

Education Development Fund report

Micro-organisms and the safety and stability of foods: an electronic teaching resource for food microbiology

■ Alan Varnam

The philosophy and methodology of higher education teaching and learning are subject to constant flux. Changes are driven by many factors, including the outlook and aspirations of students, the needs of employers, increased quantities of data within the body of knowledge underpinning teaching and changes in the technology available for delivery of course material. One of the important consequences of change is the continuing development of new courses which may combine elements of several conventional disciplines. These include a large number of food-related courses at both undergraduate and graduate level.

Microbiology is recognized as being of fundamental importance in food science and other food-related courses. The need for students to understand the relationships between micro-organisms and food extends beyond direct teaching of food microbiology to other courses, such as technology and product development. In many cases, teaching includes problem-solving and similar student-based exercises that require application of microbiological knowledge to concerns of safety and spoilage. There are inherent difficulties where the nature of the course means that underlying student microbiological knowledge is limited. In 'real-world' exercises, inherent difficulties can be compounded by problems of obtaining relevant data. These problems can affect teaching at both undergraduate and graduate level.

The Department of Health and Human Sciences at London Metropolitan University teaches a number of food-related courses, including BSc Food Science, Food and Consumer Science and MSc Food Science. The microbiological safety and stability of foods is a common feature and knowledge of hazards and options for control is required at various levels across the range of teaching. Difficulties in identifying hazards and control cause problems. Discussions with students suggested that a custom-designed database providing information about the micro-organisms associated with different types of food would be of considerable value. At the same time, a predictive model for major spoilage organisms was developed by Dr Jane Sutherland and collaborators in a European Union-funded project. There was obvious potential synergy between the database, as a means of identifying micro-organisms likely to be present, and the predictive model for determining the probable extent of their growth. After much thought and many doubts, it was decided to develop an electronic resource combining the database and predictive model.

The resource developed is based on Microsoft Office software. The initial design comprised the original two components, the database and the predictive model entered through a 'home page'. Having made the decision to develop the resource, further thought was given to its functional use. It had been noted in earlier teaching that some students encountering micro-organisms in a problem-solving context showed a natural inclination to learn more. An extra element was therefore added to the resource: illustrated text files that provide supplementary information concerning the major food-borne pathogens and spoilage micro-organisms.

The database is in MS Access and consists of two components. The first is a file of approximately 100 food commodities listing hazards, probable spoilage microflora and microbiological standards. Alerts are included warning of possible new problems and notes supply additional information. The second file comprises food-borne micro-organisms, their basic properties and control options.

The predictive model is constructed in MS Excel and incorporates yeast, *Bacillus* spp., lactic acid bacteria, *Enterobacteriaceae*, pseudomonads and *Brochothrix thermosphacta*. The output is displayed graphically, ensuring that students work for their predictions!

The resource also includes guidance notes for users and an empty MS Excel file titled 'My results'. This file is primarily intended for use in laboratory classes.

There is considerable flexibility in how the 'functional' parts of the programme are used in exercises. Any part can be used individually, but a very effective approach is to use the database to identify potential problems. Once identified the predictive model can be used to ensure product stability and that shelf life requirements are met. At this stage, or at any other time, the student can learn more about individual micro-organisms from the text files. These are designed to be read at different levels according to student background, but are not intended as an electronic textbook, the general thrust being to target specific points of direct relevance to the database.

The resource has been well received by students, although it is currently undergoing more extensive evaluation. Beyond the immediate aims, other learning benefits, including enhanced interpretational ability and greater confidence in use of complex data are apparent.

The resource was developed with the aid of an Education Development grant from the SGM. Naaema Jawaid, an undergraduate student studying Biochemistry at London Metropolitan worked on the project and played a major role in its development.

■ **Dr Alan Varnam, Department of Health and Human Sciences, Food Microbiology Unit, London Metropolitan University, North Campus, 166-220 Holloway Road, Holloway, London N7 8DB, UK.**
Tel. 0207 133 2524; Fax 0207 133 2571
email a.varnam@londonmet.ac.uk

This fund supports developments likely to lead to an improvement in the teaching of any aspect of microbiology relevant to secondary or tertiary (including postgraduate) education in the UK. For full details of the rules and an application form see the SGM website.