BS318-15 Protein Targeting

24/25

Department
Life Sciences
Level
Undergraduate Level 3
Module leader
Lorenzo Frigerio
Credit value
15
Module duration
10 weeks
Assessment
100% coursework
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This module allows the final year students, who have a substantial background in molecular and cell biology from a number of first and second year modules, to apply this knowledge to a research area (protein targeting) which is a field of fundamental importance in cell biology.

Module web page

Module aims

During the module, the students should gain an appreciation of the molecular nature of the targeting signals and the appropriate transport apparatus, an appreciation of the specific protein-protein interactions required at each step of a given transport pathway, and of the mechanisms by which large globular proteins are translocated across membrane bilayers which, in several cases, are impermeable even to protons. Specifically, they should become familiar with the evidence and up to date models for protein transport into the ER lumen, mitochondria and chloroplasts and for transport from the plasma membrane to lysosomes (by endocytosis) and from the ER to the cell surface via the Golgi (by exocytosis). They should also become aware of the experimental approaches used to study protein targeting and translocation across membranes.

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.

Secretion
Movement of proteins through cellular membranes
The secretory pathway
(a) Import of proteins into the ER lumen.
(b) Protein transport through the secretory pathway
Protein transport into mitochondria and chloroplasts
(a) Basics of chloroplasts and mitochondrial protein import
(b) Chloroplast protein import
(c) Mitochondrial protein import
Receptor-mediated endocytosis
RME responsible for delivering nutrients into cells, typified by low density lipoprotein and transferrin.
RME involved in effector function, typified by insulin and epidermal growth factor.
Role of clathrin-coated vesicles.
Transcytosis - the transfer of specific substances through polarized cells e.g.
polymeric IgA or IgM molecules.
RME involved in clearance of unwanted material from intracellular space e.g. asialoglycoproteins.
How unwelcome opportunists take advantage of the RME system to enter cells.
Retrograde transport from the trans-Golgi network.
Clathrin-independent mechanisms of endocytosis.

Learning outcomes

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

- LO1 Understand the control and mechanisms that control targeting to the ER and secretion from the ER through the Golgi apparatus
- LO2 Understand the control and mechanisms that control targeting to mitochondria and chloroplast
- LO3 Understand the control and mechanisms that control receptor mediated endocytosis
- LO4 Critical understanding of core research techniques used in the study of protein targeting and sorting

Subject specific skills

You will gain an appreciation of the molecular nature of the targeting signals and the appropriate transport apparatus, an appreciation of the specific protein-protein interactions required at each step of a given transport pathway, and of the mechanisms by which large globular proteins are translocated across membrane bilayers which, in several cases, are impermeable even to protons. You will also learn, in a journey through the key experiments, about how this field of research developed from a simple hypothesis to a major area of cell biolog

Transferable skills

1. Critical appraisal of research papers

2. Self directed learning
3. Adult learning

Study

Study time

Type	Required
Lectures	20 sessions of 1 hour (13%)
Private study	130 hours (87%)
Total	150 hours

Private study description

Independent learning, self directed learning and revision for final year assessment.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A

	Weighting	Study time
Open Book Assessment	100%	20 hours

Final assessment for the module will be on open book assessment. This is an essay based assessment consisting of 4 questions- students need to answer 2. The essays cannot be answered using lecture notes alone- students will need to perform background research and essays will need to be fully referenced.

Feedback on assessment

Pastoral meetings with personal tutor

Availability

Courses

This module is Optional for:

- Year 3 of UBSA-C700 Undergraduate Biochemistry
- ULFA-C1A2 Undergraduate Biochemistry (MBio)
    - Year 3 of C1A2 Biochemistry
    - Year 3 of C700 Biochemistry
- Year 4 of ULFA-C702 Undergraduate Biochemistry (with Placement Year)
- Year 3 of ULFA-C1A6 Undergraduate Biochemistry with Industrial Placement (MBio)
- UBSA-3 Undergraduate Biological Sciences
    - Year 3 of C100 Biological Sciences
    - Year 3 of C100 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)
- UBSA-C1B9 Undergraduate Biomedical Science
    - Year 3 of C1B9 Biomedical Science
    - Year 3 of C1B9 Biomedical Science
    - Year 3 of C1B9 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)
- ULFA-CB18 Undergraduate Biomedical Science with Placement Year
    - Year 4 of CB18 Biomedical Science with Placement Year
    - Year 4 of CB18 Biomedical Science with Placement Year
    - Year 4 of CB18 Biomedical Science with Placement Year

This module is Option list B for:

- Year 3 of UMDA-CF10 Undergraduate Integrated Natural Sciences (MSci)