The Royal College of Pathologists
Pathology: the science behind the cure

FRCPath Examination

Toxicology Speciality

Subspecialty
Toxicological Pathology
Part I, Paper II

Curriculum

Morphological Pathology

Specific Topics

Laboratory animals

- Knowledge of main laboratory animal species (rat, mouse, dog, non-human primate, minipig, rabbit, guinea pig, hamster)
- Comparative physiology, anatomy and histology of the different species and strains
- Gender and age differences in structure and function

Detailed understanding of organ systems

- Integument (skin)
- Neurological system (central and peripheral)
- Special senses (eye, ear and other sense organs)
- Endocrine organs (adrenal, pituitary, thyroid and parathyroid glands)
- Cardiovascular system (heart and blood vessels)
- Gastrointestinal tract and associated glands (liver, pancreas, salivary glands)
- Respiratory system (upper and lower tract)
- Urinary tract (kidney and urinary bladder)
- Male and female reproduction systems
- Lymphoid/haematopoietic systems (spleen, thymus, lymph nodes & bone marrow)
- Musculoskeletal system (muscle and bone)

- **Background spontaneous pathology** (congenital, inflammatory/vascular, infectious, degenerative, hyperplasia and neoplasia); how this may compromise interpretation of data
- **Pathogenesis of disease processes** (effecting physiology, anatomy and histology)
- **Drug-induced pathology and mechanisms of toxicity** (with examples of causative agents)
- **Exacerbation of disease processes** (how conditions of hypoxia, physical forces and infectious agents can cause and exacerbate chemically or biologically induced cell injury)
- **Perturbation of homeostatic functions** (by chemical induced disease processes)
- **Relationship between tissue specific pathology and systemic disease** (e.g. Hepatic damage and encephalopathy)
- **Influence of experimental procedures** on functional processes and structures
- **Effects of environment** (animal husbandry) on chemical induced toxicity

Interpretation of pathology data

- Interpretation of histopathology findings as either background, treatment-related (direct) or indirect (secondary to general perturbation in homeostasis, stress or ADA)
- Correlation of all study data: clinical signs, clinical pathology, PK, PD, macroscopic, microscopic data and anticipated biology/pharmacology of therapeutic agent at the individual animal level, within or across experimental groups and between studies
- Interpretation of histopathology data in context of all other study data

Laboratory animal science and veterinary intervention

- Animal source, quality, history of health status prior to study start
- Animal husbandry (optimal nutritional and environmental requirements)
- Animal welfare (3Rs)
- Animal clinical monitoring and veterinary interventions

• Infectious diseases, SPF and quarantine

Practical Pathology
Specific Topics
Post-mortem/necropsy • Methods of humane euthanasia for each species • Necropsy procedures (personal participation) • Gross examination, description and recording of findings • Tissue sampling for standard histological processing and other specialised assays • Standard histological processing of tissues (fixation, paraffin embedding, H&E stain) for light microscopy and more specialised processing of tissues (perfusion, resin embed) (e.g. EM) • Effects of necropsy and processing of tissues on histopathological evaluation
Histopathological evaluation of tissues • Application of light microscopy for histopathological assessment of tissues • Clear morphological description of histopathological findings with interpretation • Competence with computerised pathology data capture systems • Participation in pathology peer review and educational review schemes
Interpretation of histopathological findings • Differentiation of real findings from post-mortem, ante-mortem, morbid and agonal changes • Identification of technical artefacts • Identification of administration-related pathology • Biological plausibility of treatment-related findings and interpretation
Regulations • GLP compliance (SOP) • Standardised diagnostic terminology (STP/RITA)
Laboratory management • Management of histopathology laboratory and QC

Clinical Pathology
Specific Topics
Clinical pathology • Haematology, clinical chemistry, urine analysis, blood and bone marrow smears, lymph node imprints and cell smears • Laboratory animal species (rat, mouse, dog, NHP, minipig, rabbit, guinea pig, hamster) • Species, strain, gender and age differences
Detailed understanding of endpoints • Background spontaneous changes (normal variation) • Drug-induced changes and mechanisms of toxicity (with examples of causative agents) • Exacerbation of disease processes • Relationship between clinical pathology changes and organ systems

Practical application

- Handling and preservation of samples
- Haematology blood and bone marrow smears
- Manual and automated methods

Special molecular pathology techniques
Specific Topics
Specialised techniques • Special stains • Immunohistochemistry (IHC) • Electron microscopy (EM): general overview of procedures, review and interpretation of micrographs • In Situ Hybridisation (ISH)

Animal models
Specific Topics
Animal models of human diseases • Precise morphological description and aetiology of human disease processes • Animal models of human disease (relevance and limitations)