

# *Application of Spectroscopic Methods in a Food Control and Animal Health Laboratory*

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The task of state food laboratories is the routine analysis of food samples, which are to some extent correlated to foodborne diseases. The state veterinary laboratories are engaged in diagnostics of animal illness, including zoonotic diseases, mainly from stock. The Chemical and Veterinary Investigations Office Stuttgart, integrates both laboratory parts.

Microbiological analysis in these fields comprises two main steps: enrichment / cultivation and differentiation / conformation of the obtained isolates. In a state laboratory, the cultivation step is usually performed using methods fixed in international or national standards (ISO, method collection according §64 German food and feed law). For the differentiation step, the commonly used biochemical tests (tubes, commercial miniaturized systems) were partly replaced by gene-based methods (specific PCR, sequencing), while advanced spectroscopy methods are not yet standardized. In the last decade vibrational spectroscopy techniques (FT-IR, Raman) still have an exotic status in this field while mass-spectrometry (MALDI-TOF MS) is recently attaining greater acceptance.

The introduction of FT-IR in our laboratory ten years ago, and the purchase of an MALDI-TOF MS in 2012 changed the differentiation workflow significantly: biochemical tests as well as some species specific PCRs were replaced by MALDI-TOF MS. We now use FT-IR if

- the specificity of MS is insufficient for the target bacteria (e.g. *Bacillus cereus*, *Listeria*),
- additional information about pathogenicity has to be maintained (e.g. emetic *B. cereus*, ail-positive *Yersinia enterocolitica* [1]), or
- a chain of infection is investigated (foodborne disease [2], immunization failure).

On rare occasions we have used FT-IR to support the description of new species [3], or to perform prevalence studies [4].

Two examples visualize the potential of the combination of FT-IR with other methods routinely used in our laboratory:

- an actual foodborne outbreak caused by *Staphylococcus aureus* toxin, and
- a study of caseous lymphadenitis in game, a rare disease caused by *Corynebacterium ulcerans* – a bacterial species linked with human diphtheria [5].

By combination of MALDI-TOF MS and FT-IR microbiological diagnosis improved on a level of both, rapidity and reliability, that was not accessible with usual standard tools. This opens many options for application in routine microbiology, notably under the aspect of very limited research resources.

## References:

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