

# Correlations between ultrastructures of corticotrophs, adrenocorticotrophic hormone (ACTH) and corticosterone production affected by various diets

Khairil Azwan<sup>1</sup>, Resni Mona<sup>1</sup>, Jannathul Firdous<sup>1</sup>, Dina Keumala Sari<sup>3</sup>, Pamela Rosie David<sup>2</sup>, Noorzaid Muhamad<sup>1</sup>

<sup>1</sup>Cluster for Integrative Physiology and Molecular Medicine (CIPMM), Faculty of Medicine, Royal College of Medicine Perak, Universiti Kuala Lumpur, Ipoh, Malaysia, <sup>2</sup>Department of Anatomy, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia, <sup>3</sup>Nutrition Department, Faculty of Medicine, Universitas Sumatera Utara, Kota Medan, Sumatera Utara, Indonesia

## ABSTRACT

**Introduction:** Modern dietary habits were proposed to have contributed to metabolic and physiological stress. Adrenocorticotrophic hormone (ACTH) and corticosterone are two major stress hormones. Corticotroph in the anterior pituitary gland produces ACTH in response to hypothalamus-pituitary-adrenal (HPA) axis stimulation with the result of corticosterone production. This study aims at observing the effect of different diets on ultrastructures of corticotrophs and the relevant hormones. **Materials and methods:** Eight weeks old, 35 male Sprague-Dawley rats were acclimatized for 2 weeks. Then they were divided into 5 groups according to their diets, namely control (normal rat chow), high-fat diet, high-protein diet, high-sugar diet, and high-starch diet. Feeding was done for 8 weeks with tap water provided ad libitum. After the rats were euthanized, their blood was taken, processed, and analysed using High-Performance Liquid Chromatography (HPLC) processing, and their pituitary gland was harvested, fixed and processed according to electron microscope protocol. Funded by Malaysian Fundamental Research Grant Scheme [ref no: FRGS/1/2018/SKK08/UNIKL/03/1]. **Results and conclusion:** HPLC analysis showed high-fat diet and high-sugar diet increased corticosterone blood concentrations. There was not much difference of ACTH secretion among the groups. Ultrastructure analysis revealed a high-fat diet, and a high-sugar diet affected the corticotroph the most. Corticotrophs of the high-fat group exhibited a shrunken nucleus with numerous swollen mitochondria, while the high-sugar group showed swollen endoplasmic reticulum along with swollen mitochondria. From this study it was observed that certain diets affects the ultrastructure of corticotroph and the production of ACTH along with corticosterone hormone most probably due to metabolic and oxidative stress.