

Digestive lipases present in the midgut of insects

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Lipases hydrolyze water-insoluble substrates such as triacylglycerols (TAG), phospholipids (PL), cholesterol esters (CE) and galactolipids (GL). Neutral or pancreatic lipases hydrolyze better neutral lipids, but also act against PL and GL. Acid lipases have TAG and CE as substrate. Insect lipases already sequenced have a structure similar to the PLases A1, although they may hydrolyse TAG to account for the activity against TAG observed in the midgut. We intend to associate the specificity of midgut lipases with its amino acid sequences, after expressing and assaying recombinant enzymes of each type. In this study we describe a search for lipases and PLases in transcriptomes of the midgut of 9 insects from 5 orders: Dictyoptera, Hemiptera, Coleoptera, Diptera and Lepidoptera. The sequences were obtained from transcriptomes (454 Roche platform) and annotated by comparing the sequences with those from GO, KOG, Pfam and NR databases. After manually removing the redundant ones, 156 sequences were left, from which 78 have the characteristic catalytical residues. From the 78 sequences, 14 were complete and 11 have a transmembrane helix. The number of lipases varied according to the insect orders as follows: Dictyoptera,3; Hemiptera,8; Coleoptera,4; Diptera,9; and Lepidoptera 17. The number of acid and neutral plus PLases A1 were estimated after blasting in databanks or analyzing the distribution of the sequences in cladograms with reference sequences. The figures obtained by the two processes were similar, although 15 sequences did not group with reference sequences in the cladogram. Twelve sequences corresponds to acid lipase and 51 to neutral plus PLases A1. Hemiptera, Diptera, and Lepidoptera have 3 to 5 times more neutral plus PLases A1 than acid lipases, whereas for the other orders the figures are 0.5-2 times. The meaning of those differences is unknown.

Keywords: lipases, phospholipases, transcriptome, digestion.

Supported by: FAPESP, CNPq, INCT-ME, CAPES.