

Raman on the Palm: Illuminating Food Security with Portable Raman Spectroscopy

Roy Goodacre

Centre for Metabolomics Research, Department of Biochemistry, Cell and Systems Biology,
Institute of Systems, Molecular and Integrative Biology, University of Liverpool, BioSciences Building, Crown St.,
Liverpool, UK, L69 7ZB

ABSTRACT:

Major food security incidents occur with startling regularity, each new event reinforcing the urgent need for better protection. The food supply chain demands vigilant capable guardians. However, currently, most of these analytical tools are bulky laboratory-based instruments that deliver results only after the fact, far away from in space and time from where issues arise.

We see a game-changing opportunity in point-and-shoot technologies based on Raman spectroscopy. These compact, handheld devices enable fast, on-site analysis, even through packaging and without harming the product or its container. This is a powerful step toward smarter, more agile food safety monitoring.

In this talk I will first highlight the need for capable guardians (sensing technologies) within the food supply chain and introduce Raman spectroscopy as an approach for non-destructive on-site analysis that generates food fingerprints. The following will exemplify our food security work in Raman spectroscopy and related techniques:

- The development of Raman spectroscopy for the detection of coconut water stretching with water disguised with sugars to keep the soluble solids contents equivalent.
- The development of surface enhanced Raman scattering (SERS) for trace detection of banned azo dyes within complex food matrices.
- Through-container analysis using handheld spatially offset Raman spectroscopy: (i) to detect the adulteration and counterfeiting of Scotch whisky, and other spirit drinks; (ii) to detect the quantitative adulteration of olive oil.
- Geographic origin of palm oil which in addition to adulteration has implications for human and drug trafficking, tax evasion and illegal deforestation.