

## INSECT VECTORS OF TROPICAL DISEASES

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### Summary

Insects represent the most diverse group of animals, living in any kind of microhabitats and feeding on different foods. Parasitism is the symbiotic relationship that favored the interaction with vertebrates and with micro-organisms. There are some classifications of parasitism, but that which consider the period in which the insect lives as parasite in relation to the total life-cycle period is useful in the study of insects. The higher insect groups that include parasite species are denoted, and special emphasis is made in the separate origin of this type of symbiosis. The effects of parasitic insects on hosts are discussed considering the direct consequences of insect parasitism and the indirect damage by the transmission of pathogens. The general types of transmission, and the higher groups of micro-organisms transmitted by insects, are briefly documented. Summaries of the principal taxa of insect vectors of the most important tropical diseases are included.

### 1. Introduction

Class Insecta constitute the most diverse group of animals over the earth, not only in the sense of number of species, but in life styles, habitat and food resources they use. Almost 72 percent of all animals are insects, and they can be found in forests, grasslands, deserts, cultivated lands, urban areas, fresh and salt water collections, living in any kind of microhabitats and feeding on different foods during different stages of their lives. Some insects eat litter and dead plant matter, others on dung or carcasses,

others on green plants, and some more on most other kinds of terrestrial animals (Daly et al., 1978).

Trophic relationships of insects with other animals are the main reason by which insects interact with micro-organisms and vertebrates, and by which they acquired their importance as vehicles of pathogens to vertebrates, including man. In the sense of the symbiotic relationships, insects may be predators if they kill and consume more than one prey organism to reach maturity, parasitoids if they require only one host to reach maturity but result killed, or parasites if the insect feed on one or more hosts that may be damaged, but normally do not die by the interaction. This chapter deals with parasitic insects that associate in any time of their evolution not only with their vertebrate hosts but also with other parasitic micro-organisms that use insects as a mechanical vehicle or as one of their biological host as well as a vertebrate host.

## 2. Insects as Parasites

Although insects interact with man and other vertebrates in different manners, the most important type of interaction between them, which deserves special attention, is parasitism.

Parasitism is the symbiotic relation between two species or populations, in which one, known as parasite, obtain a benefit upon the other, named the host. This relation is a metabolic one because the parasites nourish or use enzymes from the host. As a consequence, there are some levels of damage of the host integrity, which in normal situations do not produce the death of the host, as it happens with predation or parasitoidism. In general, the body size of the parasite is considerably smaller than the host's body, usually this organism selects the host species and needs, if not one, just a few hosts to complete its life-cycle. Additionally, it is important to mention that the host abundance do not necessary needs to be higher than the parasite to hold up its population.

Insect parasitism occurs not only over vertebrate hosts, but on other invertebrates including insects. This interaction may exist before the appearance of terrestrial vertebrates, as can be interpreted from the fossil record, and the diversity of parasite-host interactions that can be seen today in nature. As an example, we can mention the case of sand-flies of the family Ceratopogonidae; females of the genus *Forcipomyia*, as well as of other related genera feed on the hemolymph of other insects, but other genera of the same family, as *Culicoides*, feed on the blood of vertebrates.

Insect parasitism arise independently in the major groups of insects, not from one stem ancestor, and for this reason, the morphological, physiological and ecological strategies to use the resource is considerably diverse. Nearly as a rule, the immunological response of the host to a new parasite is severe, whereas a parasite relationship established some time ago in the evolutionary scale usually produce null or light reactions in the host. Nevertheless in both cases parasites could produce severe effects in the host in the case of immuno-depression or if the parasite population increase above the normal number of individuals.

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