Study of liver steatosis in a rat model by annular aperture-detected coherent anti-Stokes Raman scattering (CARS) microscopy

Jian Lin, Fake Lu, Wei Zheng, and Zhiwei Huang*
Dept of Bioengineering, National University of Singapore, Singapore 117576
*E-mail: biehzw@nus.edu.sg

KEY WORDS: Liver steatosis; coherent anti-Stokes raman scattering, annular-aperture detection

Abstract
We recently demonstrate that annular-aperture detection in coherent anti-Stokes Raman scattering (CARS) microscopy provides at least 10-fold higher contrast for imaging small scatterers with the sizes comparable to the excitation wavelength; while suppresses the signals from surrounding bulky scatterers and solvent [1]. In this paper, the annular-aperture detected CARS microscopy is implemented on the sectioned tissue from high-fat-diet induced steatosis/fibrosis model of rat livers with different dose and durations. By simply swapping in and out the annular aperture in the detection path, both the small and large sizes of lipid droplets in the tissue can be clearly observed, which facilitates the monitoring of lipid formations associated with different stages of liver steatosis. These results demonstrate the ability of annular-aperture detected CARS microscopy for high contrast imaging of fine structures and small scatterers in liver tissues and cells.

References