

**INTERNATIONAL COMMITTEE ON FOOD MICROBIOLOGY AND
HYGIENE (ICFMH)**

WPAEFM symposia

Food microbiology education in practice

Chair: Peter Raspor (Slovenia), Catherine Magras (France) and Sara Malherbe (France).

Session: **14,00-18,00**

14,00-15,15

1. Teaching Food Microbiology: Staff innovation and Student Engagement

Opening lecture by Joanna Verran FEMS, UK

2. Breaking traditional rules in teaching food microbiology: Case Veterinarian university Vienna. By Martin Wagner et al. (Austria)

3. Food microbiology in Life Sciences: Good educational practice in the Netherlands. Food microbiology in the Food Safety program. by H.M.W. den Besten, et.al; (The Netherlands)

Coffee BRAKE

15,15-16,30

4. Integration of microbiology teaching into problem based population medicine cases. From theory to clinical practice. By Aurélien MADOUASSE et al.(France).

5. Food microbiology in Food technology: Good educational practice in Denmark by Susane Knochel, et al., (Denmark)

6. The impact on food microbiology education: Experiences from projects and networks, by Peter Raspor et al. (Slovenia)

Coffee BRAKE

16,30-16,45

Round table

16,45-17,45

Round table discussion with the lecture presenters:

Food microbiology education: Where the innovation is needed?

Moderator Peter Raspor

17,45-18,00

Establishment of network of food microbiology educators

Teaching Food Microbiology: Staff innovation and Student Engagement

Joanna Verran, School of Healthcare Science, Manchester Metropolitan University, UK, and FEMS Member-at-large for Microbiology Education

Knowledge of the principles of food microbiology and hygiene is essential for everyone, not just students. Of course, the message and the level of information will vary depending on the audience – the ‘general public’, students at schools and colleges, undergraduate and postgraduate students, whether full-time or part-time (practitioners?), and academic peers.

The aim of this presentation is to provide an overview of examples of innovations and explorations in food microbiology education, to a range of audiences.

In one exercise, first year undergraduate microbiologists are encouraged to utilise the additional skills they bring to University, by producing a creative output which illustrates some aspects of microbiology. These have included teaching materials, artwork, photography, models, baking – all outputs being required to demonstrate the underpinning microbiology. The benefits to students are significant: recognition of their portfolio of skills, the importance of microbiology in the world, the value of science communication, and presentations and publications where their work is displayed.

Higher level students encounter more formal aspects of food microbiology education. Critical discussion is encouraged by using ‘emerging disease’ as a tutorial topic. Why do we have some diseases now which were absent previously? How does the incidence of food-borne illness change over time? The rapidly changing field of disease epidemiology encourages students to ensure that their studies remain current!

Our research interests focus on the interactions between microorganisms and inert (hygienic) surfaces, specifically assessing the properties of the surfaces which affect microbial adhesion and retention. Among other exercises, we have developed practicals where undergraduates compare the retention of microorganisms on different kitchen surfaces, and explain the reasons for any differences.

Final year undergraduate research project students work alongside our PhS students exploring aspects such as the effect of food soil on hygiene and cleanability. Students who have an interest in teaching post-graduation have worked on research projects developing learning exercises and materials for schools, such as prevention of yoghurt formation using bacteriophage.

We have translated some of our work into activities to inform the general public about microbiology: the Bad Bugs Bookclub (www.sci-eng.mmu.ac.uk/badbugsbookclub) comprises microbiologists and non-microbiologists who read and discuss novels where infectious disease (including foodborne illness) forms part of the plot. At Science Festivals, we encourage members of the public to consider hand hygiene using agar handprints and fluorescent dye to demonstrate transmission of infection.

All of these activities provide key messages relating to food safety; all have specific aims and measurable objectives – evaluation of the success of the activities is important, as is the appropriateness of the message to the target audience, and the commitment of the educators. It is hoped that some of the examples provided in the presentation will give ideas and points for discussion to delegates.

Breaking traditional rules in teaching food microbiology: Case University of Veterinary Medicine Vienna.

Martin Wagner*

Institute for Milk Hygiene, Milk Technology and Food Science, Veterinärplatz 1, 1210 Vienna

*Corresponding author: E-mail: Martin.Wagner@vetmeduni.ac.at

Education in food science has always been a multidisciplinary duty that has been shared among different academic institutions. In Vienna, mainly the Agricultural University (BOKU) and the University of Veterinary Medicine (VUW) offer undergraduate education in this field. Both universities train approximately 200 individuals per year in food science. Food chemistry is matter of teaching at the University of Vienna and subjects complementary to food science such as human nutrition are offered at this institution as well. Human nutrition has been a favorite study in the recent years with more than 2000 student being enrolled. A more recent development is the establishment of colleges of higher education (Fachhochschulen) in many federal states. Fachhochschulen were established to train small groups of students at a very practical level, frequently in an extra-occupational fashion. Due to the practical orientation and the less amount of research being performed, Fachhochschulen are currently not allowed to enroll students in postgraduate PhD programs. Fachhochschulen, however, are seeking their future and claim incrementally to be research-driven establishments of education. The diversification in the teaching area has resulted in a situation that more and more establishments across the whole country offer training in food science and safety and one could query if the job market is capable of absorbing all human resource that is currently going to be trained. Opposite to this trend, the University for Veterinary Medicine envisages problems to inspire students for specialization in food science. Due to the general trend at veterinary academic sites of training predominately female students, many of them inspired by animal-care attitudes rather than interest in agricultural subjects, food science suffers from less recognition among the students. Recruitment of young individuals for veterinary public health could be further jeopardized by the fact that app. 50% of the students at VUW are non-Austrian citizens, many of them leaving the country after having accomplished their study. To overcome these bottlenecks, a novel study plan focuses on amalgamating food science with animal disease prevention including applied pharmacology and veterinary legislation. The modular training aims at making the segment of veterinary public health more visible to study beginners since plentiful of students do not know to which field to specialize at the beginning of their study. Getting veterinary students involved into food science is of relevance since about one-sixth of the veterinarians at labor work in the field of veterinary public health.

Food microbiology in Life Sciences: Good educational practice in the Netherlands.
[Food microbiology in the Food Safety program]

H.M.W. den Besten, M.H. Zwietering
Food Microbiology, Wageningen University, PO Box 17, 6700 AA, Wageningen, The
Netherlands. Tel -31-317-483213. Heidy.denBesten@wur.nl.

Wageningen University works in the domain “quality of life” and Food Microbiology is a clear exponent of this domain. Both the negative sides of life, illness and mortality due to pathogens, effects of spoilage on sustainability and food security, and positive effects of microorganisms in fermented products fit well within this domain. In our education programs we teach our students in gaining knowledge, being practically strong, and having a critical attitude. Our programs can be characterised as being solid, by first having disciplinary courses, which are supported by a large amount of practical classes. Then students follow more integrated courses, where they learn from a broad range of disciplines within one and the same course, and apply their obtained knowledge in project oriented group assignments. Finally they finish their study with a master thesis and an internship, in which they perform research and learn to critically reflect on their research activities and work in a professional environment.

Keywords: Food Technology, Food Safety, Biotechnology, integrated courses, from discipline to application

Integration of microbiology teaching into problem based population medicine cases. From theory to clinical practice.

¹Aurélien MADOUASSE*, ²Valérie Anthoine, ²Sandrine Rezé, ¹Nathalie Bareille, ²Catherine MAGRAS

¹LUNAM, Oniris, UMR1300 INRA, Atlanpole La Chantrerie, CS40706, 44307 Nantes, Fr

²LUNAM, Oniris, UMR1014 INRA, Atlanpole La Chantrerie, CS40706, 44307 Nantes, Fr

*Corresponding author: E-mail: aurelien.madouasse@oniris-nantes.fr

For farm animal veterinarians, who are in charge of both animal health and food safety, daily clinical practice requires the identification of disease causing bacteria. It is therefore important for veterinary students to understand the bases of sampling, carrying out the analysis and interpreting microbiological analysis results. To this end, microbiological teaching has been integrated into a population medicine rotation for 4th year veterinary students. Mastitis has been chosen because it is a very common disease that can impact milk processing and food safety. Mastitis is also interesting to teach basic epidemiology to students because there are 2 well characterised epidemiological models associated with the disease. Within the contagious model, infection is associated with the persistence of bacteria in the infected mammary glands and infected quarters serve as the reservoir for the infection of healthy quarters. The most representative bacterium of this category is *Streptococcus agalactiae* which is an obligate parasite of the mammary gland. However, as they can only survive in the mammary gland, these bacteria have been eradicated from the majority of French dairy herds. The most frequently isolated agent of contagious mastitis is now staphylococcus among which *S. aureus* is the leading cause. Coagulase negative staphylococci, although frequent, only result in mild inflammations. Within the environmental model the reservoir of infection is the environment that favours the development of bacteria. The most frequently encountered groups of bacteria associated with these infections are enterobacteriaceae and streptococci. At the start of the rotation, theoretical background is provided to students. This involves small group teaching sessions covering the bases of bacteriology including milk sampling, evaluation of sample quality and plate streaking, and, mastitis epidemiology. Two groups of 8 students are then assigned one dairy herd with mastitis problems each. An initial visit with a teacher is used to meet the farmer, understand the farming system and collect information in order to determine the mastitis epidemiological model(s). After having determined the likely model(s), a second visit is carried out to collect milk samples for bacteriological analyses and to gather data on risk factors. Finally, a report is written for each farm summarising the diagnosis in terms of epidemiological(s) model and etiologic agent(s), risk factors identified and recommendations. Each rotation is supervised by 3 lecturers. Emphasis is put on clinical reasoning and student autonomy. By integrating microbiological teaching into a real life problem solving situation, it is possible to make students reflect upon the choice of individuals to sample in light of their clinical hypotheses, the importance of taking aseptic samples, the interpretation of results, the interests and limits of antibiograms to adapt treatments. Having 2 small groups in parallel allows students to see different situations and facilitates interactions between students and between students, teachers and technicians.

Food microbiology in Food technology: Good educational practice in Denmark

Susanne Knøchel* and Henrik Siegumfeldt

University of Copenhagen, Faculty of Science, Department of Food Science, Frederiksberg C, Denmark

* Corresponding author: E-mail: skn@food.ku.dk, Phone: +45 353 333258

Food Microbiology started in Denmark as part of the curriculum for veterinarians, dairy engineers (since 1921), and Food Scientists (since 1971) at The Royal Veterinary and Agricultural University (now part of University of Copenhagen). In 2006 it became possible to specialize in Food Safety. In 2011 the Brewing Master education was integrated. The food microbiology area has expanded and diversified over the years to a broad coverage encompassing microbial food safety and spoilage, fermentations, bioprotection, and probiotics. The educations are modular with some freedom of choice but each Master program or specialization has a set of core courses. Courses are typically 7.5 ECTS corresponding to 1/8 of a year's study. At the bachelor level in Food science and Technology a basic *Microbiology* and a *Food Microbiology* course are given providing theoretical and practical insight in identification w. traditional and molecular methods, taxonomy, growth and physiology, role in safety, production and health etc. At the master level most will be introduced to the principles behind legislation as well as safety management systems incl. HACCP and ISO in the course *International Food Legislation and Quality Management*. Depending on the programme students can choose microbiology containing courses such as: *Applied Cool Climate Viticulture and Enology*, *Beverage Technology*, *Brewing 1+2*, *Control of Foodborne Microorganisms*, *Dairy Microbiology*, *Hygiene and Sanitation*, *Microbiology of Fermented Food and Beverages*, *Yeast Physiology and Applications*, *Thematic Course: Microbiological and Chemical Food Safety*, and *Risk Analysis in Food Safety*. Some courses are given in collaboration with other universities and most courses will have several lecturers from the industry. There is generally emphasis on group work, written reports and oral presentations as well as the ability to translate theory into operational practises. Examples will be given.

Keywords: education, curriculum, food microbiology

The impact on food microbiology education: Experiences from projects and networks

Peter Raspor^{1*}, Daniela Borda², Avrelija Cencič³, Wolfgang Kneifel⁴, Anna Maraz⁵, Sonja Smole Možina⁶

¹University of Primorska, Faculty of Health Sciences, Polje 42, Izola, SI; ²"Dunărea de Jos" University of Galați, Faculty of Food Science and Engineering, RO; ³University of Maribor, Faculty of Agriculture and Life Sciences, Pivola 10, Hoče, SI; BOKU – University of Natural Resources and Life Sciences, Muthgasse 18, Vienna, AT; ⁵Corvinus University of Budapest, Faculty of Food Science, Somloi ut 14-16, HU; ⁶Univerza v Ljubljani, Biotehniška fakulteta, Jamnikarjeva 101, Ljubljana, SI

*Corresponding author: E-mail: peter.raspor@fvz.upr.si

In the last years we experienced several cooperation possibilities on bilateral and multilateral level, through European and global projects. Among the successfully managed projects classical pre-determined as well as spontaneously organized projects can be found based on devotion to teaching and willingness to disseminate knowledge and skills among those prepared to listen and learn. In these activities nationally and internationally linked students were involved in winter and summer schools. Students were exposed to broad knowledge perspective by the invited lectures who stirred their critical and problem solving thinking. We have excited their creativity with seminars and open discussions and also we introduced several web-based workshops. During 20 years of experience excellent teachers were grown up through this approach. If we select few cases as illustration of approach we have to realize that cooperation is the key principle. There were some ERASMUS and CEEPUS summer and winter schools, which were focused on general safety issues rather than on microbiology. We can illustrate success with overseas project like Atlantis, which also added a cultural dimension to teaching and knowledge transfer. In Tu_Be_Safe Consortium - Tuning and Upgrading the Food Safety Education Curricula for Bachelor of Science – the two European partners that won the project competition in 2010 engaged in various educational activities related to food safety for the benefit of students, academia and industry. Among several successful examples, the international Master programme Safety in the Food Chain ("SIFC", a joint initiative among BOKU University, University members of the Euroleague of Life Science and in collaboration with Ljubljana University) has to be mentioned. As a two-years curriculum it educates experts in Food Safety on a global perspective. Graduates may find key positions in the Food Safety area, like in food production and marketing, product development, food safety management, governmental and non-governmental institutions, consumer organisations and scientific panels. Our common activities started as early as in the last century and have resulted in projects on a mutual basis dealing with education of students and research activities. Research has been mainly focused on microbiology, on models for studies of beneficial microbe or pathogen interactions with the host. Most of the work has been related to encouragement of youth potential devoted to research and innovative development. If we make balance and evaluate the progress in the area of food microbiology education, we can see many challenges which are still stimulating us to continue the development of teaching methods to transfer not just knowledge and skills but also experiences from our generation to the next generations. New methods, new tools, new machines, new ways of thinking and last but not least old problems in new dressing require some innovative approaches in research as well as in education. Nature is going its own way. So there is no doubt that a »**FoodMicro Teacher**« will have to tailor its educational tools for the new generations and find a proper balance between research and pedagogical work.

Key words: food microbiology, food safety, curricula, competencies, education, internship