Basil Essential Oil and Its Nanoemulsion Mitigate Non Alcoholic Steatohepatitis in Rat Model with Special Reference to Gut Microbiota

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Abstract

The present research evaluated the protective effect of basil essential oil nanoemulsion (BNO) and its parent basil essential oil (BO) towards steatohepatitis. Chemical composition of BO was assessed followed by formulation into different BNOs using the low energy spontaneous emulsification technique. An ideal formula of BNO was selected among the others based on its ultra-fine particle size (15.42 nm) and physical stability at 25-37□, which was then tested in steatohepatitis rat model along with BO. Rats were divided into four groups, the first was fed on balanced diet (C), and the other groups were maintained on high fructose saturated fat diet deficient in choline to induce steatohepatitis, one of such groups served as control steatohepatitis (SC), the other groups received daily oral dose of BO and BNO, respectively. Microbiota (Firmicutes and Bacteroidetes) were counted in colon content and their ratio (F/B) was calculated. Liver fat, plasma lipid profile, plama interlukin-6, plasma lipopolysaccharides and plasma and colon content of lipocaline were assessed with histopathological examination of liver and colon. Results showed that the major volatile components of BO were linalool (60.9 %), eugenol (5.1 %) and eucalyptol (9.5%). SC group exhibited significant increase in liver lipids, plasma triglycerides, total cholesterol (TC), low density lipoprotein cholesterol and significant reduction in high density lipoprotein-cholesterol (HDL-C) compared to C group. Significant increase in plasma TC/HDL-C, interlukin-6, and lipocaline and F/B ratio and lipocaline in colon content were demonstrated in SC group without changes in plasma lipopolysaccharides compared to C. Histopathology of SC group showed liver fatty degeneration and fibroblasts activation while the colon demonstrated erosion and mucosal epithelium detachment. Treatment with either BNO or BO showed improvement compared to SC group. BNO was superior in reducing F/B ratio, liver lipids and histopathological changes. BO was more efficient in reducing TC, triglycerides and low density lipoprotein cholesterol. It is concluded that BO and BNO reduced the progression of nonalcoholic steatohepatitis in rat model. Gut microbiota in relation to steatohepatitis and related new therapies needs further investigations.