

## EIBE biotechnology units

This set of teaching materials for biotechnology was devised by members of the European Initiative for Biotechnology Education (EIBE), a group of practising teachers and educationalists drawn from 20 centres in 17 European countries. The materials consist of 19 units that cover many aspects of biotechnology and have been extensively tested in a variety of teaching applications.

Although intended principally for the 16-19 age group and for initial teacher training, there is also much that can be used with younger students. The range of activities used, including practical investigations, role play, debates and drama, all supported by extensive background information, enables the units to be used in a variety of teaching situations. The presentation of the units in both English and several other European languages provides added opportunities for use in language teaching.

### 1: Microbes and molecules

A wide collection of practical activities for a range of levels of courses in microbiology and DNA technology with detailed protocols and additional information on the various topics. Involves making cut-out models, DNA extraction, enzyme production, monitoring microbial activity and gene transfer.

### 2: DNA profiling

Information and discussion questions about DNA fingerprinting and DNA profiling and their applications, designed to stimulate debate in the classroom. A practical activity using DNA gel electrophoresis forms the basis for a simulation exercise of DNA fingerprinting.

### 3: Biscuits and biotechnology

A series of activities on two aspects of the use of biotechnology in the food industry, i.e. biscuit production and novel sweeteners. Includes background information, question cards for a quiz, a tasting activity, a biscuit recipe and two laboratory activities using industrial enzymes.

### 4: Issues in human genetics

A role-play exercise to inform students and stimulate debate

- The EIBE project was funded by the European Commission.
- The units may be down-loaded from [www.eibe.info](http://www.eibe.info).
- These summary notes were prepared by Dr John Grainger, Chairman of MiSAC. He was closely involved in the formation of EIBE when he was Director of the National Centre for Biotechnology Education at The University of Reading and also served as a member of the EIBE Management Group.



about the genetic disorders cystic fibrosis, Duchenne muscular dystrophy and Huntington's disease, and other inherited conditions. Students adopt the role of potential parents who are carriers of inherited genetic conditions.

### 5: Fermentation

The role of fermentation technology in the production of food, beverages and pharmaceuticals, including historical aspects of biotechnology and laboratory research and development. The modular structure provides access to illustrations, animations, video sequences and self-assessment questions.

### 6: DNA model kit

An instruction manual for a two-dimensional model kit designed to aid learning and understanding about the structure and replication of DNA and the transcription of DNA to RNA. [Note: The model kit is no longer available.]

### 7: Human genetics: debate on a personal dilemma

A debate game to generate discussion on the use of genetic modification technology on people and embryos. The game is

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placed in the future, enabling the data, issues and input to be a mixture of fact and also fiction based on informed projection of scientific and technological developments.

## 8: Practical immunology

Three practical activities using two enzyme-linked immunosorbent assay (ELISA) tests (for an infection of pigs by the bacterium *Bordetella* and the pelargonium flower break (PFB) virus) and a double immuno-diffusion test (for egg albumin in foods). An ELISA kit using an animal system is available from Bio-Rad; [www.bio-rad.com](http://www.bio-rad.com).

## 9: Transgenic plants I

Information on transgenic plants and their use including scientific principles and technology, field trials, risk assessment, regulations, case studies of oilseed rape, maize, tomatoes and soya, potential and problems, and a questionnaire evaluation of students' understanding of the concepts involved.

## 10: Transgenic plants II

A decision-making exercise in role-play or debate form involving problem-solving techniques. Economic, moral and social questions and an appreciation of basic techniques for developing and exploiting transgenic plants are raised when a local firm proposes to produce transgenic plants.

## 11: Transgenic animals

An outline of the techniques used to transfer genes in animals and information for considering some of the implications through classroom discussion or role-play. The topics are transgenic mice in medical research, transgenic salmon for food and transgenic animals for producing pharmaceuticals.

## 12: A model European Council

A framework for a simulated meeting of the Council of Ministers of the European Union in which the social, political and ethical issues raised by pre-implantation diagnosis of inherited genetic disorders are put forward from the points of view of different countries.

## 14\*: The Human Genome Project

Background information, worksheets and accounts of experimental work for gaining basic knowledge about the early stages of the Human Genome Project and the methods used for mapping and sequencing a genome, and for considering possible advantages and social-ethical implications.

## 15: Biotechnology in developing countries

A set of materials designed to provide information and ideas on the impact of the introduction of genetically modified crops to

developing countries and the consequences to their relationship with industrialised countries. The example of rice is used to consider the benefits and who might gain from them.

## 16: Biotechnology and the environment

Aspects of environmental biotechnology involving theory, laboratory and field work, case studies and discussion are underpinned by considering the C, N and S cycles. Issues addressed cover detection, prevention and remediation, using air pollution, plant gene technology and oil pollution as examples.

## 17: Biotechnology past and present

Reference material for teaching the history of biotechnology from its ancient origins to the present day. Case studies on the historical, scientific and economic aspects of making bread, supplying clean water and producing penicillin. There is also a cartoon on yeast, suitable for young students.

## 18: The EIBE family

Instructions for the use of an inexpensive laboratory kit involving restriction enzymes and gel electrophoresis in DNA analysis. The results are used in a simulated genetic screening for an inherited genetic condition in a fictitious EIBE family and an ethical discussion. The kit is available from NCBE; [www.ncbe.reading.ac.uk](http://www.ncbe.reading.ac.uk).

## 19: Biotechnology education through drama

Guidance on aims, objectives and evaluation of using drama in education with practical details on planning and directing a production. An example is given of a student production about genetic modification made with the object of closing the communication gap between science and society.

## 20: The enzyme game

A board game devised to introduce players to the various factors involved in optimising the commercial production and use of industrial enzymes. The board, 8 enzyme data sheets, sets of chance, production and utilisation cards, spinner discs and currency are provided ready to print.

*Also of interest: Teaching Biotechnology at School: a European Perspective (2000). Eds H. Bayrhuber, W. Garvin & J Grainger. IPN, Kiel, Germany. ISBN 3-89088-137-8.*



\* Please note that there is no unit 13.