

# VISUALIZATION OF FUNCTIONING MOLECULES IN LIVING CELLS AND TISSUES WITH SPONTANEOUS RAMAN MICROSCOPY

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To analyze functioning biomolecules in living subjects, label-free imaging is desirable. Exogenous probes frequently used for molecular imaging may have some influence on the intracellular dynamics of target molecules. In contrast, Raman scattering light measurement can identify biomolecules in their innate state without application of staining methods. In this study, we have performed label-free imaging of dynamics of an anticancer drug in cultured cells and rat myocardial infarct lesions with spontaneous Raman microscopy.

Firstly, we applied slit-scanning confocal Raman microscopy to analyze the drug distribution in unstained living cells exposed to topoisomerase I inhibitor, CPT-11. We could acquire images of the intracellular distribution of CPT-11 and its metabolite SN-38 within several minutes without use of any exogenous probes. We also showed intracellular conversion from CPT-11 to SN-38 using Raman spectra. Raman spectromicroscopic imaging is useful for pharmacokinetic studies of anticancer drugs in living cells [1].

Secondly, we applied the Raman microscopy for tissue imaging of rat myocardial infarct regions. We found that individual cardiomyocytes were identified with resonance Raman signal arising mainly from reduced b- and c-type cytochromes, and that cardiomyocytes and blood vessels were imaged by distinguishing cytochromes from oxy- and deoxyhemoglobin in intact hearts, while cardiomyocytes and fibrotic tissue were imaged by distinguishing cytochromes from collagen type-I in infarct hearts with principal component analysis [2].

Our results suggest the potential of spontaneous Raman microscopy as a label-free high-contrast imaging technique, providing a useful approach for studying biochemical changes, based on the molecular composition, in the living cells and tissues.

## References

- [1] Harada Y, et al. *Histochem Cell Biol.* **132**, 39-46 (2009)
- [2] Ogawa M, et al. *Biochem Biophys Res Commun.* **382**, 370-374 (2009)