MORPHOLOGICAL AND MOLECULAR ANALYSIS OF NON-ALCOHOLIC STEATOHEPATITIS BY RAMAN MICROSCOPY

Takeo Minamikawa[1,2], Mayuko Ichimura-Shimizu[1], Hiroki Takanari[1], Ryosuke Shiomi[1], Hiroki Kusaka[1], Hiroki Tanioka[1], Eiji Hase[1], Takeshi Yasui[1], and Koichi Tsuneyama[1]

[1]Tokushima University, 2-1 Minami-Josanjima, Tokushima, 770-8506, Japan.

[2]PRESTO, Japan Science and Technology Agency (JST) , 2-1 Minami-Josanjima, Tokushima, Tokushima 770-8506, Japan.

E-mail: minamikawa.takeo@tokushima-u.ac.jp

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Non-alcoholic fatty liver disease (NAFLD) is a common liver disease associated with obesity [1]. A type of the NAFLD, non-alcoholic steatohepatitis (NASH), has been gaining medical attention because it leads to liver-related complications such as cirrhosis and hepatocellular carcinoma. In contrast, the other type of NAFLD, non-alcoholic fatty liver (NAFL), basically has benign prognosis. Although NASH and NAFL at early stage sometimes exhibit the similar accumulation of excess fat without apparent inflammation and fibrosis, the pathological role of the fat on the progression of NASH has not been clearly understood due to lack of fat-based investigation of the pathogenesis of NASH.

To clarify the role of fat in NASH, in this study, we sought to characterize the accumulated fats in the liver of NASH model mice by Raman microscopy for the investigation of NASH in terms of fat. Raman microscopy provides information about the molecular species and structures via Raman spectrum that reflects molecular vibrations of intrinsic tissue molecules, and therefore, has the potential to characterize the accumulated fats in NASH in terms of fat molecules. We analyzed spectral features of the Raman spectra of accumulated fats in frozen-sectioned liver tissues of NASH model mice induced by high-fat/cholesterol/cholate diet. By comparing with histopathological findings, we revealed the inhomogeneous accumulation of fats in the NASH liver tissues, such as the degree of saturation of triglycerides in the lipid droplets and the molecular composition of cholesterol and triglyceride in the lipid droplets, depending on histological features.

[1] M. E. Rinella, “Nonalcoholic fatty liver disease: a systematic review, ” JAMA, 313 (22) , 2263-2273 (2015).