Raman Spectroscopy and Molecular Imaging of Living Cells

Hiro-o Hamaguchi

Department of Chemistry, School of Science, The University of Tokyo,Bunkyo-ku, Tokyo 113-0033, Japan
E-mail: hhamai@chem.s.u-tokyo.ac.jp

Recent developments of Raman microspectroscopy have enabled *in vivo* imaging of living cells with high time, space and molecular specificity. We have recently discovered in a living fission yeast (*S. Pombe*) cell a Raman band that sharply reflects the metabolic activity of mitochondria. We called it the "Raman spectroscopic signature of life" [1, 2]. We have also found [3] that this signature disappears concomitantly with a sudden appearance of a particle called "dancing body" in a vacuole of a budding yeast (*S. cerevisiae*) cell and that the appearance of the dancing body inevitably results in an eventual cell death. Changes in organelles accompanying this spontaneous cell death process have been traced with excellent molecular specificity by time-resolved Raman imaging (Figure 1). We are now able to discuss the bio-activities of a single living cell from the viewpoint of structural chemistry.

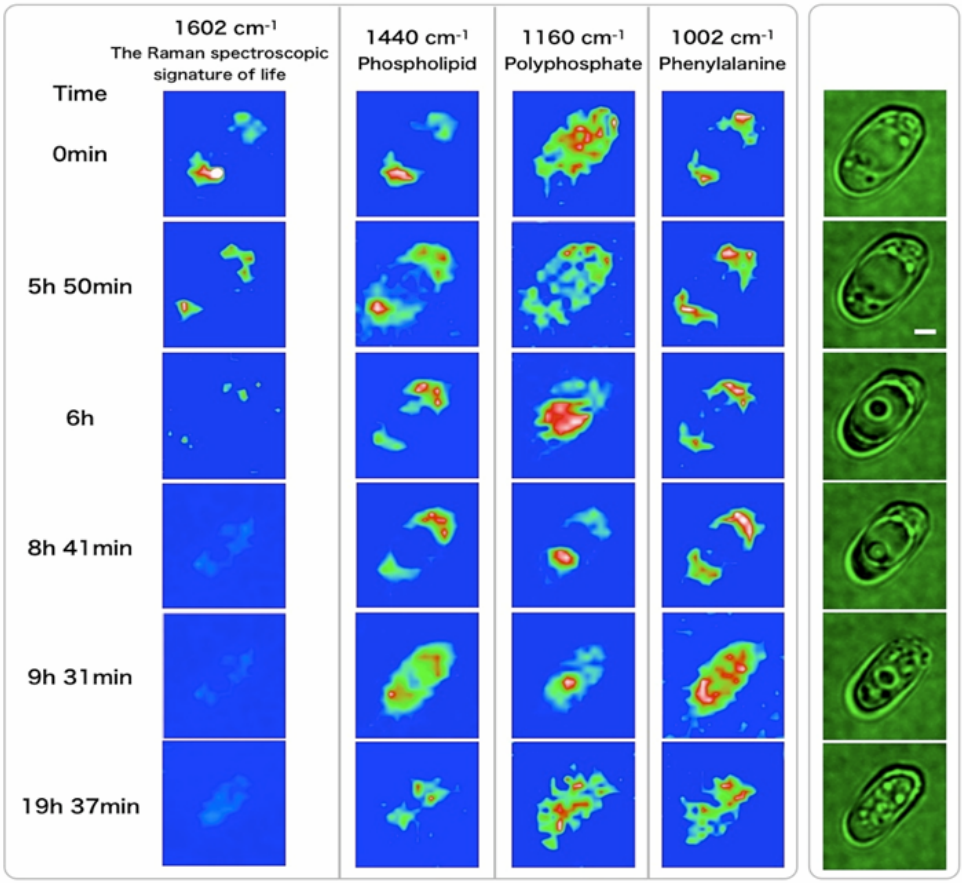

Figure 1: Raman-image tracing of cell death

[1] Y.-S. Huang, T. Karashima, M. Yamamoto, T. Ogura, H. Hamaguchi, *J. Raman Spectrosc.* 35 (2004) 525-527.
[2] Y.-S. Huang, T. Karashima, M. Yamamoto, H. Hamaguchi, *Biochemistry* 44 (2005) 10009-10019.
[3] Y. Naito, A. To-e, H. Hamaguchi, *J. Raman Spectrosc.* 36 (2005) 837-839.