

From Perimicrovillar Membranes to Induction of Digestive Enzymes in Insects

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My work at Professor Terra's laboratory started with the aim of understanding the origin, organization and function of the extra-cellular plasma membranes called perimicrovillar membranes (PMM) found in the midgut of hemipteran insects. The results obtained from the insect model *Dysdercus peruvianus* were used to infer the digestive physiology characteristics of the Heteropteran ancestor, and to discuss the major adaptations which occurred when the bugs moved from a sap sucking habit to a habit which included digestion of polymers. The described morphological features agree with physiological data showing the regions of water, glucose and amino acid absorption. α -Glucosidase, a PMM marker, was immunolocalized in *D. peruvianus* midgut cells. The data suggested that PMM are formed in Golgi areas, migrate as the internal membrane of double membrane vesicles, which finally fuse at the cell apex- the outer vesicle membrane with the microvillar membrane and the inner vesicle membrane with the PMM. We have reported that adults of the hemipteran infra-orders have both PMM and a major membrane bound α -glucosidase, which is recognized by a polyclonal antibody raised against the *D. peruvianus* enzyme. The same antibody was also capable of recognizing perimicrovillar α -glucosidase from thrips. No PMM nor membrane-bound α -glucosidase were found in Psocoptera and Phthiraptera midguts. The data supported the hypothesis that PMM may have originated in the Condylognatha (taxon including Hemiptera and Thysanoptera) ancestral stock. The lessons and experience acquired at Prof. Terra's laboratory paved the way to further discoveries at the insect-plant interface, for example, the demonstration of induction of amylases in the bruchid *Zabrotes subfasciatus*. The study on the adaptation of larval *Tenebrio molitor* to plant protease inhibitors is also being developed with the collaborative participation of Prof. Terra and his team. Keywords: Insect digestion, Hemiptera, Coleoptera. Supported by: CNPq and FAPERJ.