

The Research Group

Industrial Microbiology and Food Biotechnology (IMDO)

has the honour to invite you to the public defence of the PhD thesis of

ing. ir. Wim GEERAERTS

to obtain the degree of Doctor of Bioengineering Sciences

Title of the PhD thesis:

Mapping bacterial communities and volatiles associated with meat, meat products, and their alternatives in the Belgian retail

Promotor:

Prof. Dr. ir. Frédéric Leroy

The defence will take place on

Friday, February 14, 2020 at 17:00 h

in Auditorium D0.05 at the Campus Etterbeek of the Vrije Universiteit Brussel, Pleinlaan 2, 1050 Elsene, and will be followed by a reception.

Members of the jury

Prof. Dr. ir. W. VERSÉES (VUB, chairman)
Prof. Dr. ir. W. DE MALSCHE (VUB, secretary)
Prof. Dr. ir. F. LEROY (VUB, promotor)
Prof. Dr. B. POT (VUB, Yakult)
Prof. Dr. ir. S. EELTINK (VUB)
Prof. Dr. ir. G. VLAEMYNCK (ILVO)
Prof. Dr. J. LEISNER (Copenhagen University, Denmark)

Curriculum vitae

Wim Geeraerts was born on September 23, 1988 in Vilvoorde. He graduated at the Koninklijk Atheneum Grimbergen in 2006 and then obtained a Professional Bachelor in Environmental Care in 2009 (Erasmus Hogeschool), a Master in Industrial Engineering in 2011 (Thomas More Hogeschool), and a Master of Science in Bioscience Engineering in 2013 (Ghent University). In April 2014, he started a PhD at the Research Group IMDO under the supervision of Prof. Dr. ir. Frédéric Leroy, during which he (co-)authored a book chapter and six peer-reviewed articles in international journals (five as first author). He won a first poster prize at the *International Congress of Meat Science and Technology* in 2015 (Clermont-Ferrand, France) and gave three oral and four poster presentations at (inter)national conferences.

Abstract of the PhD research

Meat and meat products harbour various bacterial communities. Despite available preservation techniques, such as packaging and chilling, they are still at risk of bacterial spoilage, which can manifest itself under different forms, including the production of unwanted volatiles.

In a first phase of the present study, the bacterial communities of distinct types of meat (products) and their plant- or insect-based alternatives in the Belgian retail were analysed at expiration date. Fresh meats and their derived products (based on pork, poultry, or equine meat) mainly contained specific species of carnobacteria, lactobacilli, and leuconostocs among the prevailing communities, besides some catalase-positive cocci, Enterobacterales, *Brochothrix thermosphacta*, and others. Overall, the bacterial load and species diversity varied considerably, which depended on the production facility, the meat type, the sample pH, and the addition of additives and/or preservatives. Vegan and vegetarian alternatives often had very low bacterial loads, although some of them contained considerable numbers of lactic acid bacteria, including enterococci. It was shown that insect products could also contain abundant levels of enterococci.

In a second phase, selected ion flow tube-mass spectrometry (SIFT-MS) was applied to continuously follow the production of volatiles during the storage of cooked meat products under three different temperature conditions. Experiments were started at eight days prior to the expiration date and analysed up to eight days after the expiration date. When the samples were analysed microbiologically, lactic acid bacteria and Enterobacterales were found. Several volatiles increased over time, more specifically 1-octen-3-ol, 2,3-butanediol, acetoin, benzaldehyde, ethanol, and methylbutanol. Differences were seen based on storage temperature and experimental duration.

To conclude, the present PhD research has contributed to a better view on the bacterial communities that prevail in a range of meats and meat products, as well as their plant- or insect-based alternatives. Also, the potential of SIFT-MS to investigate spoilage phenomena was explored, in particular with respect to the identification and monitoring of biomarker volatiles. Taken together, the knowledge obtained is valuable in view of a better understanding of and, therefore, control over food microbiota, for instance with respect to the development of bioprotective cultures or the adjustment of food processing conditions.