

LF301-15 Bacteria: Genes to Behaviour

26/27

Department

Life Sciences

Level

Undergraduate Level 3

Module leader

Vardis Ntoukakis

Credit value

15

Module duration

10 weeks

Assessment

100% exam

Study location

University of Warwick main campus, Coventry

Description

Introductory description

This module constitutes part of the final-year teaching of the school's provision of advanced-level microbiology teaching. It builds on key microbiological modules from previous years.

Module Lead: Prof. Vardis Ntoukakis

Module Lecturers: Prof. Miriam Gifford, Dr Mojgan Rabiey, Prof. Vardis Ntoukakis

Module aims

This module constitutes part of the final-year teaching of the school's provision of advanced-level microbiology teaching. This module builds on key microbiological modules from previous years.

This module allows students an opportunity to study molecular and cellular microbiology at the level of current research. The module covers the study of the mechanisms of gene regulation in microorganisms at the molecular and cellular level and includes the rapidly developing area of bacterial omics biology.

Students will be introduced to a range of molecular mechanisms, which show how bacteria respond to their environment, including nutrient limitation, interaction with pan-eukaryotic hosts and interaction within the community. The information on gene content of organisms generated by

comparative genomics can only be useful if we can understand how gene expression is coordinated, including the integration of metabolism, environmental responses and interaction with their hosts and other members of the community.

One of the principal aims of the module is to consider bacteria as complex systems that respond to changes in their external and internal environments by overlapping response mechanisms, which exhibit a considerable degree of conservation throughout the microbial world.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

This module will cover the molecular and ecological basis of microbe–host interactions, with a strong focus on how microorganisms sense, regulate, and adapt to their environments. Topics include the regulation of bacterial nitrogen metabolism, ammonia assimilation and nitrogen fixation, as well as the control of phosphorus and iron acquisition. It will also explore key bacterial regulatory systems, including two-component systems, sigma factors, quorum sensing, and biofilm formation. These concepts will be placed in the context of complex microbial communities such as plant and gut microbiomes, examining their location, composition, and functional importance. The module will further address host–microbe interactions through pan-eukaryotic immunity and the diverse ways microbes reprogramme host biology.

Learning outcomes

By the end of the module, students should be able to:

- Critically analyse the regulation, integration, and coordination of macromolecular synthesis during microbial cell cycles
- Evaluate intracellular and extracellular response mechanisms that enable bacteria to sense, respond to and adapt to environmental change.
- Analyse the molecular mechanisms underpinning bacterial motility and taxis, and assess their functional significance for survival and behaviour.
- Critically evaluate the role of two-component sensing systems in bacterial nutrition, environmental sensing and pathogenesis.
- Analyse the process of sporulation in *Bacillus* as a model of cellular differentiation in bacteria, integrating regulatory, molecular and developmental perspectives.
- Integrate and interpret molecular and cellular evidence to assess the mechanisms and consequences of bacterial cell–cell interactions.

Indicative reading list

[Reading lists can be found in Talis](#)

Subject specific skills

a. Demonstrate a clear understanding of the scientific topic

- b. Contain evidence of extended reading and lateral integration of material not covered in the lectures
- c. Demonstrate independent thought and deep understanding
- d. Specifically answer the set question using information from multiple lectures and sources
- e. Be structured and formatted in a way that demonstrates understanding and logical flow
- f. Use multiple sources to construct complex scientific arguments and integrating these to build and develop the student's own scientific conclusions.

Transferable skills

1. Critical appraisal of source material
 2. Self-directed learning
 3. Adult learning
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Study

Study time

Type	Required
Lectures	20 sessions of 1 hour (13%)
Private study	128 hours (85%)
Assessment	2 hours (1%)
Total	150 hours

Private study description

128 hrs of self-study and directed reading to prepare for the closed-book examination

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Students can register for this module without taking any assessment.

Assessment group B

Weighting Study time Eligible for self-certification

Assessment component

Closed-book end-of-year examination 100% 2 hours No
In-person locally-timetabled closed-book end-of-year examination

Reassessment component is the same

Feedback on assessment

Pastoral meeting with the academic tutor

[Past exam papers for LF301](#)

Availability

Courses

This module is Optional for:

- Year 3 of UBSA-3 Undergraduate Biological Sciences
- Year 3 of ULFA-C1A1 Undergraduate Biological Sciences (MBio)
- Year 4 of ULFA-C113 Undergraduate Biological Sciences (with Placement Year)
- Year 3 of ULFA-C1A5 Undergraduate Biological Sciences with Industrial Placement (MBio)
- Year 3 of UBSA-C1B9 Undergraduate Biomedical Science
- ULFA-C1A3 Undergraduate Biomedical Science (MBio)
 - Year 3 of C1A3 Biomedical Science
 - Year 3 of C1B9 Biomedical Science
- Year 3 of ULFA-C1A7 Undergraduate Biomedical Science with Industrial Placement (MBio)
- Year 4 of ULFA-CB18 Undergraduate Biomedical Science with Placement Year