For immediate release

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**Nematode - model organism**

**Simple multicellular organisms, such as nematode, zebrafish, and fruit flies, play a critical role in translational medicine. Their ease of breeding, rapid turnover rates, simple cellular organisation, and transparency make them ideal for understanding early developmental pathways, gene functions, and human diseases.**

A non-invasive and label-free technique such as Raman spectroscopy, which can resolve a wide range of chemical details and simultaneously provide spatial information, is therefore an ideal tool for studying these organisms.

Nematode *Caenorhabditis elegans* is one of the key, and best, model organisms. Current biological assays for investigating biochemical changes in the nematodes post genetic modification are largely invasive and/or rely on the use of labels. These assays typically lack the capability to simultaneously quantify biochemical molecules and resolve spatial information.

Raman imaging was applied directly to unfixed *Steinernema kraussei,* a nematode species similar to *C. elegans*, to demonstrate the capabilities of Raman spectroscopy. Streamline Plus™ and StreamLineHR™ imaging were applied to the whole and selected areas of the same organism.

The Raman images provide valuable information on the biochemical species within the nematode and their spatial arrangement. By analysing the information provided by the Raman images and spectra, a multitude of phenotypic changes in the nematodes can be deduced without the need for labelling or dissection. Raman imaging therefore serves as an ideal method for studying chemo-structural changes *in situ* in micrometre scale model organisms.

**Figure 1** - A Raman image of the whole nematode based on the intensity variation of three Raman bands. Green: 1003 cm-1, ascribed to ring breathing mode of phenylalanine; yellow: 1247 cm-1 to 1282 cm-1, ascribed to amide III modes of protein; red: between 1640 cm-1 to 1677 cm-1, ascribed to amide I mode of protein and (=C-H) of unsaturated fatty acids. Phenylalanine is a typically ubiquitous constituent of biological species. Thus, the green region represents the main nematode cavity. The red regions represent protein and lipid-rich domains, and the yellow region represents protein-rich domains.

**Figure 2** - Principal component anaylsis (PCA) performed on the tail region of the nematode unveiled information on the chemical species and their distribution, without labelling. In figure 2, overlaid PCA images are superimposed on a white light micrograph. The green regions make up the bulk of the mapped area. According to the PCA loadings, they represent protein and lipid presence. The red regions represent lipid domains, where levels of protein presence are relatively low. The yellow domains are especially rich in protein of α-helix secondary structure and amino acids. The cyan regions correspond to the collagen rich region which correlates to the outer cuticle of the nematode. The magenta regions represent myoglobin presence.

For further information on Raman Spectroscopy visit www.renishaw.com/raman

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