

INTRODUCTORY HISTOLOGY

Individual cells are grouped into tissues and each tissue type is highly specialised to perform specific functions.

A knowledge of the functional organisation of tissues helps in the understanding of how individual cells are organised to form tissues, organs, organ systems and the complete organism.

Histology is the study of the microscopic structure of tissues and organs ie: microscopic anatomy.

What is the difference between **CYTOLOGY and **HISTOLOGY**?**

CYTOLOGY : The study of cells.

HISTOLOGY : The study of the microscopic structure of tissues
and organs.

Histology forms an essential basis for

- **understanding how cells and organs function, once the structure is known the function can be derived and vice versa.**
- **the study of pathology which is the study of abnormal structure and function.**

Light microscopy is used on regular basis to examine cells and tissues.

Preparation of tissue for light microscopy

The image seen in the light microscope is a result of light passing through the tissue.

Hence the tissue must be cut into very thin slices, (1- 20 microns thick).

How many sections 1 micron thick could be cut from a 1mm block of tissue?

Answer : 1000

Preparation of tissue for light microscopy

The first stage in preparation is **fixation**.

This preserves the tissue and makes it more rigid.

The tissue is **embedded** in wax or plastic, making it rigid enough for **cutting into sections**.

These sections are **mounted onto a slide**.

Preparation of tissue for light microscopy

Most tissues are colourless and transparent when thinly sectioned.

It must be **stained** with a coloured dye so as to enable structural details to be seen.

The colours seen under the light microscope are not the true colours of the tissues but the colours of the stains used.

Often the colour of the stain, once applied to the tissue, can provide specific information about the tissue.

The final stage is to cover the section with a **coverslip**.

The sections are then ready to examine under the light microscope.

Light microscope appearance

Stains are used to show the histological structure of cells and tissue.

Most stains depend on the formation of bonds between the **acidic and basic components** of the stain mixture with the tissue.

Cellular components that bind with basic dyes are said to be **basophilic**.

Cellular components that bind with acidic dyes are said to be **acidophilic**.

Most class sections are stained with **haematoxylin** and **eosin** (H&E).

Haematoxylin acts as a basic dye; stains chromatin, ribosomes etc. a **purple/blue**.

Eosin acts as an acidic dye and stains most of the components of the cytoplasm and intercellular material **red/pink**.

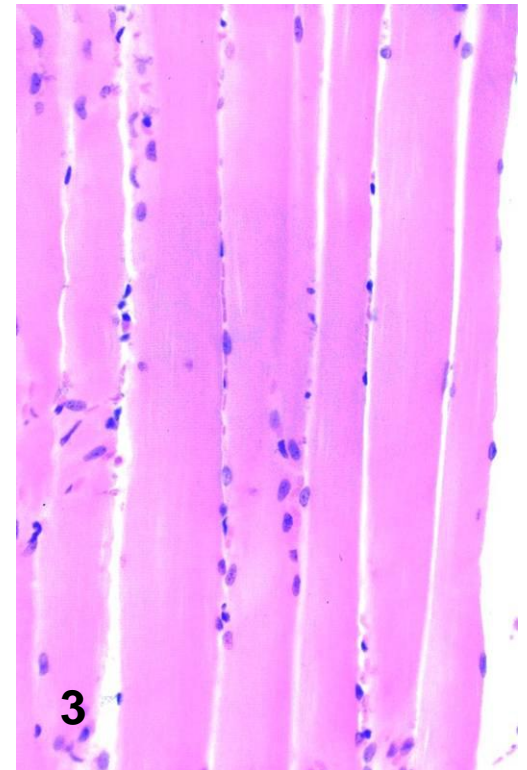
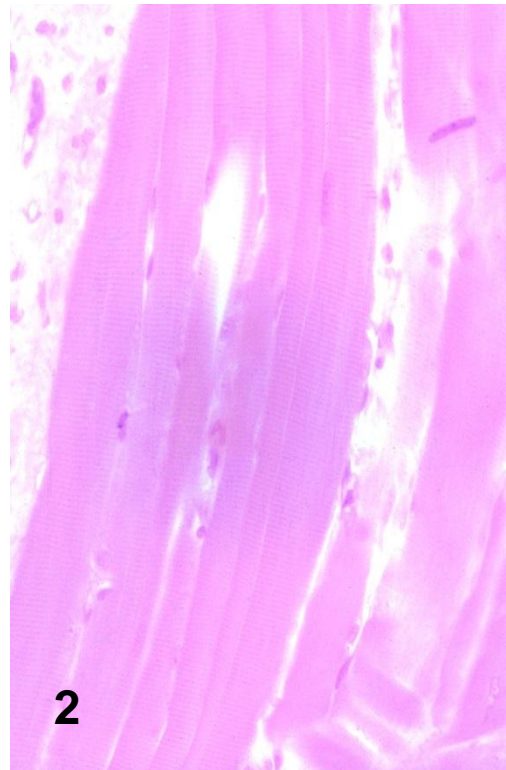
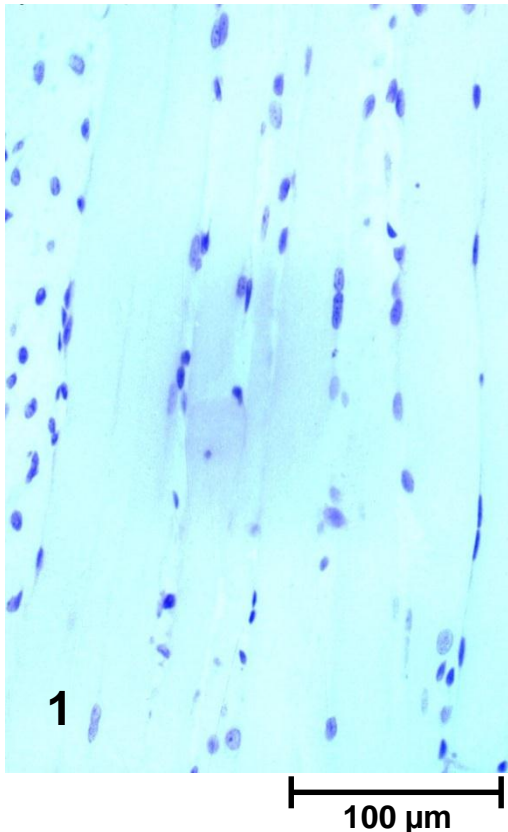
Light microscope appearance

These three micrographs are of striated muscle.

No 1 has been stained with haematoxylin only.

No 2 has been stained with eosin only.

No 3 has been stained with both haematoxylin and eosin.



Light microscope appearance

Staining of white blood cells (leucocytes) is an example of H&E staining to differentiate between cell types.

There are three types of white blood cells.

Lymphocytes

Monocytes

Polymorphonuclear leucocytes (granulocytes)

These granulocytes can be distinguished by their cytoplasmic granules.

When stained with H&E:

Neutrophils: granules faintly stained or unstained.

Eosinophils: granules bind with eosin and are stained red.

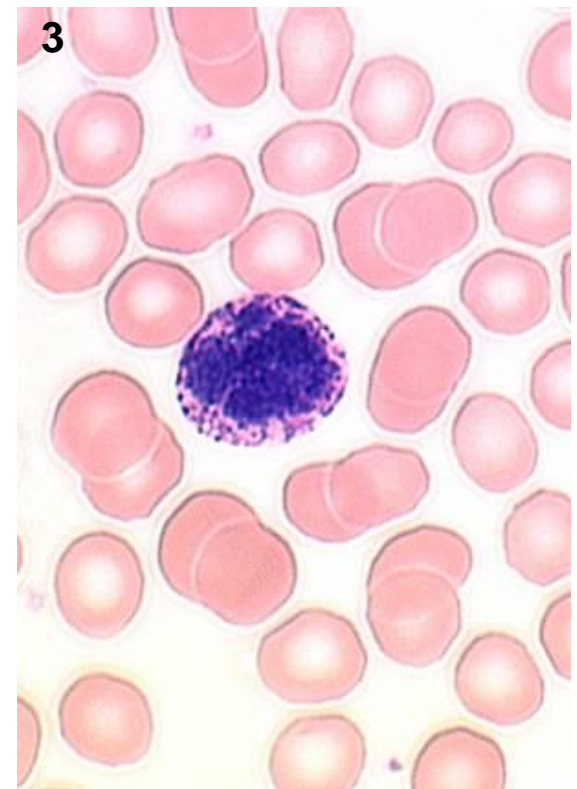
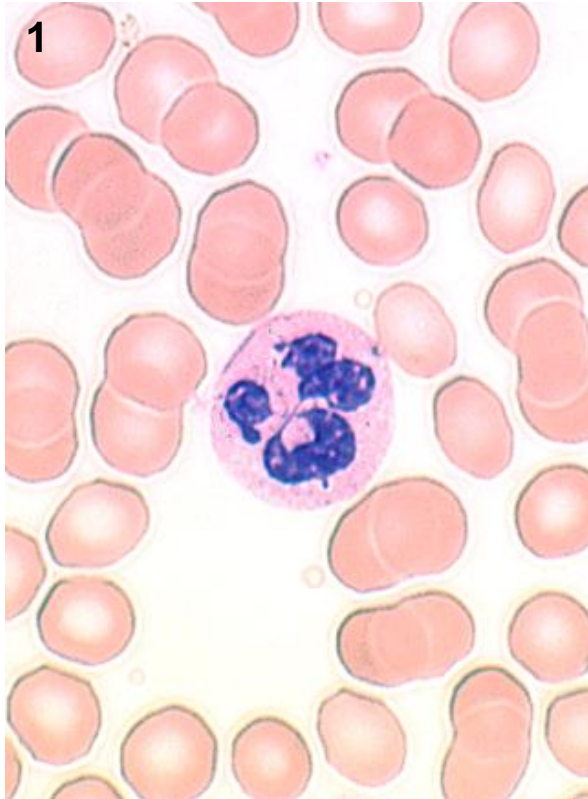
Basophils: granules bind with haematoxylin and are stained blue/purple.

Light microscope appearance

Granulocytes.

1. Neutrophil .. granules lightly stained.
2. Eosinophil .. granules stained red/pink.
3. Basophil .. granules stained blue/purple.

10 μ m



Light microscope appearance

The most obvious feature of cells when viewed under the light microscope is the nucleus that stains purple /blue with H&E stain.

Is DNA acidophilic or basophilic?

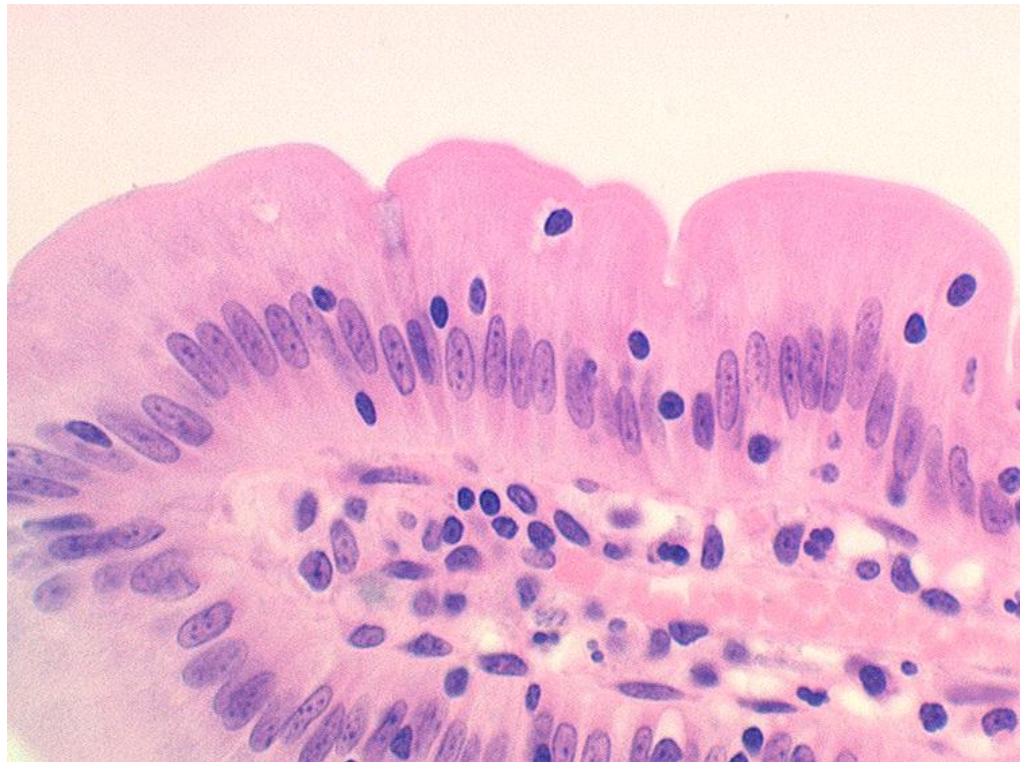
Answer: basophilic.

Light microscope appearance

As you continue to look at cells and tissues always take notice of **nuclear shapes**.

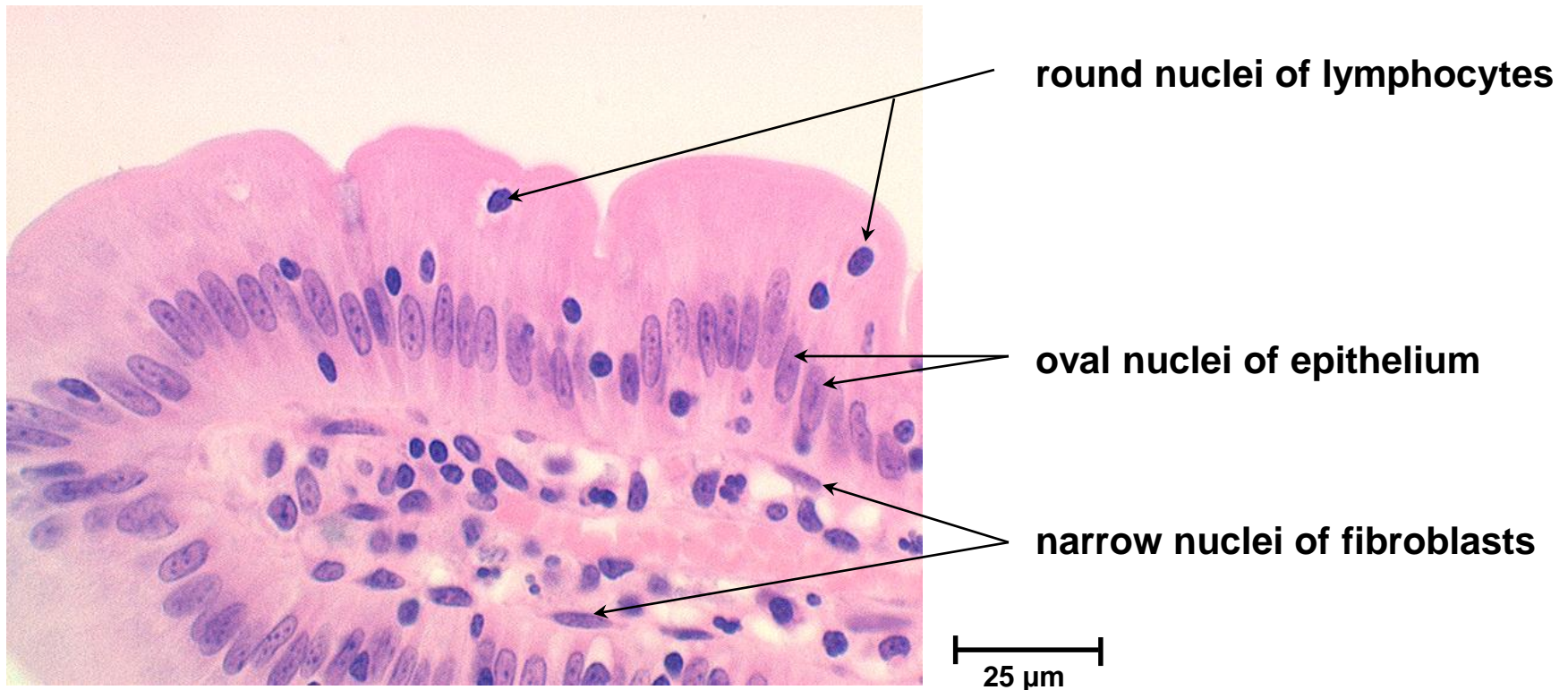
Different types of cells have distinctive nuclei.

The picture below shows part of a villus in the small intestine.



Light microscope appearance

The lining epithelium has largish, relatively pale staining ,elongated nuclei. The wandering lymphocytes (white blood cells that are the first line of defence) are scattered throughout the tissue, have a round dark nucleus. Underlying connective tissue cells contains typical fibroblasts with narrow nuclei.



Light microscope appearance

H&E staining provides some structural detail but does not always reveal certain structural components.

**eg. Elastic fibres, reticular fibres, lipids etc.
other selective staining procedures are used.**

TEST YOURSELF

1. Define histology.
The study of the microscopic structure of tissues and organs.
2. What colour is a thinly sectioned piece of tissue?
Colourless and transparent.
3. Is haematoxylin an acidic or basic dye?
A basic dye.
4. What colour are cytoplasmic components of cells after staining with eosin?
red/pink.
5. What is the colour of the granules found in basophils?
Purple/blue.

TEST YOURSELF

6. **Pancreatic cells produce large amounts of enzymes, what do such cells look like after H&E staining?**
Sites of enzyme synthesis extremely basophilic.
7. **Name types of fibres found within tissues that can be demonstrated by a special staining procedure?**
Elastic fibres, reticular fibres.
8. **What are the characteristics of lymphocyte nuclei?**
Round and darkly staining.
9. **When given a slide to examine would you use a high or low magnification initially?**
Start by looking at the slide by eye, then with the lowest magnification.