

BIOCHEMICAL SYSTEMS AS TARGETS FOR INSECTICIDES

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ABSTRACT

Insecticides are biocidal agents which are designed to affect biological systems. Old type insecticides were often nonselective, meaning that they affect nontarget organisms as well as the target pest insects. The essential requirements for modern insecticides are that they selectively affect pest insects with minimum effects on other species including beneficial insects. The increase in such selectivity may be achieved by using differences in behavior, morphology, habitat and biochemistry among different organisms. Among biochemical selectivities usually two areas are exploited by toxicologists. They are metabolic and target sensitivity differences among species.

"Target" is a term toxicologists often use to describe putative or real biochemical sites, where biocidal agents interact to cause a critical event leading to a decisive toxic manifestation such as reproductive failure, nerve excitation and death. The importance of studies of the target systems may be illustrated in the case of organophosphates and carbamate insecticides which attacks cholinesterase as their target. These pieces of information contributed greatly to the understanding of the cause of resistance and the development of antidotes and treatment methods. Recently we have discovered that the primary target system for cyclodiene type insecticides is the picrotoxinin receptor. This receptor is known to play an important role in carrying out the message initiated by a natural inhibitor called GABA (gamma-amino butyric acid). We also found that three cyclodiene-resistant insect species show positive cross-resistance to picrotoxinin. Therefore, such a knowledge helps to explain the mechanism of resistance as well. An interesting observation is that the newly discovered group of insecticides, avermectins have been also reputed to attack the GABA related system as their biochemical target. Thus, there is a good chance that the GABA related system is a very important target for insecticidal chemicals which may be exploited in the future by insect toxicologists.