



Dairy Microbiology - DM

**Notes for the course NFOK14026U, at the University of
Copenhagen; November 2024 - January 2025**

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Link to Git repo.: https://github.com/DanishUnicorn/dmicro_notes



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Chapter 1

Course Description

1.1 Content

The course will contain lectures on:

- Raw milk microflora
- Pathogenic and spoilage microflora
- Bio-protective cultures
- Starter cultures: primary (lactic acid bacteria) and adjunct (yeasts, moulds, propionibacterium, red smear microflora, lactic acid bacteria ripening cultures) starter cultures microflora as well as adventitious microflora (non-starter lactic acid bacteria) and their role in dairy products
- Bacteriophage and bacteriophage resistance in dairy environment
- Role of starter culture physiology on growth and end products (aroma formation, proteolysis, glycolysis, amino acid catabolism)
- Guest lectures from speakers representing major starter culture producers

Laboratory and theoretical exercises will include:

- Characterization of starter cultures using culture and culture independent techniques
- Detection and propagation of bacteriophages from dairy products
- Influence of starter culture propagation conditions on starter composition and activity

1.2 Learning Outcome

The aim of the course is to give the students a thorough knowledge of roles and importance of microbes in manufacture of dairy products. Focus will be on primary and adjunct starter cultures for dairy products, and including the adventitious microflora associated with cheese.

Through lectures and laboratory exercise the course will also give the students additional knowledge on microbiological analysis on organisms relevant for dairy products. Knowledge of the most important spoilage and pathogenic microbes in dairy products will also be obtained. After completing the course the student should be able to:

1.2.1 Knowledge

- Describe the composition of starter cultures and their use in dairy products
- Describe the secondary, adjunct and adventitious microflora found in cheese and their biochemical role in cheese ripening
- Comprehend the role of physiology of starter, secondary starter, adjunct cultures and non-starter bacteria in fermented dairy products
- Comprehend the principles for starter production
- Comprehend how bacteriophages influence fermented dairy product quality and how to detect them
- Display knowledge on culture dependent and culture independent techniques for quantification of microorganisms from dairy products

1.2.2 Skills

- Apply principles for species and strain identification of dairy organisms
- Analyse dairy product for relevant microorganisms using classical and molecular biology based methods and evaluate the putative source of them
- Compare literature information with own obtained data

1.2.3 Competences

- Find, use and evaluate dairy microbiology literature in relation to dairy fermentation processes
- Cooperate with fellow students about literature and practical laboratory work
- Communicate and evaluate own data in relation to literature in writing and orally

1.3 Literature

See Absalon for a list of course literature. It will include textbooks, reviews and original literature, presentations, notes and laboratory manuals.

1.4 Recommended Academic Qualifications

Qualifications within the field of microbiology of fermented food and beverages are recommended. Academic qualifications equivalent to a BSc degree is recommended.

1.5 Teaching and Learning Methods

Lectures, theoretical and practical exercises, group work.

Table 1.1: A table with an overview over the workload for the course.

Category	Hours
Lectures	28
Preparation	80
Theory exercises	5
Practical exercises	50
Study Groups	20
Guidance	10
Exam Preparation	12
Exam	1
Total	206

1.6 Workload

1.7 Feedback Form

- Oral
- Collective
- Continuous feedback during the course of the semester
- Peer feedback (Students give each other feedback)

1.8 Sign Up

Self Service at KUnet

<http://www.science.ku.dk/english/courses-and-programmes/>

<https://www.science.ku.dk/english/continuing-and-professional-education/single-subject-courses/practical/>

1.9 Exam

Table 1.2: The table shows the details of the course exam, as defined from the website of the University of Copenhagen.

Category	Details
Credit	7.5 ECTS
Type of assessment	Oral examination, 20 min
Type of assessment details	Individual oral examination without time for preparation. At minimum 2 weeks before the examination, all examination questions (covering the essential issues of the course) are handed out.
Aid	All aids allowed.
Marking scale	7-point grading scale
Censorship form	No external censorship. Several internal examiners.
Re-exam	Same as ordinary exam.

Criteria for exam assessment See Learning Outcome.

Chapter 2

Lecture Notes

2.1 04.09.24 - Microscope

Chapter 3

Laboratory Exercises

Introduction

In this chapter a summary of the laboratory exercises is given. The exercises are designed to give the student a practical understanding of the theoretical concepts discussed in the previous chapters. The exercises are divided into two parts: the first part deals with the basic techniques of microbiology, while the second part deals with the identification of bacteria.

Chapter 4

Lecture Exercises

4.1 02.09.24 - Exercise 1 - CasePCR

Chapter 5

Literature résumés

This section of the course notes is designed to streamline access to the key findings from each reading material (RM), providing a concise and accessible overview of essential information. Created through experimentation with various AI platforms, this chapter also serves to enhance prompt engineering skills, exploring diverse methods of note-taking for maximum efficiency and clarity. The procedures for creating these summaries have varied, but all methods share a common approach: each RM has been fully read, with summaries and notes prepared after completing each respective subsection. By using these AI-co-op'ed approaches, these notes aim to be both a reliable reference and a resource for continuous improvement in capturing complex microbiology concepts.

5.1 1st lecture

5.1.1 Article 1 - Fermented Foods as Experimentally Tractable Microbial Ecosystems

Introduction

Chapter 6

Exam

Chapter 7

Abbreviations and Explanations

Topic	Abb.	Description
16S ribosomal RNA	16S rRNA	<i>A component of the 30S subunit of prokaryotic ribosomes, commonly used in phylogenetic studies to identify bacteria and archaea.</i>

Chapter A

Appendix

A.1 Appendix 1 - Principles for isolation of microorganisms from fermented food and beverages