

## Cockroach Biology

There are an estimated 3500 species of cockroaches. All cockroaches undergo a gradual metamorphosis consisting of three stages – egg, nymph, and adult. Eggs are laid in an egg case or ootheca. Egg to adult development varies by species from an average of 103 days for the German cockroach to an average of 600 days for the American and Smokybrown cockroaches. The adult American cockroach female can live up to 700 days. Cockroaches are omnivorous with a preference for starchy materials. In domestic environments, they prefer to live near hot water pipes, moist kitchen sinks, behind stoves and refrigerators, and in cracks and crevices.

## Most Common Species

American – *Periplaneta americana*  
 Australian – *Periplaneta australasiae*  
 Brown – *Periplaneta brunnea*  
 Brownbanded – *Supella longipalpa*  
 German – *Blattella germanica*  
 Oriental – *Blatta orientalis*  
 Smokybrown – *Periplaneta fuliginosa*

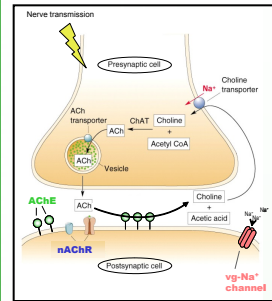


C. Wang, Rutgers University

## Public Health Importance

Cockroaches are among the most important pests of households and commercial establishments. They are capable of mechanically transmitting disease causing pathogens such as *Salmonella*, *Staphylococcus*, *Streptococcus*, *Coliform*, *Clostridium*, *Escherchia coli* and *Shigella dysenteriae* as well as diseases such as toxoplasmosis and hepatitis B. Cockroaches are also a source of allergens.

## Insecticides and Mode of Action Classes



### Application methods

- Residual treatment (aerosols, dusts and sprays)
- Baits (gel and granular)

Biochemical mode of action of chemical classes of recommended insecticides for the control of cockroaches and IRAC classification group.

Chemical class/subgroup	Mode of action (IRAC group)
Boric acid/Silica gel/ Essential oils	Inorganics
Carbamates	Acetylcholinesterase (1A)
Organophosphates	Acetylcholinesterase (1B)
Pyrethrins/Pyrethroids	Sodium channel (3)
Neonicotinoids	Acetylcholine receptor (4A)
Spinosyns	Acetylcholine receptor (5)
Insect Growth Regulators	Juvenile hormone mimics (7A,7C)
Chlorfenapyr/Sulfluramid	Uncouplers (13)
Flufenoxuron	Chitin synthesis inhibitor (15)
Avermectins	Chloride channel activator (6)
Hydramethylnon	Mitochondrial complex III inhibitor (20A)
Phenylpyrazoles	GABA-gated chloride channel antagonist (2B)
Indoxacarb	Voltage-dependent Na channel blocker (22A)



Additional information on control measures against cockroaches is available in the WHO brochure on pesticide application.



## Resistance

Field resistance to most current insecticides is found only in German cockroaches. American and Smokybrown cockroach populations were found to be resistant to chlorinated hydrocarbon insecticides during the period of time when these insecticides were used extensively for cockroach control. Insecticide resistance in the German cockroach was first identified in 1952 in populations exposed to chlordane, in 1964 to organophosphates, in 1968 to carbamates, in mid-1980s for pyrethroids, in 1992 to sulfluramid, and in 1994 to abamectin. Resistance in American cockroach to trichlorfon in China and Brown cockroach to diazinon in USA have been reported.

## Resistance Management

Although resistance in German cockroaches is widespread, different application methods (e.g. baits and sprays) using different modes of action classes rather than insecticides from within the same IRAC mode of action group should be used in a rotational strategy to provide control and delay the rapid development of resistance in all species.



J. Obermeyer, Purdue Extension Entomology5