World Academy of Science, Engineering and Technology
International Journal of Biomedical and Biological Engineering
Vol:9, No:05, 2015

Cellular Energy Metabolism Decreases with Age in the Trophocytes and Oenocytes of Honeybees (Apis Mellifera)

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Abstract : The expression, concentration, and activity of mitochondrial energy-utilized molecules and cellular energy-regulated molecules decreased with age in the trophocytes and oenocytes of honeybees (Apis mellifera), but those of cellular energy-metabolized molecules is unknown. In this study, the expression, concentration, and activity of cellular energy-metabolized molecules were assayed in the trophocytes and fat cells of young and old worker bees by using the techniques of cell and biochemistry. The results showed that (i) the •-hydroxylacyl-coenzyme A dehydrogenase (HOAD) activity/citrate synthase (CS) activity ratio, non-esterified fatty acids concentrations, the expression of eukaryotic initiation factor 4E, and the expression of phosphorylated eIF4E binding protein 1 decreased with age; (ii) fat and glycogen accumulation increased with age; and (iii) the pyruvate dehydrogenase (PDH) activity/citrate synthase (CS) activity ratio was not correlated with age. These finding indicated that •-oxidation (HOAD/CS) and protein synthsis decreased with age. Glycolysis (PDH/CS) was unchanged with age. The most likely reason is that sugars are the vital food of worker bees. Taken together these data reveal that young workers have higher cellular energy metabolism than old workers and that aging results in a decline in the cellular energy metabolism in worker honeybees.

Keywords : aging, energy, honeybee, metabolism
Conference Title : ICMBB 2015 : International Conference on Molecular Biology and Biomedicine
Conference Location : Tokyo, Japan
Conference Dates : May 28-29, 2015