

## CM-Path Information Sheet on Cellular Pathology



## Introduction

- Pathology is a broad term referring to the study of disease. Pathology departments in hospitals include a number of different medical specialties focused on different ways of studying disease (eg. Haematologists study disease by examining the blood).
- Cellular pathologists are doctors who study disease by examining human tissue and cells.
- 'Cellular and Molecular Pathologist' is a modern name often used interchangeably with 'Histopathologist' – a term traditionally used to describe this specialty. Hence the name given to the **CM-Path** initiative.

## How does a cellular pathologist train?

- Attend medical school for 5-6 years
- Work as a hospital doctor (Foundation Training) for 2 years. Competitive application for histopathology training.
- Cellular pathology training lasts for a minimum of 5 years. From this point on, although we are doctors, we rarely interact with patients face-to-face. We do not work on wards or in clinics but instead work in hospital laboratories.
- We are trained by cellular pathology consultants. We learn how to diagnose the different diseases which occur in all of the body's organs and tissues. This includes cancer and non-cancerous conditions.
- During the first two years of training we learn how to perform post-mortems. After that, we can decide to stop doing further post-mortems or undertake additional training and an examination in post-mortem pathology.
- During the first two years we also learn how to interpret cytology (for example, samples obtained from the cervical smear test). After the first two years, we can decide to stop learning further cytology or undertake additional training and an examination in cytology pathology.
- We have to take three exams during our training. After completion of training, we become independent consultant cellular pathologists.
- During our training, we can choose to undertake research.

## Ways in which tissue is removed from the body:

- As a small biopsy (the size of a pinhead) usually removed at endoscopy (a camera test) or keyhole surgery.
- As a lump or bump removed by the GP.
- As a lump of tissue/organ removed at surgery.
- As cells removed by a needle (an aspirate).
- As cells removed as part of the cervical screening programme (smear test).



## What happens to the tissue after it is removed from the body?

- It is taken to a cellular pathology laboratory and usually placed in formalin (a chemical which stops the tissue from decaying).
- We check that the details on the specimen pot match the details on the accompanying form. These checks take place at every step of the tissue's journey - it is vital that we do not mix samples up.
- We look at and feel the specimen and describe its size, shape, colour etc. We can gain a lot of important information by doing this.
- We may paint the edges of the tissue with coloured ink so that we know how it was orientated in the body (i.e. which side is which) and, if a tumour is present, whether it has reached the outer inked surface.
- We may photograph the tissue.
- Unless it is tiny, we then cut the tissue into thin slices.
- We look at the slices and decide which contain the most useful information (e.g., if there is tumour, we choose the slice where the tumour is invading the deepest). We cannot process all of the tissue from large specimens (imagine the size of a whole lung) - we have to be selective.
- We choose which slices will be processed (passed through a series of chemicals) and made into wax blocks. The wax preserves the tissue (like an insect trapped in the sap of a tree) and makes it firm enough to cut very thinly.
- The scientists who work in the laboratory cut very thin shaves from the wax blocks containing the tissue and these are put onto glass slides. The glass slides are then stained with dyes to reveal the tissue.
- We look at the glass slides using a microscope. We are able to see the cells making up the tissue. We make a diagnosis. If there is tumour present, we also record information about how aggressive it is and how far it has spread (to help assess the patient's prognosis). We sometimes perform special tests which give us information about proteins and genetic abnormalities in the tumour. This helps us determine accurately the type of tumour and whether it is likely to respond to certain treatments.
- We write all of this information in a report which is sent to GPs and hospital doctors. For patients with cancer, we attend a meeting with the surgeons, radiologists and oncologists (cancer specialists) so that we can join together information from all of the patient's investigations to plan their treatment.
- The remainder of the specimen (ie the part of the tissue which was not made into wax blocks) is kept for a few weeks, in case we need to take more samples to check under the microscope, and then disposed of.
- The glass slides and wax blocks are kept for a much longer period, 20- 30 years. Sometimes these will be sent to a specialist hospital for an expert opinion. Sometimes we may go back and look at the glass slides and wax blocks several years later (for example, if a patient develops a second tumour).

## Types of post-mortem

- There are a specific set of circumstances in which a post-mortem has to be carried out by law (<https://www.gov.uk/after-a-death/when-a-death-is-reported-to-a-coroner>).
- Occasionally hospital doctors and relatives may together choose to have a post-mortem, in order to answer a medical question which arose from the case.
- Forensic post-mortems are carried out in cases in which a crime is suspected. The cellular pathologists who carry out forensic post-mortems have undergone a special branch of pathology training.



## What happens at a post-mortem?

- We first read the relevant hospital notes or report from the police/coroner. A coroner is a person with a legal qualification who investigates certain types of death.
- We then examine the outside of the body and look for signs of disease, injury and identifying features.
- We make an incision down the front of the body and remove the organs from the chest, abdomen and pelvis. We open the skull and remove the brain. This does not occur in every case as occasionally requests are authorised by the Coroner for a limited examination of certain organs.
- We examine the organs to identify a cause of death.
- The organs are then returned to body and the body is reconstructed so that it is ready for burial or cremation and can be viewed by relatives.
- Occasionally we take blood, urine or tissue samples to perform extra tests to establish the cause of death.
- We write a report which is sent to the coroner. The coroner may hold an inquest in certain instances - this is a meeting attended by relatives, the pathologist and perhaps other doctors in order to review all of the evidence and confirm the cause of death.

## What sorts of research are cellular pathologists involved in?

- Clinical trials are a type of research in which groups of patients are given different treatments in order to assess the best way to treat a disease. Cellular pathologists review tissue removed from these patients to accurately define the type of disease they have at the start, and sometimes again afterwards, to see how well it has responded to treatment. Many clinical trials nowadays are for new treatments for cancer.
- Cellular pathologists are also involved in anatomy-based research. This influences the way that surgical operations are performed. It also improves the way that pathologists review and process the tissue that they receive.
- In addition, cellular pathologists have created a new way to view tissues called digital/virtual pathology. Rather than looking at tissue using a microscope, the glass slides are scanned onto a computer and the image of the tissue viewed on a computer screen. This has many advantages – for example, measurements can be made easily from the screen and comments added to the images. It is also very easy to share digital images with other cellular pathologists as part of a case discussion.
- Cellular pathologists are working with radiologists to develop “digital/virtual post-mortems” i.e. using CT scans to determine cause of death.
- Cellular pathologists are increasingly involved in understanding how genes are involved in the diseases we diagnose with our microscopes. The study of genes in disease is ‘molecular pathology’ – hence our training and daily work as cellular pathologists is evolving into the new science of ‘cellular molecular pathology’.

