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Biochemical characterization of high fat diet fed and low dose streptozotocin induced diabetic Wistar rat model

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Abstract

The development of a stable disease model with an adequate biochemical profile is crucial for the preclinical investigation of new antidiabetic agents. This study aimed at optimization and characterization of high fat diet (HFD) fed streptozotocin (STZ) induced type 2 diabetes mellitus (type 2 DM) Wistar rat model. Wistar rats fed with HFD for four weeks received STZ (30, 40, and 50 mg/kg, intraperitoneal). Diabetic rats were observed for four more weeks and sacrificed. Non- injected healthy Wistar rats and HFD-fed rats were used as control groups. The glucose status and the lipid profile of the model were assessed. STZ-induced rats showed significant dose-dependent alterations in fasting serum insulin and glucose, homeostatic model assessment- insulin resistance (HOMA-IR), HOMA- β cell function (HOMA- β), quantitative insulin sensitivity check index (QUICKI), total cholesterol (TC), triglycerides (TG) and atherogenic index (AI). STZ 50 mg/kg group rats showed significant increase in glycated hemoglobin (HbA_{1c}), low density lipoprotein cholesterol (LDL-C) and very low density lipoprotein cholesterol (VLDL-C) levels compared to healthy rats. The atherogenic risk index (ARI), the Castelli risk index-I (CRII), and CRI-II were significantly ($p < 0.05$) high in the STZ 40 mg/kg and 50 mg/kg group rats. Results suggest that the Wistar rats fed with HFD rich in saturated fat for four weeks followed by a single intraperitoneal dose of 50 mg/kg of STZ would produce a stable diabetic model which closely mimic biochemical features of type 2 DM. Key messages: Wistar rats fed with HFD rich in saturated fat for four weeks followed by a single intraperitoneal dose of 50 mg/kg STZ would produce a stable diabetic model that closely mimics the biochemical characteristics of type 2 DM characterized by insulin resistance, relative insulin deficiency and impaired β cell function.

Keywords: High fat diet**,**Streptozotocin**,**Type 2 diabetes mellitus**,**Wistar rat