

Insect digestion: an historical and evolutionary perspective

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Historically, studies on insect digestion report to the beginning of the 20th century. However, till 1979 the comprehension of spatial organization of digestion in insects was limited. Few studies dealt with purification and characterization of insect digestive enzymes, the peritrophic membrane and digestion compartmentalization and midgut fluid fluxes. Dr. Walter R. Terra and Dra. Clélia Ferreira published the first article on insect digestion in 1979 using *Rhynchosciara americana* as model and measuring the activity of digestive enzymes in different portions of *Rhynchosciara* midgut. This study led to the proposal of the first comprehensive model for the digestive process in insects. Similar studies were done in different insect orders allowing phylogenetic considerations of the spatial organization of insect digestion, indicating that the phylogenetic position is the most important factor determining the organization of insect digestion. In addition to digestion models and the evolutionary considerations, the catalytic mechanism of a series of digestive enzymes were elucidated. This group published 150 scientific articles and formed 19 PhDs which are dispersing the interest on insects and other Arthropoda digestion in different Brazilian research institutes. Arthropoda includes the major groups Insecta, Crustacea and Arachnida. A comparative-evolutionary study of digestion in Arthropoda was not possible because there are few data on Arachnida digestion. This gave rise to a new research line: Biochemistry of Arachnida digestion and the proteolytic activity control. The spider *Nephilengys cruentata*, the scorpion *Tityus serrulatus* and the tick *Amblyomma cajennense* have been used as models to these studies. The first results indicated an acidic digestion of proteins and carbohydrates. Major enzymes were identified, isolated and characterized. Besides that, spiders protein inhibitors of insect proteolytic enzymes were isolated. Studies on digestion compartmentalization on Arachnida are in progress.

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