Fourier-Transform Infrared (FTIR) microscopic imaging of a whole organism

Alison J. Hobro and Bernhard Lendl

Institute of Chemical Technologies and Analytics, Vienna University of Technology,
Getreidemarkt 9/164-AC, A-1060 Vienna, Austria

Nematodes are one of the most populous animals on the planet and occupy all biotic environments on earth. While some species are not harmful to humans or human interests (such as agriculture, livestock etc), some can be beneficial (eating pest larvae in gardens, for example) and many species are parasitic to both animals and plants. Therefore, accurate identification of nematode species is important in such diverse spheres as agriculture and clinical medicine.

Currently, the majority of nematode species identification is performed using a range of molecular biology techniques to classify an individual based on its genome, proteome, metabolome or excreteome. Such analyses can be time consuming and labour intensive. In 2004, Ami *et al.* [1] used FTIR microscopy to measure a range of nematode species at three positions; pharynx, intestine and tail regions. They found that FTIR spectra collected from the intestine, in particular, could provide a much faster species selective identification than the conventional molecular biology based techniques. By using a FPA detector it is possible to extend such analyses by producing spectral image maps of individual nematodes for use in both species identification and for metabolic studies.

Here we present our FTIR spectroscopic studies of nematodes, focusing on the distribution of biologically relevant materials, such as proteins (an example from *Steinernema feltiae* is shown in Figure 1) and the variation in distribution for these markers between individuals of the same species and between different species. We also present multivariate cluster analyses of the IR chemical images obtained and provide an assessment of the usefulness of such chemical imaging and multivariate cluster analysis for the classification of nematode species.

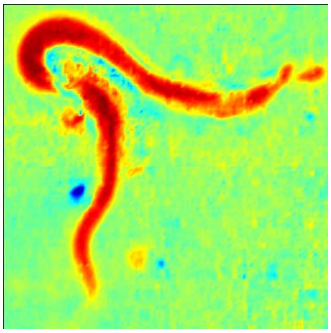

Figure 1: FTIR chemical image of the distribution of protein, as identified by the Amide I band at 1651 cm^{-1}, in an individual Steinernema feltiae nematode.

References:

[1] Ami, D. et al., Fourier transform infrared microspectroscopy as a new tool for nematode studies, *FEBS Letters* 576, 297-300 (2004).