

Biological Control of Mosquito

To control mosquitoes using a biological method means to reduce the mosquito population by using predators, parasites, pathogens, toxins from microorganisms or even by releasing sterilized male adult mosquitoes. Through this method, it is expected that the mosquito population is reduced to an acceptable level for protecting human health while the side-effects on the environment/ecosystem arisen from control work are avoided. Same as other control methods (environmental control, chemical control), biological control is best targeted at the immature stages of mosquitoes to yield a more promising and cost-effective result, as such stages are comparatively more localized at their breeding sites than the widely dispersed adults.

Among various biological control methods, the use of predator (mosquito-eating fish) and the use of pathogens/toxins from microorganisms (*Bacillus thuringiensis israelensis* (*B.t.i.*)) are considered as more effective and practicable; they are widely accepted by other countries and are also adopted in Hong Kong.

Mosquito-eating fish

The major advantage of releasing mosquito-eating fish into a mosquito breeding place is that the predators can be conserved and their population can gradually establish under favourable living conditions, which provides a sustained way to suppress/control mosquitoes. In the



selection of suitable species of mosquito-eating fish, the characteristics of the fish which enable it to prey on the mosquito effectively as well as its effect on ecology of the habitat where it is introduced should also be taken into account. In Hong Kong, *Poecilia reticulata* is a desirable species to serve the purpose.

B.t.i.

B.t.i. produces protein toxins which are highly toxic to mosquitoes and blackfly larvae after ingestion but harmless to other aquatic animals, and therefore it can be used in ecologically sensitive areas. It is biodegradable and leaves no toxic residues after use. Resistance to *B.t.i.* has not been observed in the target species after years of application, and is less likely to develop due to the complexity in mode of action of *B.t.i.* Re-treatment at regular intervals is, however, needed as the existing formulations cannot persist in the environment.



Biological control indeed could be a more environmentally friendly way to control mosquito population over the use of pesticides. Whenever mosquito control work is needed, it is worthwhile to consider adopting such approach to safeguard our health and to protect our environment at the same time.

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Ultrasonic device in pest control



The use of ultrasonic devices in pest control would be a potential source of environmental-friendly technology because ultrasound is clean and non-chemical. Are ultrasonic devices effective in pest control work? In this article, ultrasonic devices for rodent control will be discussed.

Rodents can hear sound that we cannot. They can produce and hear ultrasound (sound waves with a frequency above the upper limit of human hearing). The ultrasonic devices for rodent control are practically inaudible to humans with their output frequencies above 20 kilohertz (kHz). They produce ultrasonic noise so aversive to rodents that it drives rodents away. Many devices are sold with claims that they can repel or eliminate rodents. However, there are limitations of these devices.

The intensity of ultrasound emitted by an ultrasonic device drops rapidly as the distance from the device increases according to the inverse square law which states that the intensity is inversely proportional to the square of the relative distance. For example, an ultrasound stimulus at a distance of 4 meters from the device is going to measure only one-fourth of the strength recorded at a distance of 2 meters from the same device. Ultrasound is therefore of a very short range.

Ultrasound is also blocked by intervening objects like walls and furniture. It cannot penetrate effectively through these objects and cannot go around corners. Therefore, walls, doors and furniture produce "sound shadows"

behind them. Rats and mice can easily use these areas for auditory shelter, thus avoiding the ultrasound.

Furthermore, rodents rapidly become habituated to repeat sounds. After rodents have realized that the ultrasound is not dangerous, they could gradually get used to it. They would return to their nesting and feeding areas even in the presence of ultrasound. Ultrasonic devices may only temporarily discourage rodents from visiting certain areas. Although ultrasound is possible to cause permanent physiological damage to rodents, the intensity of such sounds must be so great that it would probably damage people or domestic animals. Ultrasound that is safe to use around humans will not kill rodents or drive rodents out of their favourable habitats.

Many studies have rejected ultrasonic devices as a practical means of rodent control. There is no scientific evidence that ultrasonic rodent control devices work effectively at the moment.

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