

Undergraduate Pharmacology core curriculum

Having successfully completed an undergraduate degree in Pharmacology, graduates will be able to integrate and apply the knowledge, skills and attitudes detailed in this core curriculum.

A fundamental aim of the British Pharmacological Society is to 'promote and encourage the education and training of pharmacologists'. To meet the challenge of a changing global scientific landscape, pharmacology must be a responsive discipline, producing graduates who can innovate and adapt. This new core curriculum will inform undergraduate Pharmacology programmes and help educators nurture the graduates of the future. It was produced using a unique, subject community based adaptation of the Delphi method that drew on the expertise of over 40 stakeholders from academia, industry and beyond.

It will be freely available on the Society website for use by educators, employers and students to identify the core knowledge, skills and attitudes of Pharmacology undergraduates. The curriculum is not intended to be overly prescriptive and should be read in conjunction with the QAA Benchmark Statement for Biomedical Sciences¹. Educators should use their own academic judgement, experience, resources, and knowledge of their students' needs in interpreting the curriculum and applying it to their programmes.

A primary goal of this project has been to establish the Society as a nucleus of support for pharmacology education. Through this project, the Education & Skills Affinity Group and other education-focussed activities, a pharmacology education community has begun to flourish. The next step will be to work with this community to support educators across the UK using the new core curriculum as a foundation.

CORE KNOWLEDGE

Having successfully completed an undergraduate degree in Pharmacology, graduates will have knowledge and understanding of:

Related disciplines

- Life sciences e.g. molecular biology, physiology
- Relevant mathematics
- The basics of medicinal chemistry, including the principles behind structure activity relationships
- How related disciplines can yield insights in pharmacology and vice versa

Theoretical principles of drug action

- Drugs that can be used in health and disease, giving examples from body systems
- How drugs interact with their targets, including drug-receptor theory
- Pharmacodynamics (molecule to whole organism)
- Pharmacokinetics (absorption, distribution, metabolism & excretion)
- How physiological and pathophysiological processes are affected by drug action
- Pharmacogenomics
- Principles of toxicology and their application in safety pharmacology
- Principles of translational research and experimental medicine

Methodological principles

- Qualitative and quantitative statistical tools and analytical methods used to interpret pharmacological data
- The scientific method (hypothesis formulation, hypothesis testing, experimental design, experimental analysis)
- Appropriate and emerging methods for interrogating the pharmacodynamic effects of drugs
- Appropriate and emerging methods for interrogating the pharmacokinetic effects of drugs
- Drugs as pharmacological tools in scientific research
- The principles of reduction, refinement and replacement in the use of animals in research

Drug discovery & development

- The multidisciplinary nature of drug discovery and development and the pivotal role played by pharmacology
- The stages of drug discovery and development
- Principles of clinical trial design
- How knowledge of pathophysiology can yield insights into drug targets and new therapeutic avenues
- Emerging therapeutic avenues
- The use of gene modification techniques in drug discovery and development
- Commercial drug discovery techniques
- How medicine formulation impacts on drug action
- Regulatory processes to include medicine quality, safety and effectiveness
- The challenges associated with developing and assessing the efficacy and safety of new therapeutic approaches

The societal impact of the discipline

- The ethical principles of research, including clinical trials and animal research (design, implementation and reporting)
- How pharmacology relates to social challenges and public health
- The impact of pharmacology on patient care with respect to the safe and effective use of medicines
- The various career paths and opportunities afforded by a pharmacology degree

CORE SKILLS

Having successfully completed an undergraduate degree in Pharmacology, graduates will:

Experimental techniques

- Be able to formulate a scientific hypothesis
- Implement principles of good experimental planning and design
- Identify the most appropriate statistical approach
- Be able to make appropriate decisions about methodology when designing a study
- Be precise and accurate when performing core laboratory skills
- Carry out experiments following principles of Good Laboratory Practice
- Be able to use quantitative methods to collect, process and present data
- Be able to use *in vitro* techniques in pharmacology
- Have the necessary theoretical and/or practical training to be able to use *in vivo* techniques in pharmacology



Data handling & analysis

- Identify and use information from appropriate and reliable sources
- Integrate information from a range of sources and critically evaluate it
- Apply and interpret appropriate statistical tests correctly
- Use a common statistical software package
- Accurately record and reference source material
- Analyse and interrogate large data sets



Working practices

- Keep up-to-date with the relevant literature and developments in pharmacology
- Perform research efficiently through good planning and management
- Organise and accurately record information e.g. in a laboratory book
- Work independently
- Work constructively in small groups or teams
- Communicate effectively to scientific and non-scientific audiences (including written and oral forms)

CORE ATTITUDES

Having successfully completed an undergraduate degree in Pharmacology, graduates will have:

- A concern for detail and quality
- A curious attitude and openness when interpreting data
- A confident and adaptable working attitude
- A willingness to accept a challenge
- The courage to stand up for their principles under pressure
- A resilient attitude in the face of failure or unexpected outcomes
- The ability to work to the highest principles of scientific integrity, following ethical working practices
- The ability to apply creative/innovative approaches to addressing complex problems
- The ability to maintain effective working relationships and collaborations
- The ability to work to fixed deadlines and manage pressure
- A willingness to engage with developments across science and healthcare
- The ability to identify employment opportunities and independently pursue personal career goals
- The confidence and ability to apply their skills in a real world setting
- The skills for lifelong learning e.g. independence, time management, organisation and planning, initiative, knowledge transfer
- An appreciation of the societal relevance and impact of pharmacology
- An appreciation of the value of public engagement and outreach
- The ability to self-assess performance
- An understanding of how to evaluate risk

If you'd like to discuss the core curriculum, or work more closely with the Society on pharmacology education, please contact the Education, Training & Policy Team on education@bps.ac.uk.



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