

Oleic Acid and Palmitic Acid Induced Non-Alcoholic Fatty Liver Disease (NAFLD) in HepG2 Model

Nadta Sukkasem¹, Waranya Chatuphonprasert², Kanokwan Jarukamjorn^{3*}

¹Faculty of Pharmaceutical Sciences, Khon Kaen University, Khon Kaen 40002, Thailand

²Faculty of Medicine, Mahasarakham University, Mahasarakham 44000, Thailand

³Research Group for Pharmaceutical Activities of Natural Products using Pharmaceutical Biotechnology (PANPB), Faculty of Pharmaceutical Sciences, Khon Kaen University, Khon Kaen 40002, Thailand

*Corresponding author's e-mail: kanok_ja@kku.ac.th

Abstract:

Oleic acid (OA) is a monounsaturated fatty acid which is the major constituent of plant oils including olive oil and almond oil while palmitic acid (PA) is a saturated fatty acid which is commonly found in nature such as palm oil and lard oil, and also in human body. These fatty acids have shown the effects on both health benefits and diseases. In recent years, an interest in metabolic impact has been renewed and suggested that OA and PA can induce steatosis which is defined as 5.5% intrahepatic fat disposition of total liver weight. Hence, this study aimed to establish optimal models of fatty acid-induced non-alcoholic fatty liver disease (NAFLD) in HepG2 cells. HepG2 cells (5×10^5 cells/well) were cultured in DMEM containing 10% fetal bovine serum for 24 h before treated with 1 and 5 mM of OA and PA for 24 h. The control group was simply subjected to 0.5% isopropanol. After 24-h of the treatments, histology was observed with Oil Red O (ORO) staining. Alanine aminotransferase (ALT), aspartate aminotransferase (AST), and expression of peroxisome proliferator-activated receptors-alpha/gamma (PPAR- α/γ) mRNA were determined. A large number of lipid droplets were detected in HepG2 cells exposed OA and PA in a dose-dependent pattern in which the histomorphological features of both OA- and PA-exposure at the dose of 5 mM exhibited cell shrinkage especially that of PA. Levels of AST and ALT were unchanged while the expression of PPAR- α/γ mRNA were elevated by both OA and PA in a dose-dependent manner. OA and PA note as potential compounds to induce steatosis in HepG2 cells with the optimal concentration of 1 mM for stimulation of simple steatosis; nevertheless OA is more potent steatogenic than PA with less apoptotic effect.

Keywords: ALT, AST, Oil red O, Oleic acid, Palmitic acid, PPAR- α/γ