

NITBUSTERS: HEADLICE IN SCHOOLS PROGRAM

The Nitbusters program is a NSW Health initiative to reduce the prevalence of headlice in the community. The project, developed in consultation with the NSW Federation of Parents and Citizens Associations and the NSW Department of Education and Training, educates school children and parents about headlice and how to screen for and treat them as a community.

The program is aimed not at eradicating headlice but at identifying and managing infestations. Nitbusters tries to educate communities through schools about the most effective ways to reduce populations of headlice by encouraging school 'Nitbuster days'. These days are coordinated by parent volunteers, who use a fine-toothed nit comb and white hair conditioner to both screen for and treat headlice.

As most parents realise, eliminating headlice completely is probably—for the moment at least—not realistic. However, learning a safe and effective and simple method of removing headlice can make the management of infestations a little easier. Nitbusters recommends that all families regularly practise this method of treatment. Keep a good quality nit comb in the shower and train children to use it every time they wash their hair, even if their heads are not itchy.

The Nitbusters program has held demonstration training days in a number of primary schools across New South Wales. Neighbouring schools were invited to attend these days and learn how to coordinate their own Nitbuster day.

Data is available from some of those demonstration schools. Over 3,000 primary school children have been screened. Of those screened, more than 24 per cent had infestations of headlice. This is similar to both Victoria and Queensland, where more than 20 per cent of primary school children have been reported to have headlice. Information on headlice, and the Nitbusters program, including how to run a Nitbuster day, is available at www.health.nsw.gov.au/headlice.

OVERVIEW OF THE PUBLIC HEALTH IMPLICATIONS OF COCKROACHES AND THEIR MANAGEMENT

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BACKGROUND

There are approximately 4,000 species of cockroaches worldwide and 428 species in Australia.¹ The majority of these species are not pests but live in the wild, feeding on decaying vegetation or other organic matter, and they are important in recycling this material. A number of cockroaches have become pests and live in or around homes where they are omnivorous scavengers. The 2 most significant pest cockroaches worldwide are the German cockroach *Blattella germanica* (Linnaeus) and the American cockroach *Periplaneta americana* (Linnaeus).

There are health implications from these pests, as they move freely from areas that may harbour pathogenic organisms: for example, from sewers to food or food preparation surfaces. Cockroach allergens can also be responsible for asthma. This article describes the public health implications of cockroaches, and their

management, including consequences for the management of other pests.

THE COCKROACH SPECIES

The German cockroach *Blattella germanica*

The German cockroach is the most common cockroach in houses and apartments in Australia.² Adults are about 15 mm long and first instar nymphs (that is, the first nymphal stage) are about 3 mm long. They are able to live and breed in the numerous cracks and crevices and hiding places present in most kitchens, bathrooms and living areas. Their small size means that they are initially tolerated by human occupants, many of whom do not recognise early nymphal stages as cockroaches. Their rapid reproduction rate enables a few individuals to become a pest problem over one season, as each female produces a number of egg cases containing numerous eggs (Table 1). The egg cases are carried until just before the eggs hatch. This helps protect the egg cases and the eggs and is another factor in their success as pests.

Like other pest cockroaches, German cockroaches are nocturnal and forage for food and water at night when

TABLE 1**LIFE HISTORY OF THE GERMAN AND AMERICAN COCKROACHES**

Cockroach	No. of eggs per egg case	Duration of nymphal development	Adult lifespan	No. of egg cases per female
German cockroach <i>Blattella germanica</i>	30–40	6–12 weeks	4–6 months	5–8
American cockroach <i>Periplaneta americana</i>	12–16	6–12 months	6–12 months	10–50

Source: Summarised from Hadlington and Gerozisis.²

they are less likely to be seen. In the daytime, they hide in cracks and crevices in cupboards and kitchen appliances and so are easily overlooked. The German cockroach is the most difficult pest cockroach species to control.

The American cockroach *Periplaneta americana*

This is the largest of the pest species, growing to around 40 mm in length.² It is red-brown, with fully developed wings that cover the abdomen, and it will fly in warm conditions. The species produces fewer generations per year than does the German cockroach and infestations therefore build up more slowly (Table 1). Because of the large size of both adults and nymphs, people are less tolerant of this species of cockroach in their homes or businesses, and the cockroaches also find fewer places inside to hide in the daytime. When established in homes they are normally found in wall voids or behind cupboards, in underfloor areas or in roof spaces. If sanitation is poor they can establish and breed inside homes but normally they enter living rooms, kitchens and bathrooms when they are foraging for food and water. In commercial premises, they are found in similar places and also in basement areas, service ducts and grease traps.

American cockroaches are often called peridomestic cockroaches because they are most associated with the areas around homes or buildings. Common areas where they are found include gardens, around garbage, inside drains and in outhouses such as sheds or garages. They can be common in sewers and sewer manholes. Because of their large size and relatively fast movement, a few American cockroaches inside the home means that people often initiate pest control measures more quickly than if they see a few German cockroaches.

Other pest cockroaches

There are other pest species of *Periplaneta* in Australia and throughout the world, and in some areas these may be as common as the German and American species. The smoky brown cockroach *Periplaneta fuliginosa* (Serville) is found in and around Sydney, and the Australian cockroach *Periplaneta australasiae* (Fabricius) is found commonly in tropical and subtropical areas of Australia. Both are large peridomestic cockroaches (around 35 mm long) that feed mainly on garden organic matter but they will forage inside buildings and establish themselves in

garages and outbuildings, under floor areas, and in wall voids. These species are not usually found in sewers, unlike the American cockroach. The smoky brown cockroach is dark brown and the Australian cockroach is red-brown with distinctive yellow edges on the protective forewings.

The brown-banded cockroach *Supella longipalpa* (Serville) is about the same size as the German cockroach and has distinctive light bands running across the wings and abdomen. These cockroaches are often found dispersed through the house behind picture frames and in light switches and furniture. They are found in the warmer northern areas of Australia.

Finally, the Oriental cockroach *Blatta orientalis* (Linnaeus) can be encountered in cooler areas of Australia. It is about 30 mm long and has small functionless wings. Oriental cockroaches are dark brown or black and may be found under floors, in sewers and drains, and around garden rubbish.

Cockroaches as vectors of pathogens

The habits of cockroaches mean that they have the potential to be vectors of organisms that cause disease. A number of species live in sewers from which they can escape via poorly fitting manholes, vent pipes or drains. (Cockroaches are able to pass through the water in the S-bends of plumbing fixtures.) Cockroaches may feed on sewage, garbage and rotting food, which all support pathogens, and then transfer to food or food preparation surfaces and utensils. Roth and Willis published an extensive review of the biotic associations of cockroaches in which they cite numerous pathogens harmful to humans being found in or on cockroaches or in the faeces.³ Brenner summarised the organisms pathogenic to humans that have been isolated from cockroaches.⁴ There were 32 species of bacteria (including *Salmonella* and *Shigella* species), 15 species of fungi and moulds, 7 helminths (intestinal parasites), 2 protozoans, and 1 virus. Ash and Greenburg reviewed the vector potential of the German cockroach in spreading *Salmonella enteritidis* (Gaertner).⁵ They pointed out that there was ample evidence that cockroaches could occur in large numbers in homes, restaurants and other institutions, and that they lived in close association with people, thus satisfying the requirement for synanthropy

(a preference for living in human settlements). They found that bacteria rarely multiplied in the gut of the German cockroach but that the cockroach was capable of giving an inoculative dose to food. After experimental feeding of cockroaches with *S. enteritidis*, their faeces contained the organism for between 3 and 20 days.

Klowden and Greenburg came to a similar conclusion for the American cockroach as a disease vector.⁶ Mackerras and Mackerras studied gastroenteritis in Queensland in 1946–1947 when there was an epidemic caused by *S. bovismorbificans* (Basenau).⁷ They examined the cockroach population in hospitals and surrounding suburbs and concluded that the prevalence of contaminated cockroaches in hospitals could be regarded as a reflection of the opportunities they had to acquire and disseminate infections in the wards. Mackerras and Pope found that infected cockroaches could become carriers of *Salmonella* for 2–7 weeks.⁸

Cockroaches were also implicated in the spread of infective hepatitis in California,⁹ as evidenced by the decrease in the disease after cockroach control and the increase when control ceased.

COCKROACH ALLERGIES AND ASTHMA

Bernton and Brown first demonstrated in 1964 that people could become allergic to cockroaches and their faeces.¹⁰ This allergic reaction is a worldwide phenomenon, with sensitivity to cockroaches ranging from 23 to 60 per cent

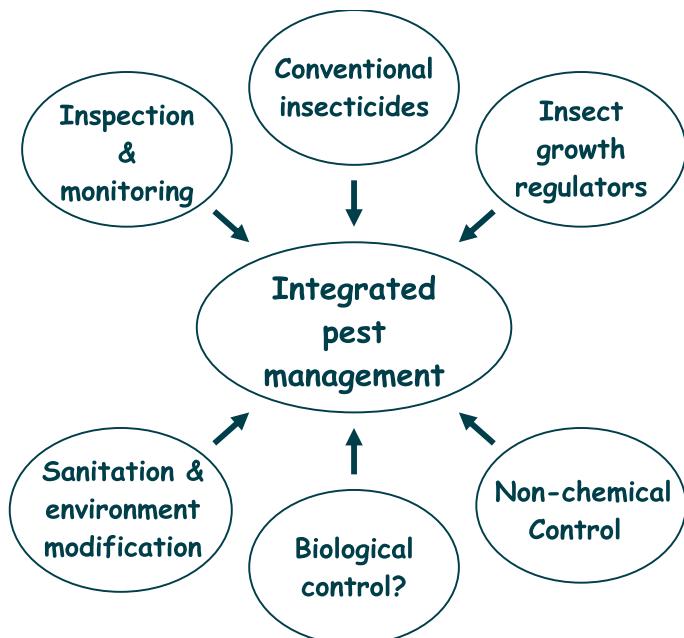
of the population tested.¹¹ Cockroach allergens are present mostly in settled dust, rather than air, as the particles are large and do not remain airborne unless disturbed. There seems to be a particular association between cockroach allergens and asthma but they also can cause rhinitis and dermatitis. The allergens are potent sensitizers of children and exposure to cockroach allergens early in life has been found to be a predictor for the development of asthma.¹²

Brenner cites the German cockroach as the principal cockroach causing allergies,⁴ which is to be expected because of the close association between German cockroaches and people. Cockroach infestations in bedrooms are particularly associated with asthma, presumably because of the extended close association between the person and the cockroach allergens.

A number of studies have examined threshold levels of cockroach exposure above which susceptible individuals may be at risk of developing symptoms of asthma. For example, Arruda et al. found that levels of greater than 8 micrograms of 1 allergen in children's bedrooms led to increased hospital admissions for asthma.¹³ Regular cockroach control will reduce the incidence of cockroaches and hence reduce the build-up of allergens.¹⁴ However, even after cockroach control, allergens persist. Cleaning to reduce cockroach allergen may be possible to lower the risk of sensitisation or cockroach-induced asthma. Eggleston et al. used abamectin baits to control German cockroach populations and coupled this with

FIGURE 1

INTEGRATED MANAGEMENT OF PEST COCKROACHES



Source: Department of Health Sciences, University of Technology, Sydney.

cleaning.¹⁵ The amount of allergens was reduced, but generally they were still at a level to cause clinical effects.

If control and cleaning techniques are to be successful in reducing allergens, the control must occur in all rooms and be completed with thorough cleaning to reduce allergen reservoirs to acceptable levels.¹³ There should also be measures to maintain control and prevent reinfestation.

CONTROL OF COCKROACHES

Insect pest management, which involves integrating a number of procedures to gain control of cockroaches, can be instigated (Figure 1).¹⁶ Insecticides remain the most common control method and these are usually applied as sprays to the cockroaches' hiding places and breeding areas. For German cockroaches, this would involve crack and crevice treatments, particularly to kitchens and bathrooms but often to bedrooms and living rooms. For American and other peridomestic cockroaches it would also involve treatment to under-floor and wall and ceiling spaces, drains and some garden areas.

Gels are newer formulations that are being used with good results. Gels are a combination of insecticide, food, attractants and water, which rely on the natural foraging and feeding behaviour of the cockroach. They involve less insecticide use and disruption to the human occupants. They are applied by means of a gel gun and they appear to control an infestation as effectively as or better than sprays.¹⁷ The changeover to gels means that other pests, which may have been killed by sprays, are not controlled as they are not attracted to the gel. This may explain the increased problems from other pests such as ants and bedbugs.

CONCLUSION

Cockroaches live and feed in unhygienic places such as sewers and drains, or feed on garbage that may be contaminated. They certainly have the opportunity to transfer pathogens physically to humans or to their food and living areas, but whether they are competent vectors of the organisms they carry is still under debate. However, the general conclusion is that they should be controlled, particularly in sensitive areas such as medical facilities or food preparation areas, to limit their potential for physical transfer of pathogens. Cockroach allergens are potent sensitisers of children to asthma and are triggers for asthma attacks. Control of cockroaches should be instigated to limit potential adverse health effects from their presence. The newer gel formulations are effective and reduce insecticide use but their close targeting of cockroaches means that other pests, such as bedbugs, are no longer controlled during cockroach control programs.

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