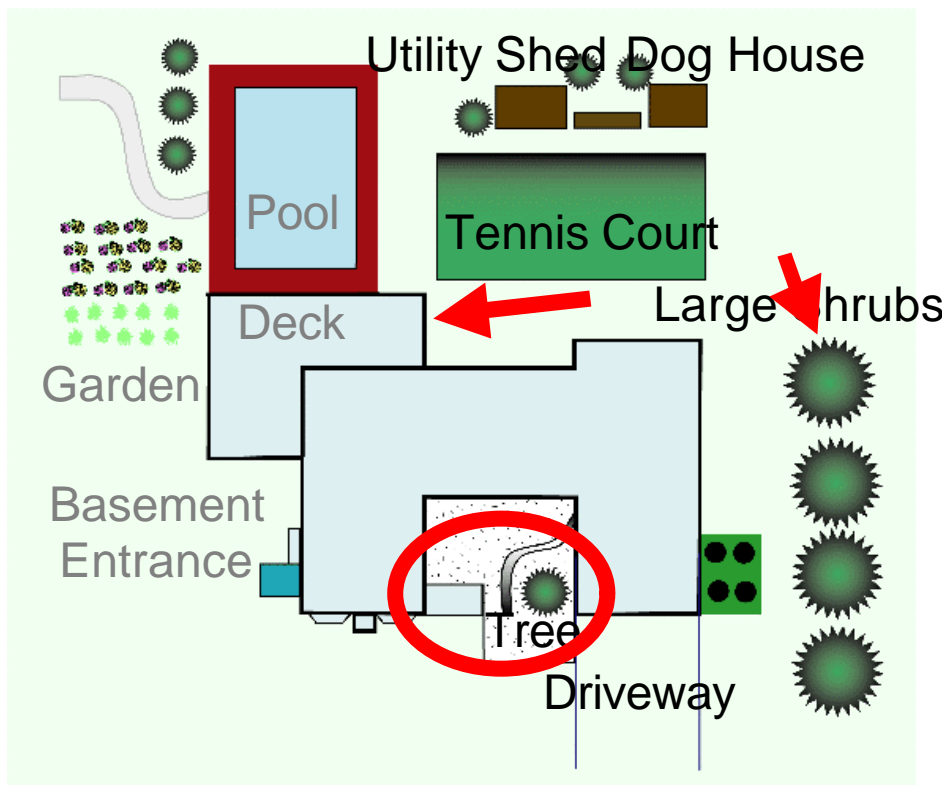
For maintenance treatments Avert only needs to be applied in the areas where cockroaches remain. For a typical home with German cockroaches, 20-50 correct placements with 10-25 of these in the kitchen area are normally sufficient to gain control.

Control of Periplaneta spp (large cockroaches)

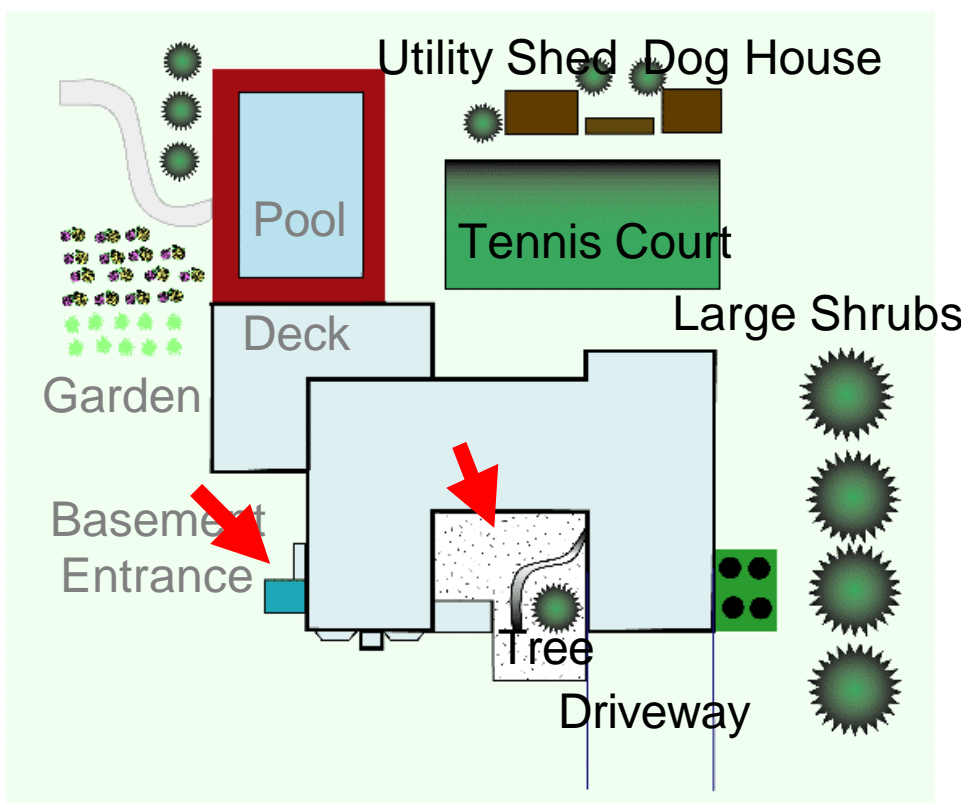
Place baits in areas where cockroaches are likely to gain entry (interception baiting) or where harborage is likely to occur (defensive baiting).

Outside sprays can be utilised to areas that may act as a cockroach reservoir. Research has shown that most breeding areas are near the home. By spraying outside you reduce the pest pressure.

Defensive baiting strategies can be used to place baits in areas where cockroaches will seek to form patches. This means placing baits around dryers, washing machines, refrigerators, fireplaces, bookshelves, drawers, bathrooms and kitchens.



Above - Areas to spray to reduce reservoirs. Below - Areas to bait and intercept cockroaches.



Rockwell Laboratories Cockroach Bait Station –

Recommended and marketed by PCT International, the **D-Sect station** is a fully tamper-resistant station for baiting and monitoring crawling insects indoors and in areas protected from direct rain outdoors. Though very difficult to open without instruction, the D-Sect is quick and easy to service with no key needed, even when secured down. A young child's hand is too small to release the locking prongs and open the station. D-Sect is ideal for child-sensitive accounts, eg. homes, schools and day care centres; as well as nursing homes, hospitals and IPM-intensive accounts eg food processing, service and storage areas D-Sect gives safety, accurate monitoring of bait consumption, decreased loss of glue-board monitors, and projects a clean, professional image to your client.

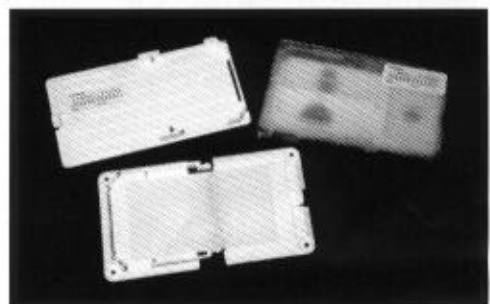
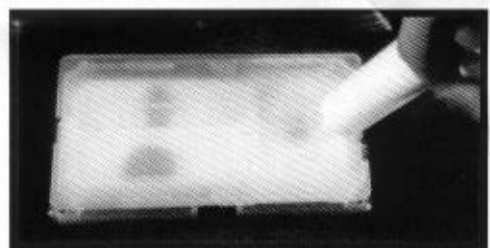
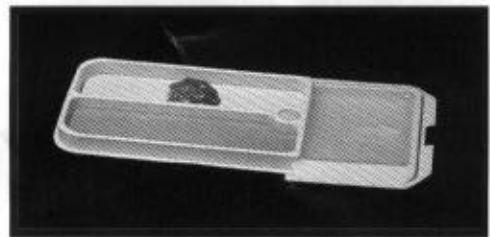
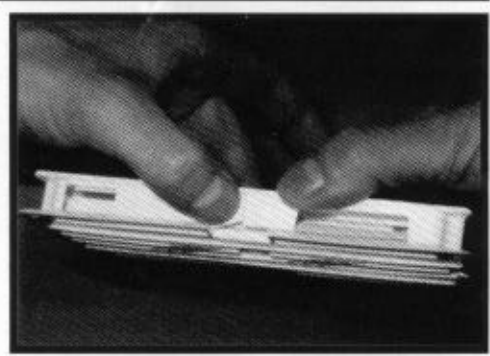
To open Place the D-Sect on a table so you can read the D-Sect logo right-side-up. With your left hand over the station, **LIGHTLY** squeeze the raised pads on the sides of the station which are located just to the left of the small centre gap, as in the photo. With your right hand slide the TOP slightly to the right and lift off. Squeezing too hard is self-defeating. Left handed people should turn the station so the logo is upside down, squeeze with the right hand and slide the top left. To close: Place the top on the base about ¼ inch to the right of centre and slide the top ¼ inch to the left to snap it shut.

D-Sect Baiting Trays are made of rigid plastic and fit inside the D-Sect station. The Tray has three reservoirs which may be used to hold gel, liquid and granular baits for ants, roaches, and other crawling insects. D-Sect Baiting Trays may be thrown away to avoid tedious cleaning, yet are sturdy enough to be used repeatedly.

D-Sect Custom Glue boards come conveniently pre-baited with two different insect attractants and an ample amount of non-drying glue. The D-Sect Station extends the life of the glue by keeping dust and moisture off and by preventing the boards from being crushed or swept/washed away; the way cardboard monitors often are. Specific pheromone tablets may also be placed directly on the glue.

For fast rebaiting, the D-Sect has two knockout holes on the top for refilling applicator-tip type baits without opening the station. The D-Sect also features four corner holes, a centre knockout hole and spots on the back for double-sided tape or adhesives, making it simple to secure to a variety of surfaces. Knockout holes can be easily pushed out with a phillips-head screwdriver.

The D-Sect Station is available in white for a clean, professional image, and in clear for easy inspection without opening the station. White stations are good in open areas and clear stations are ideal in concealed or hard-to-reach locations. Just 13mm high, the D-Sect slides easily under appliances and into other tight areas for baiting and monitoring. The D-Sect comes with Service Labels which can be placed on the station or inside the station.



Resistance Management

There is NO NEED to use other baits or sprays in rotation with Avert. You will not create resistance to Avert. This is because Avert has a totally unique, dual mode of action.

A recent study conducted by the Virginia Polytechnic Institute, a leading USA University Research Centre, tried to select for abamectin resistant German cockroaches in an intensive multi-generation induced breeding program. It was not possible to create a resistant strain.

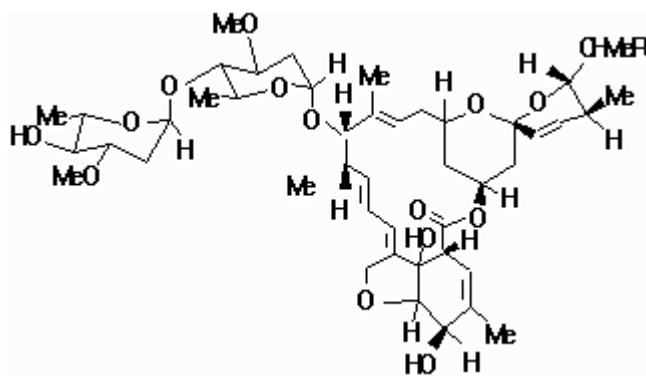
Avert cockroach gel will control cockroach populations that are resistant to organochlorines, organophosphates, carbamates and pyrethroids and other cockroach bait formulations. The most widely used cockroach gel bait actives are fipronil and imidacloprid. Avert will not show cross resistance to either of these groups as it has a totally unique mode of action.

Whilst work in the literature hints that organochlorine resistant cockroaches may be cross-resistant to fipronil, which means care is needed in chemical rotation; there is no cross-resistance to Avert. Studies in the US show that there are hydromethylnon resistant cockroaches. Resistance is not an issue for Avert.

Of course if you are using a cockroach bait where the manufacturer needs to recommend rotation, then Avert is your ideal choice to use in your management program.

Abamectin

Abamectin is a natural fermentation product of the soil bacterium Streptomyces avermitilis. Abamectin is a complex 16-membered macrocyclic lactone.



Due to its large molecular weight and low vapour activity, abamectin stays put in the cracks and crevices where it is applied. The following table demonstrates the low vapour activity of abamectin compared to several standard insecticides.

Dichlorvos:	4.2×10^3 mPa
Chlorpyrifos:	2.4 mPa
Abamectin:	2.0×10^{-4} mPa

The abamectin used in Avert Cockroach Gel is sourced from, and supported by, Merck & Co in the United States of America. It's regulatory status in the United States is General Use Pesticide (GUP). It is classified as toxicity class IV – practically non-toxic and has no precautionary statement on its label.

In Australia Avert is classed as Schedule 6 and carries a Poison label.

The micro-organism that produces abamectin was originally isolated from a soil sample collected near a golf course at Kawana, Ito City, Shizuoka Prefecture, Japan.

Mode of Action

Abamectin has a dual mode of action. It works as both an Insect Growth Regulator (IGR) and as a conventional insecticide with a unique mode of action.

As an IGR, abamectin upsets nymphal growth, sexual maturity and egg laying

As an insecticide, abamectin increases calcium permeability by its interaction with GABA-gated (gamma aminobutyric acid) chloride channels. It inhibits transmission between interneurons and excitatory motoneurons in the ventral nerve cord as well as inhibiting transmission between inhibitory motoneurons and muscle. There are other sites in the insect nervous system upon which abamectin exerts its effects. It is suggested that abamectin can act as either a GABA agonist or as a stimulator of GABA release from presynaptic inhibitory terminals. As a result, a flaccid paralysis is initially observed in many insects.

Some of the effects observed with abamectin can be reversed by picrotoxin, known to close chloride ion channels, and to a lesser degree by bicuculline, a GABA receptor antagonist.

This mode of action is unique and not shared by any other chemical classes. Cross-resistance with existing conventional insecticides has not been observed.

Toxicological Information

Abamectin is approved for oral administration for the control of intestinal worms in horses.

- ❖ **Acute toxicity:** Abamectin is highly toxic to insects. Abamectin acts on insects by interfering with the nervous system.

At very high doses, it can affect mammals, causing symptoms of nervous system depression such as incoordination, tremors, lethargy, excitation, and pupil dilation. Abamectin is not readily absorbed through skin. Tests with monkeys show that less than 1% of dermally applied abamectin was absorbed into the bloodstream through the skin. Abamectin does not cause allergic skin reactions.

The oral LD₅₀ for Avert in rats is greater than 5,000 mg/kg..

- ❖ **Mutagenic effects:** Abamectin does not appear to be mutagenic. Mutagenicity tests in live rats and mice were negative. Abamectin was shown to be non-mutagenic in the Ames test.
- ❖ **Carcinogenic effects:** Abamectin is not carcinogenic in rats or mice. The rats were fed dietary doses of up to 2 mg/kg/day for 24 months, and the mice were fed up to 8 mg/kg/day for 22 months. These represent the maximum tolerated doses.
- ❖ **Fate in humans and animals:** Tests with laboratory animals show that ingested abamectin B1 is not readily absorbed into the bloodstream by mammals and that it is rapidly eliminated from the body within 2 days via the faeces. Rats given single oral doses of abamectin B1 excreted 69 to 82% of the dose unchanged in the faeces. The average half-life of abamectin B1 in rat tissue is 1.2 days. Lactating goats given daily oral doses for 10 days excreted 89% of the abamectin, mainly in the faeces. Less than 1% was recovered in the urine.

Ecological Effects:

- ❖ **Effects on birds:** *Abamectin is practically non-toxic to birds.* The LD₅₀ for abamectin in bobwhite quail is >2000 mg/kg. The dietary LC₅₀ is 3102 ppm in bobwhite quail. There were no adverse effects on reproduction when mallard ducks were fed dietary doses of 3, 6, or 12 ppm for 18 weeks.

- ❖ **Effects on aquatic organisms:** Abamectin is highly toxic to fish and extremely toxic to aquatic invertebrates. While highly toxic to aquatic organisms, actual concentrations of abamectin in surface waters adjacent to treated areas are expected to be nil from the presentation used. Abamectin did not bioaccumulate in bluegill sunfish exposed to 0.099 ög/L for 28 days in a flow-through tank. Abamectin from Avert will not pose a hazard to fish if applied correctly.

Environmental Fate:

- ❖ **Breakdown in soil and groundwater:** Abamectin is rapidly degraded in soil. At the soil surface, it is subject to rapid photodegradation, with half-lives of 8 hours to 1 day reported. When applied to the soil surface and not shaded, its soil half-life is about 1 week. Because abamectin is nearly insoluble in water and has a strong tendency to bind to soil particles, it is immobile in soil and unlikely to leach or contaminate groundwater. Compounds produced by the degradation of abamectin are also immobile and unlikely to contaminate groundwater.
- ❖ **Breakdown in water:** Abamectin is rapidly degraded in water. After initial distribution, its half-life in artificial pond water was 4 days. Its half-life in pond sediment was 2 to 4 weeks. It undergoes rapid photodegradation, with a half-life of 12 hours in water. When tested at pH levels common to surface and groundwater (pH 5, 7, and 9), abamectin did not hydrolyse.
- ❖ **Breakdown in vegetation:** Plants do not absorb abamectin from the soil. Abamectin is subject to rapid degradation when present as a thin film, as on treated leaf surfaces. Under laboratory conditions and in the presence of light, its half-life as a thin film was 4 to 6 hours.

Physical Properties:

- **Chemical Name:** abamectin B1 or avermectin B1
- **CAS Number:** 71751-41-2
- **Molecular Weight:** 873.11
- **Water Solubility:** Insoluble
- **Melting Point:** 150-155 C
- **Vapour Pressure:** Negligible

Exposure Guidelines:

- **ADI:** 0.0001 mg/kg/day
- **RfD:** 0.0004 mg/kg/day

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