THE ROLE OF XANTHURENIC ACID IN THE PHYSIOLOGY OF Aedes aegypti

Rodrigo D. Nunes¹,²; Pedro L. Oliveira¹,²

¹Federal University of Rio de Janeiro, Institute of Medical Biochemistry, Program of Molecular Biology and Biotechnology, Rio de Janeiro, RJ, Brazil; ²National Institute of Science and Technology in Molecular Entomology

Introduction: In the midgut of the mosquito Aedes aegypti, vector of Dengue, an intense release of heme and iron takes place during blood meal digestion. We previously demonstrated that xanthurenic acid (XA), a product of the oxidative metabolism of tryptophan that binds heme and iron, is produced in the midgut after blood meal ingestion and reaches milimolar levels after 24 h, the period of maximal digestive activity. XA formation does not occur in the White Eye (WE) strain, which lacks kynurenine hydroxylase and accumulates kynurenic acid. This condition increases cell death after a blood meal and is reversed by supplementation of blood with XA.

Objectives: Here we characterize the importance of XA to the global physiology of Aedes. Methods: Bacterial culture and isolation, Trypsin activity, Hemoglobin quantification, Light Absorption Spectrometry, qPCR, SDS-PAGE. Results and Discussion: WE mosquito showed a slower digestion caused by a decrease in trypsin activity compared to wild type. Besides, the total (16S) and cultivable midgut bacterial population were markedly increased in the WE strain. We also isolated and identified two different cultivable bacteria most frequently present in both strains, Herbaspirillum sp and Serratia sp. They were only slightly sensitive to XA, showing a small decrease in growth, but showing inhibition of growth in the presence of heme or hemoglobin. The excretion of WE is also impaired may resulting in less nutrient absorption. There are lower levels of vitellogenin accumulation in the ovaries and only about half the number of oocytes and eggs are produced in the WE. All of these results are reversed with supplementation with XA. Conclusions: XA is an important physiological component, contributing to the digestive process, interfering with microbiota, contributing to midgut homeostasis and thus allowing enough nutrition to the mosquito to achieve a normal oogenesis and oviposition.

Key Words: Aedes; Tryptophan; Digestion.