Development of Myocardial Infarction in Rat Model of Diet-Induced Hypercholesterolaemia

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Received: 25th July 2022       Accepted: 23rd August 2022       Published: 30th October 2022

Abstract

The evidence of hypercholesterolaemia (HC) being a significant contributor to the progression of ischemic heart diseases (IHDs), particularly myocardial infarction (MI) is steadily increasing globally [1]. However, data on the establishment of MI-associated diet-induced HC rat model are lacking.

Hence, this study aimed to establish an MI-associated diet-induced HC rat model, allowing a better understanding of the pathological changes of this rat model. A total of 6 male Sprague Dawley rats weighing 200-250 were randomly allotted into 2 groups; Control and HC-MI. Control rats were fed with standard pellet, while HC rats were fed with a self-made high-cholesterol diet (HCD) for 10 weeks. The recipe for the HCD was adopted from a previous study [2] with slight modification. At the end of 10th week, MI was induced with the administration of isoprenaline (85 mg/kg, s.c) for 2 consecutive days [3].

In this study, 10 weeks of HCD significantly increased body mass index (BMI), triglyceride, and total cholesterol but not fasting blood glucose level in the HC group compared to the control group, suggestive of obese and HC state (Figure 1). MI was also evident by prominent observation of myocardial necrosis accompanied by infiltration of inflammatory cells in cardiac histology, although cardiac troponin T was not significantly elevated (Figure 2). Although liver function test showed significant elevation of AST but not ALT, but liver histological observation showed the presence of mixed steatosis and ballooning degeneration, suggestive of non-alcoholic fatty liver disease development (Figure 3). Nonetheless, kidney function test revealed a significant creatinine elevation but not urea level (Figure 4).
Collectively, these findings suggest that supplementation of HCD for 10 weeks together with administration of isoprenaline successfully developed a rat model of HC with MI as shown across elevated systemic cholesterol level, BMI, and myocardial necrosis. This study provides useful data on the establishment of the model which could be used in the future.

Figure 1: Effect of 10 weeks HCD supplementation and MI induction on a) BMI, plasma level of b) total cholesterol, c) triglycerides, d) fasting blood glucose

Figure 2: Effect of 10 weeks HCD supplementation and MI induction on plasma level of a) troponin T and, b) representative images of cardiac sections stained with H&E staining; 40x; arrow shows myocardial necrosis with infiltration of inflammatory cells
Acknowledgement
This work was supported by the Herbal Research Grant Scheme by the Malaysian Ministry of Agriculture (Grant code: 304.PPSK.6150169.K123).

References