CURRENT INSECTICIDE RESISTANCE PATTERNS IN MOSQUITO VECTORS IN THAILAND

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Abstract. Chemical pesticides are still commonly used in Thailand for control of agricultural pests and disease vectors. Organophosphates, carbamates and synthetic pyrethroids are commonly used for agricultural purposes, whereas synthetic pyrethroids have become more popular and predominate for public health use. The genetic selection of insecticide resistance (whether physiological, biochemical or behavioral) in pests and disease vectors has been extensively reported worldwide (Brown and Pal, 1971). The long-term intensive use of chemical pesticides to control insect pests and disease vectors is often cited as the reason behind the development of insecticide resistance in insect populations. Unfortunately, reliable information on vector resistance patterns to pesticides in Thailand is sparse because of a remarkable shortage of carefully controlled, systematic studies. This review gathers useful information on what is presently known about disease vector resistance to chemical pesticides in Thailand and provides some possible management strategies when serious insecticide resistance occurs.

INTRODUCTION

Over the 20th century, insecticides of natural and synthetic origins have increased in importance and overall volume of uses as agricultural and public health needs have demanded. Years of routine use have led in some cases to high levels of chemical resistance by certain pests and disease vectors (Georghiou and Saito, 1983).

Resistance can be broadly defined as"the developed ability in a strain of insects to tolerate doses of insecticides which prove lethal to the majority of individuals in a normal population of the same species" (WHO, 1975). This ability is brought about by selection of individuals in a population with a genetically inheritable capacity to withstand insecticides, and not due to the action of the insecticide on a given individual insect. Therefore, the development of resistance is dependent on genetic variability already present in a target population or spontaneously arising during the period of selection (Oppenoorth, 1984). Development of physiological resistance by mosquitos, the most important group of medically important arthropods, was first reported in 1947 when *Aedes. taeniorhynchus* was shown to be resistant to DDT in Florida after only 4 years of use (Brown, 1986). The following 40 years of intensive use of organic insecticides to control insect pests and disease vectors has led to the extensive selection of insecticide resistance in more than 450 species (Georghiou, 1986). Resistance to insecticides has been reported in over 500 species of arthropods, including at least 109 mosquito species found resistant to organochlorines, primarily DDT and dieldrin (Roberts and Andre, 1994).

There are 2 principal types of responses to insecticides, one is physiological and the other is behavioral (avoidance). Physiological resistance, sometimes referred to as biochemical resistance, is the ability of mosquito to survive the effect of insecticide by mechanisms such as detoxifying enzymes. Behavioral avoidance is the ability of a mosquito to avoid the insecticide-treated surface by either direct contact irritancy or noncontact repellency or the combination of both, referred to as excito-repellency (Chareonviriyaphap *et al,* 1997).

Common resistance mechanisms in arthropods include: reduced sensitivity of altered acetylcholinesterases to organophosphates and carbamates; the *kdr* (knockdown resistance) insensitivity to DDT and pyrethroids; reduced neuronal sensitivity to chlorinated cyclodienes; increased metabolism by hydrolysis of organophosphates, carbamates and pyrethroids; increased activity of mixed function oxidases in DDT,

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