Association between inflammation and oxidative stress of white and brown adipose tissues in db/db mice: A longitudinal study

Mr. MT Moetlediwa, Mr. K Ziqubu, Prof. SE Mazibuko-Mbeje.

North-West University, South Africa

Background: Adipose tissue (AT) is the central organ for regulating whole-body energy and glucose homeostasis.The two classical types of AT that have been characterized in this study are (i) white adipose tissue(WAT) responsible for the storage of excess energy in the form of fat and (ii) brown adipose tissue (BAT) which converts energy in fat stores into heat to promote thermogenesis. Nonetheless, AT, particularly WAT plays a key role in the pathogenesis of obesity-related type 2 diabetes (T2D). Indeed, WAT expansion is strongly correlated with several pathogenic mechanisms such as inflammation, oxidative stress, and insulin resistance which underlie T2D. However, the link betweenthese pathogenic processes in the age-related progression of diabetes remains unknown, especiallyin BAT.

Aim: To investigate the age-related changes on the inflammatory and oxidative stress markers in WAT and BAT of T2D *db/db* mice model.

Methods and results: Animals were divided into three age groups; -8, -12, and 18- weeks and each group was subdividedinto two groups, male *db/db* mice (obese) (n=10) and control littermates *db/+* mice (lean) (n=10). The body weight and biochemical parameters, including blood glucose and insulin levels as well as insulin resistance (HOMA-IR) were significantly increased in *db/db* mice in an age-dependent manner. In terms of histological analysis, both WAT and BAT developed hypertrophy, while BAT acquired

WAT phenotype “whitening” characterized by large unilocular lipid droplets in *db/db* mice. At the molecular level, the mRNA expression for pro-inflammatory cytokines interleukin (IL)-6 and tumor necrosis factor (TNF)-α were significantly increased in both BAT and WAT of obese mice. Consistently, mRNA expression of adipoQ, a regulator of inflammation and oxidative stress, was significantly increased while glucose transporter (GLUT)-4 expression was decreased indicating impaired glucose metabolism in *db/db* obese mice.

Conclusion: These results suggest that there is a dynamic change in inflammatory makers within WAT and BATof *db/db* mice with the age-related progression of obesity.