Li-Heng Pao et al., J Diabetes Metab 2018, Volume 9
DOI: 10.4172/2155-6156-C5-091

Using gallic acid to alleviate diabetes and nonalcoholic fatty liver disease induced by high fat diet and Streptozotocin: A pharmacodynamics and metabolomics evaluation

Li-Heng Pao[1] and Jung Chao[2]
[1]Chang Gung University of Science and Technology, Taiwan
[2]China Medical University, Taiwan

Gallic Acid (GA) is a polyphenol compound present in vegetables, fruits, red wine, tea and various types of food and exhibits a relatively simple structure compared with other polyphenols in food. Although numerous studies have reported that GA facilitates alleviating metabolic diseases, previous studies have mainly employed conventional biomarkers and histopathological sections to conduct analysis, thus gaining only unilateral understanding concerning the functions of GA. Therefore, the functions and mechanisms of GA in alleviating metabolic diseases should be reexamined. In this study, a pharmacodynamics mouse model was used to examine the use of GA to alleviate diabetes and Nonalcoholic Fatty Liver Disease (NAFLD) induced by High Fat Diet (HFD) and Streptozotocin (STZ). Moreover, a 1H nuclear magnetic resonance-based metabolomics analysis was adopted to investigate metabolites changes in mouse serum, urine, liver and muscle tissues, thereby verifying the therapeutic effect and potential mechanisms of GA in alleviating diabetes and NAFLD. The results revealed that HFD and STZ induced severe metabolic disorders in the diabetes and NAFLD mice, including metabolic disturbance related to glucose, lipids, amino acids, purines and pyrimidines as well as changes in intestinal microbiota. GA treatment alleviated the high blood glucose of the mice, decelerated the progression of NAFLD and partially reversed the disordered metabolic pathways in the diabetes mice. This study was the first to report that GA mechanism in alleviating lipid accumulation was related to the up-regulations of β-oxidation and ketogenesis. This finding accords with those of previous pharmacodynamics studies and facilitate identifying new mechanisms of GA in alleviating metabolic diseases.

Biography

Li-Heng Pao is a Professor of Graduate Institute of Health Industry Technology at Chang Gung University of Science and Technology, Taiwan. He is also the Director of Research Center of Food and Cosmetic Safety at the same university. He has completed his Doctorate in Pharmaceutical at the University of Michigan, USA in 1997. Currently, he is devoted in traditional Chinese medicine researches involved in herbal-drug interactions as well as their effects on neurodegenerative diseases; applying the mass spectrometry and NMR in metabolomics study on the effects of herbal drug in metabolic diseases.

paolh@mail.cgust.edu.tw

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