

MECHANISTIC TOXICOLOGY AND PHARMACOKINETICS - 2024/5

Module code: BMS3099

Module Overview

Pharmacokinetics and Toxicology is the science of safety: It is the study of how exogenous chemicals enter and are disposed of by the body, and the effects that they can have on the organ systems of the body. Toxicology is designed to minimise the risk of harm to humans from exposure to any of the thousands of chemicals that we use every day. In this module, we will look at the basic mechanisms of how chemicals may cause harm to living organisms, and some of the testing procedures in place to detect such adverse effects. We will examine the mathematical patterns of drug administration and excretion and learn to explain these and determine their meaning, these concepts will be brought together through a series of case study workshops where mathematical data will be handled and examined.

Module provider

School of Biosciences

Module Leader

LYMPANY Penny (Biosciences)

Number of Credits: 15

ECTS Credits: 7.5

Framework: FHEQ Level 6

Module cap (Maximum number of students): N/A

Overall student workload

Independent Learning Hours: 80

Lecture Hours: 11

Tutorial Hours: 20

Guided Learning: 8

Captured Content: 31

Module Availability

Semester 2

Prerequisites / Co-requisites

N/A

Module content

Indicative content includes:

- Introduction to Experimental Toxicology
- Mechanisms of Toxicity (oxidative stress, receptor-mediated toxicity, biopharmaceuticals, nanotoxicology, and genotoxins)
- Toxicity testing (acute, (sub)chronic, carcinogenicity, and reproductive)
- The drug development cycle & moving from pre-clinical to clinical
- Target Organ Toxicity (nephrotoxicity, dermal toxicity, liver toxicity)
- Tutorials: Specific tutorials will be held for the assessment feedback and briefing and for revision.

Assessment pattern

Assessment type	Unit of assessment	Weighting
Online Scheduled Summative Class Test	Online Test (3 Hours)	20
Coursework	Coursework	80

Alternative Assessment

N/A

Assessment Strategy

The assessment strategy is designed to provide students with the opportunity to demonstrate a deep understanding of all the different topics under consideration.

Students are assessed by coursework only. All students will take an online pharmacokinetics test, which will take place through SurreyLearn and will ask the students to complete calculations based on their learning in the lectures and tutorials, and provide some interpretation of the results.

Each student will then write one essay, the titles of which are provided by the three members of teaching staff. Thus, the summative assessment for this module consists of:

20% - Pharmacokinetics online coursework taken through SurreyLearn.

80% - Three part essay - each part will address a question from one of the three lecturers. Each section no more than 750 words (hard word limit).

Formative assessment and feedback

Students will receive formative feedback and assessment briefing throughout the module during both lectures and tutorials. Students will be able to submit a one sided A4 plan for feedback as well as attend a 15 mins feed-forward session.

Module aims

- To create an awareness of the scope of toxicology in relation to industrial chemicals, food additives and contaminants, pharmaceuticals and consumer products
- To provide a sound understanding of the principles underlying toxicity testing and risk assessment, including concepts of the NO(A)EL, ADI, MTD
- To study both acute and chronic toxicity
- To undertake and explain the results of some essential pharmacokinetics calculations based on model data
- To illustrate mechanisms of toxicity
- To study the mechanisms of target tissue, cell and organelle toxicity

Learning outcomes

		Attributes Developed
001	Understand the concepts of pharmacokinetic parameters	CPT
002	Appreciate the toxicological tests necessary to evaluate potential toxicity, assess risk and assess safety in use of food additives, pharmaceuticals, chemicals in consumer products	KC
003	Understand the limitations of animals as surrogates for humans in toxicological assessment and safety assurance, and how interspecies and interindividual differences in sensitivity are accommodated	C
004	Understand the basic concepts underlying the development of toxicity and recognise common themes	KC
005	Understand the basic principles of action of a number of toxins that act upon organs central to exposure (skin), metabolism (liver) and excretion (kidney) of xenobiotics	K

Attributes Developed

C - Cognitive/analytical

K - Subject knowledge

T - Transferable skills

P - Professional/Practical skills

Methods of Teaching / Learning

The learning and teaching strategy is designed to:

The pharmacokinetics will begin with an introductory lecture prior to "practical seminars" where students will work with each other and with academics to complete calculations based on pharmacokinetic data. This combination of workshops and lectures should provide students with a solid handle of the mathematical tools to complete the calculations before their assessment.

The module will then move towards a theoretical basis in toxicology where we will explore the molecular mechanisms underpinning several key organ system toxicologies. The module uses a series of building blocks to first embed subject knowledge within the student and then develop cognitive and analytical skill to allow the correct application of this knowledge. This is achieved through

the use of initial concept lectures that are designed to impart fundamental knowledge of the area to the students.

The learning and teaching methods include:

Live lectures

Captured mini-lecture videos

Pharmacokinetics maths tutorials

- Coursework tutorials

Indicated Lecture Hours (which may also include seminars, tutorials, workshops and other contact time) are approximate and may include in-class tests where one or more of these are an assessment on the module. In-class tests are scheduled/organised separately to taught content and will be published on to student personal timetables, where they apply to taken modules, as soon as they are finalised by central administration. This will usually be after the initial publication of the teaching timetable for the relevant semester.

Reading list

<https://readinglists.surrey.ac.uk>

Upon accessing the reading list, please search for the module using the module code: **BMS3099**

Other information

Resourcefulness & resilience

The module requires students to perform their own research in order to identify appropriate examples of toxicological compounds.

Global & cultural capabilities

A real-life toxicological scenario workshop will be created, which will require the students to take on different roles.

Sustainability.

Appreciation of how many compounds fail due to toxicological issues. Importance of early screens. The new toxicology workshop will also illustrate the role toxicology plays in sustainability. Consider the requirement, appropriateness, and reliability of animal models of disease.

In line with One Health approach the module works towards relevant Sustainable Development Goals (SDGs) like SDG3 (health). Reducing cost of disease burden across the life course by understanding molecular and cellular toxicological processes in health and disease, leading to interventions to promote health and prevent or treat disease. Consider the requirement, appropriateness and reliability of animal models of disease.

Digital capabilities

This module requires a high level of research which will include the use of various online databases.

Employability.

Calculation of pharmacokinetic parameters. An appreciation of mechanistic toxicology is a key aspect for roles in pharma but also the environment. The module will enhance employability through knowledge of subject area, problem solving and critical analysis skills - key to employment and success in the professional workplace.

Programmes this module appears in

Programme	Semester	Classification	Qualifying conditions
Biochemistry BSc (Hons)	2	Optional	A weighted aggregate mark of 40% is required to pass the module
Biochemistry MSci (Hons)	2	Optional	A weighted aggregate mark of 40% is required to pass the module
Biological Sciences (Cellular and Molecular Sciences) BSc (Hons)	2	Optional	A weighted aggregate mark of 40% is required to pass the module
Biological Sciences (Infection and Immunity) BSc (Hons)	2	Optional	A weighted aggregate mark of 40% is required to pass the module
Biological Sciences BSc (Hons)	2	Optional	A weighted aggregate mark of 40% is required to pass the module
Biomedical Science BSc (Hons)	2	Optional	A weighted aggregate mark of 40% is required to pass the module
Biomedical Science MSci (Hons)	2	Optional	A weighted aggregate mark of 40% is required to pass the module
Food Science and Nutrition BSc (Hons)	2	Optional	A weighted aggregate mark of 40% is required to pass the module

Please note that the information detailed within this record is accurate at the time of publishing and may be subject to change. This record contains information for the most up to date version of the programme / module for the 2024/5 academic year.