AFSIS MOLECULAR BIOLOGY SHORT COURSES

Course Overviews

Course 1:

Detection of Foodborne Pathogens Using Nucleic Acid-based Techniques,

September 9-12, 2004

Course 2:

Contemporary Molecular Biology Techniques,

October 27-November 2, 2004

Course 3:

Polymerase Chain Reaction (PCR)

December 3-7, 2004

Further Information

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I. Introduction

Molecular biology is a relatively new scientific discipline that has revolutionized research in the life sciences.

Molecular biology provides some answers to enduring questions in the biological sciences, such as the transfer mechanism whereby genetic information passes from one generation to the next. It also provides the necessary tools to approach and answer such questions. Researchers in human or veterinary medicine, biology, botany, microbiology and biotechnology have all benefited from this emerging revolution.

The milestones of molecular biology, outlined below, set out key advances in the discipline, which has been established in a relatively short time:

1954: The double helix model, describing the structure of the DNA molecule, is identified by Frances Crick and James Watson.

1970s: Restriction endonucleases, ligases and other enzymes are purified and their function determined. This leads to the idea of the "cloning" of DNA molecules.

1985: Polymerase Chain Reaction (PCR), a method for *in vitro* synthesis of DNA molecules is invented.

1990s: The "sequencing" decade (ongoing…). The process of defining the sequence of the human genome has resulted in an unprecedented improvement in dedicated equipment and supplies for molecular biology researchers. It has also seen the dawn of the genomics and proteomics era in molecular biology. The number of organisms whose genome sequence has been defined, is increasing rapidly. The information gained is changing the way research is now performed.

Molecular Biology Tools

The tools of molecular biology in a sense mimic processes in nature. To be able to apply these tools in a laboratory environment, a good understanding of the theory behind them is required. Participants are advised to prepare themselves by refreshing their reading of overview texts on the development and theory of molecular biology.

Purpose of the Courses

The Molecular Biology Short Courses offered by AFSIS have dual purposes:

- familiarize participants with or refresh the basic knowledge that leads to the understanding of the theory and mechanisms behind Molecular Biology research tools
- acquaint participants with the application of the Molecular Biology methods in the laboratory.

This second purpose has, in turn, two aspects:

A. participants learn how to set up and equip a laboratory designed to employ Molecular Biology methods

B. participants gain intensive hands on experience, by applying these methods in a laboratory that already routinely performs such techniques.

The core course was first given in 2003 as part of a European Union sponsored program for capacity building in candidate member countries[1]. Its success with participants has led to the development of this suite of short courses.

II. Participants

The short courses are addressed to biologists, chemists, medical doctors, veterinarians, food scientists, microbiologists and graduates of other disciplines with a background in physical chemistry, biochemistry and biology.

Participants will acquire basic knowledge of the theory of molecular biology techniques and experience of applying these techniques in various laboratory environments, such as:

- medical microbiology (for diagnostic purposes)
- food analysis (food safety and quality control purposes),
- environmental microbiology
- plant pathology.

III. Location and Facilities

The short courses will take place in the Department of Food Science, University of Udine, Italy. For the practical and hands-on elements of the program, participants will enjoy full use of the state of the art Food Microbiology Laboratory. The laboratory has all the necessary equipment and consumables for the application of Molecular Biology protocols, which it has been performing for the past 10 years.

IV. Instructors

Dr. Luca Cocolin, BS Food Science, PhD Food Biotechnology (Udine), is currently, Assistant Professor, University of Udine.

Dr. Kalliopi Rantsiou, BS Biology (Athens, Greece) PhD Food Science (University of California, Davis) is a consultant with EBTE Consultants, Ltd., Athens.

V. Language

Courses are taught in English.

[1] EU INCO project, reference ICA4-CT-2002-10037

AFSIS: MOLECULAR BIOLOGY TECHNIQUES

HANDS-ON SHORT COURSES FOR LABORATORY PROFESSIONALS

Food Microbiology Laboratory, *University of Udine, Italy*

Instructors: *Dr. Luca Cocolin, PhD, Food Microbiologist*
Dr. Kalliopi Rantsiou, PhD, Biologist

In three short, intensive, hands-on courses, taught in English, learn to set up and use a laboratory using molecular biology techniques.

Courses

1. September 9-12, 2004: **Detection and Identification of Foodborne Pathogens Using Nucleic-acid Techniques (4 days)**
   - Theory and methodology
   - The application of molecular methods to the sample
   - Standard analysis of food samples
   - Sample preparation
   - Interpretation of results
   - Protocols
   - Hands-on practice, under supervision

   Course Fee: €1,500.00 (one thousand five hundred Euros)
   Participants: 10

2. October 27-November 2, 2004: **Contemporary Molecular Biology Techniques (7 days)**
   - Sample handling
   - Enzymes – *in vivo* and *in vitro*
   - Electrophoresis
   - Cloning
   - Sequencing
   - PCR
   - Laboratory procedures
   - Hands-on practice, under supervision

   Course Fee: €2,000.00 (two thousand Euros)
   Participants: 10

3. December 3-7, 2004: **Polymerase Chain Reaction (PCR) (5 days)**
   - Theory and applications of PCR
   - Protocols
   - Equipment, reagents and procedures
   - Demonstration / presentation of the protocols
   - Hands-on practice, under supervision

   Course Fee: €1,700.00 (one thousand seven hundred Euros)
   Participants: 10

FEES EXCLUDE COSTS OF TRAVEL, MEALS AND LODGING.
DISCOUNTS MAY APPLY.

Detection of Foodborne Pathogens Using Nucleic Acid-based Techniques

Laboratory-based Short Course (1)

Course Duration: 4 days **Maximum Class Size:** 10

Overview

This specialised course focuses on the application of nucleic acid-based techniques, in particular, those used in the detection of foodborne pathogens. Participants should have a good grounding in the theory of molecular biology methods and ideally, have had experience working in a lab employing these methods. A particular interest in the food microbiology field is also an advantage.

Topics:

(i) **Theory and methodology.** A brief overview.
Course Units: 3 hours.

(ii) **Standard analysis of food samples.** Issues covered include:

(a) nature of the sample and its effect on the application of molecular methods

(b) steps during **standard analysis** of food samples at which molecular methods can be applied

(c) appropriate **sample preparation** for subsequent steps

(d) **interpretation of results** obtained and possible accompanying tests for further verification.

Course Units: 6 hours.

(iii) **Protocols.** Specific protocols for the use of molecular tools in detection of foodborne pathogens will be presented, discussed and applied. Participants will gain hands-on experience, using the protocols in the lab setting.
Course Units: 15 hours.

Contemporary Molecular Biology Techniques

Laboratory-based Short Course (2)

Course Duration: 7 days **Maximum Class Size:** 10

Topics:

(i) **Sample handling**. The segment introduces participants to a wide array of possible methods for sampling. Design, selection, handling and management of samples are the critical steps in the overall procedures of molecular methodology. The choice of specific laboratory technique determines the appropriate procedures for sampling. A key issue is the extraction of nucleic acids. Related protocols will be presented and discussed.
Course Units: 2 hours.

(ii) **Enzymes** used in molecular biology. The segment covers mechanisms of action, *in vivo* and *in vitro*, applications and appropriate modes of use as well as correct handling of enzymes.
Course Units: 2 hours.

(iii) **Electrophoresis.** The segment reviews the theory and applications of the various types of electrophoresis (mainly of nucleic acids but also of proteins).
Course Units: 2 hours.

(iv) **Cloning.** This segment introduces guidelines for cloning. The focus is on the principles of cloning, for research purposes and laboratory use. Further topics include: cloning of a DNA fragment, cloning of PCR products, library construction and methods for identification of desired clones.
Course Units: 4 hours.

(v) **Sequencing.** This segment covers different methods for the sequencing of a DNA fragment.
Course Units: 2 hours.

(vi) **PCR.** This covers the theory of the polymerase chain reaction (PCR). (Participants needing the in-depth study and practice of PCR techniques should then take Course 3 – PCR).
Course Units: 3 hours.

(vii) **Laboratory practice.** Several selected protocols will be applied in the lab, covering the subjects presented above, namely, nucleic acid extraction, cloning and PCR. The use of modifying and restriction enzymes as well as electrophoresis is part of the above processes and will be demonstrated too. Throughout the laboratory practice, participants will be actively involved in the various steps of the protocols. Total time: 20 hours.

Polymerase Chain Reaction (PCR)

Laboratory-based Short Course (3)

Course Duration: 5 days **Maximum Class Size:** 10

Topics:

(i) **Theory and applications of PCR**, including, the structure/ function/ characteristics of nucleic acids, Biochemistry of the PCR, PCR: the archetype and the variations (Reverse Transcriptase RT-PCR, Randomly Amplified Polymorphic DNA RAPD-PCR), applications in various fields of science (with specific examples), analysis following PCR.
Course units: 10 hours.

(ii) **Protocols**. General protocols will be presented, related to PCR as well as the steps preceding and following the PCR. The protocols will cover a wide range of purposes, applicable to various scientific fields.
Course units: 4 hours.

(iii) **Equipment, reagents and core procedures of a molecular biology laboratory**. This part of the course will introduce participants to various types of equipment, their characteristics and modes of use. It will present them with sources of information on equipment, reagents and a variety of support services, such as software.
Course units: 4 hours.

(iv) **Demonstration / presentation of protocols**. In this segment, partcipants work through basic protocols in the lab themselves, with demonstration, support and supervision from the instructors.
Course units: 15 hours.

(v) **Practice hands-on by participants**. This part runs in parallel to segment iv. Participants have hands-on use of equipment and reagents, and learn to apply the methods and techniques on their own.

Sponsors and Organisers

EBTE Consultants Ltd., Athens, Greece (www.ebte.gr)
AleffGroup, London, UK (www.AleffGroup.com)

Special Courses on Your Site or On Line

AFSIS will be pleased to discuss with you your needs, and can arrange to deliver such short courses on your site, or at a site of your choice, if suitably equipped and staffed.

Special Short Courses and Consulting Services

Examples of courses available from AFSIS include:

- **HACCP:** Implementation in the Food Industry
- **Food Safety:** a holistic approach for Senior Managers
- **Total Quality Management Systems** in the Food Industry, including ISO Standards.

We recommend we conduct a needs analysis with you before settling on a training program.

AFSIS is also willing to develop customised short courses, supported by consulting services, to meet your needs. Courses can be integrated into your staff training programs, and be delivered, where suitable, on line.

Certification

Courses can be certified if required.

Further Information

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