Characterization of the Calorie Restriction and Anti-Lipidemic Effects of Baicalin in Type 2 Diabetic Goto-Kakizaki Rats

Viduranga Waisundara 1 *, Sing Yung Siu 2, Annie Hsu 2, Dejian Huang 1, Benny K. H. Tan 2

1 Food Science & Technology Programme, Department of Chemistry, National University of Singapore, 3 Science Drive 3, Singapore 117543
2 Department of Pharmacology, Yong Loo Lin School of Medicine, National University of Singapore, 10 Medical Drive, Singapore 117543

* Corresponding author. Tel: (65) 93864961, Fax: (65) 67825498, E-mail: viduranga@gmail.com

Calorie restriction is known to produce a desirable metabolic profile in treating type 2 diabetes. Control of total cholesterol (TC) and triglyceride (TG) levels is also a focus of anti-diabetic treatments. This study investigated whether baicalin, a flavonoid, has an effect on calorie restriction markers as well as TC and TG levels in type 2 diabetic Goto-Kakizaki (GK) rats. Its effects were also compared with the oral anti-hyperglycemic agent metformin. Four groups of GK rats (n=6) were given the following treatments orally for 30 days: (1) metformin (M) – 500 mg/kg (2) baicalin (B) – 120 mg/kg (3) metformin 500 mg/kg and baicalin (MB) - 120 mg/kg (4) diabetic controls (DC) receiving distilled water. Plasma leptin, TC and TG concentrations and hepatic citrate synthase activity were measured. Transmission Electron Microscopy (TEM) of the hepatic mitochondria was performed. The daily food and water intakes of groups DC and M had significant fluctuations compared with groups B and MB, indicating the alleviation of the diabetic condition. TEM quantification of hepatic mitochondria revealed statistically significant increases in groups B and MB, compared with group DC (p < 0.05). This was further complemented by the hepatic citrate synthase activity and plasma leptin contents, indicating the calorie restriction effect of baicalin. Groups B and MB also showed statistically significant decreases (p < 0.05) in plasma TC and TG levels. Overall, Baicalin displayed calorie restriction & anti-lipidemic effects in the GK rats, and an overall multi-therapeutic effect against the diabetic condition compared with metformin.