Down-regulation of Mitochondrial Function in the Digest Cells of *Rhipicephalus (Boophilus) microplus*: An Antioxidant Defense?

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Rhipicephalus (Boophilus) microplus is the main ecto-parasite of bovine cattle. Females ingest large volumes of blood that is degraded intracellularly. Hydrolysis of hemoglobin results in an intense release of heme, a pro-oxidant molecule. The aim of this work is to identify antioxidant enzymes that contribute to adapt the tick to its diet. We have identified three enzymes related to H_2O_2 detoxification expressed in digest cells: a catalase; a non-selenium phospholipid-dependent glutathione-peroxidase (GPx) and a selenium-dependent-GPx. We observed by qPCR that the expression of all antioxidant enzymes tested increased during blood digestion, paralleling the course of hemoglobin degradation and formation of hemosomes, a specialized organelle where heme from hemoglobin digestion is accumulated. We have previously hypothesized that the switch from aerobic to anaerobic metabolism could be a preventive antioxidant defense in blood-feeding parasites (FEBS Letters, 525: 3-6, 2002). Here we observed, by fluorescence microscopy, a lower abundance of mitochondria in digest cells of fully engorged females compared to cells from partially engorged females (~10% of full blood meal). We also showed that digest cells of fully engorged females were tolerant to respiratory poisons cyanide and antimycin, surviving several days in culture media, in contrast to digest cells from partially feed ticks that promptly died in the presence of these compounds. Both cells were highly sensitive to the glycolytic-inhibitor iodoacetamide. Our data indicate that down-regulation of mitochondrial function in fully engorged tick digest cells could represent an adaptation to hemotophagy in order to prevent heme-mediated oxidative damage. Supported by: HHMI, CNPq, CAPES, FAPERJ, INCT-EM.