Classification of meat lactobacilli by FT-IR spectroscopy

Astrid Oust, Carolin Kirschner, Kristine Naterstad, Trond Møretrø, Achim Kohler

MATFORSK, Norwegian Food Research Institute, Osloveien 1, N-1430 Ås, Norway

Rapid and reliable identification and characterisation of lactic acid bacteria is an important task, since these microorganisms are widely used in processes in the food industry. In this study, 32 lactobacilli strains, comprising 3 species, were analysed with FT-IR spectroscopy for classification and identification purposes. The results show that the method, in combination with multivariate statistical analysis, can be used to clearly differentiate between the 3 lactobacilli species, *Lactobacillus sakei*, *L. plantarum* and *L. curvatus*. When hierarchical cluster analysis was used to analyse the data, using spectral ranges from the mixed region, the polysaccharide and the true fingerprint region (1400-1200/ 1200-900/900-700 cm^{-1}), only one strain, *L. curvatus* NCIB 2749, grouped with strains from another species. The same spectral regions were also used to calculate principal components analysis (PCA) models for soft independent modelling of class analogy (SIMCA). In the SIMCA classification, only *L. curvatus* NCIB2749 was misclassified.

From the literature, it is known that when FT-IR spectroscopy is used for classification of microorganisms, it is important to use highly standardised growth conditions in order to obtain reproducible results. To test the robustness of the technique for classification of lactic acid bacteria, the growth temperature, growth time, the accesses to oxygen and the growth medium were systematically varied. The results showed that a change in the growth temperature, growth time and from aerobic to anaerobic conditions gave rise to only minor changes in the spectra. A change in the growth medium, however, led to large changes in the spectra.

Some *L. sakei* strains produce sakacin, which is a peptide. Since sakacin can be used to prevent growth of phatogenic microorganisms, for example *Listeria monocytogenes*, in food, it is important to know which organisms produce sakacin. 3 of the strains in this study produced sakacin P, while 3 strains produced sakacin A. By use of variable selection methods, it was possible to differentiate between sakacin P producing and non-producing strains. However, it was not possible to differentiate between sakacin A producing and non-producing strains. These results indicate that FT-IR spectroscopy can be used to screen for sakacin P producing strains.