

# **Topic 1 slides**

## **Ask Weber**

**Weber Liu**

## Purpose of ask weber

- **To help you understand what is assessable**
- **To help you understand the content better**
- **To give you a safe space to ask questions (no matter how basic you think they are)**
  - In fact, I'll be asking you stupid questions if you don't ask me any!
- **I'm here to support you and make your learning easier!**

## Random trivia

**What type of cell makes up the longest cell in your body?**

**Where is this cell located**

**What is the shape of a red blood cell (RBC)?**

— Why is it shaped this way?

## Learning objectives

- Describe the main compartments of the body, inside-vs-outside, dorsal versus ventral, major body fluid, layers of organisational scale, dimensionality, complexity, dynamic nature of systems, and systems operating together
- Explain the major themes organising the human body including scale, concept of surface area to volume ratio and examples of it in operation in the human body including the lungs, digestive tract

# Topic 1

## Cell diversity

# Cell Theory

**What are the three parts to Theodor Schwann's cell theory?**

- 1. Organisms <- cells**
- 2. Cells = basic units of life**
- 3. Cells <- other cells**

# Cell Theory

**What are the two major classes of cells?**

**1. Prokaryotes**

- 'single celled organism'
- Weird looking things that live on their own

**2. Eukaryotes**

- 'multicellular organism'
- Typically more complex (which needs more organization)

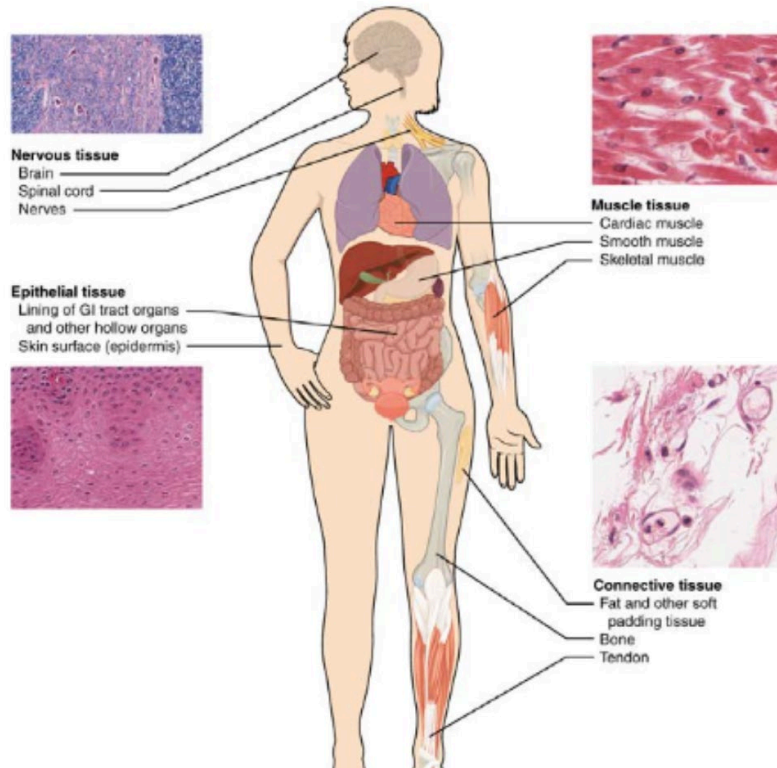
Characteristic	Prokaryote	Eukaryote
Nucleus	Absent	Present
Diameter of a typical cell	$\approx 1\mu\text{m}$	10–100 $\mu\text{m}$
Cytoskeleton	Absent	Present
Cytoplasmic organelles	Absent	Present
<a href="#">DNA</a> content (base pairs)	$1 \times 10^6$ to $5 \times 10^6$	$1.5 \times 10^7$ to $5 \times 10^9$
Chromosomes	Single circular <a href="#">DNA</a> molecule	Multiple linear <a href="#">DNA</a> molecules



## **Name 5 types of tissues**

- Epithelial tissue
- Connective tissue
- Muscle tissue
- Nervous tissue
- Adipose tissue

# Lecture 1: Types of tissues



## 1. Identify the three types of muscle tissue

1. What muscle tissues are under 'voluntary' control
2. What muscle tissues are under 'involuntary' control
3. What is responsible for 'involuntary' control of muscles?

## 2. This type of cell lines the GIT as well as the skin. What type of tissue is this?

1. What is the name of the cell type that lines the inside of your blood vessels?
2. Blood vessels can contract and relax – this is called vasocontraction and vasoconstriction. What does that imply about the cell-type composition of blood vessels?

## Lecture 1 - Apoptosis



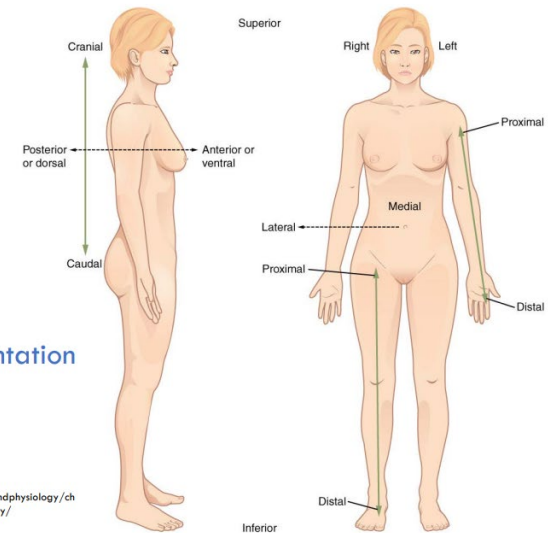
1. In the figure to the left, the child has **Syndactyly** - the fusion of digits. In fact, when we are all developing in our mother's wombs, our toes are all joined and webbed together. Explain what apoptosis is and how this sign relates to apoptosis.

# Orient yourself

What is the term for?

1. Towards the centre of your body?
2. Towards the sides of your body?
3. Towards the top of your body?
4. Towards the bottom of your body?
5. CLOSER towards the centre of your body
6. FURTHER from the centre of your body
7. The front of your body
8. The back of your body
9. Towards the top
10. Towards the bottom

A bit of orientation



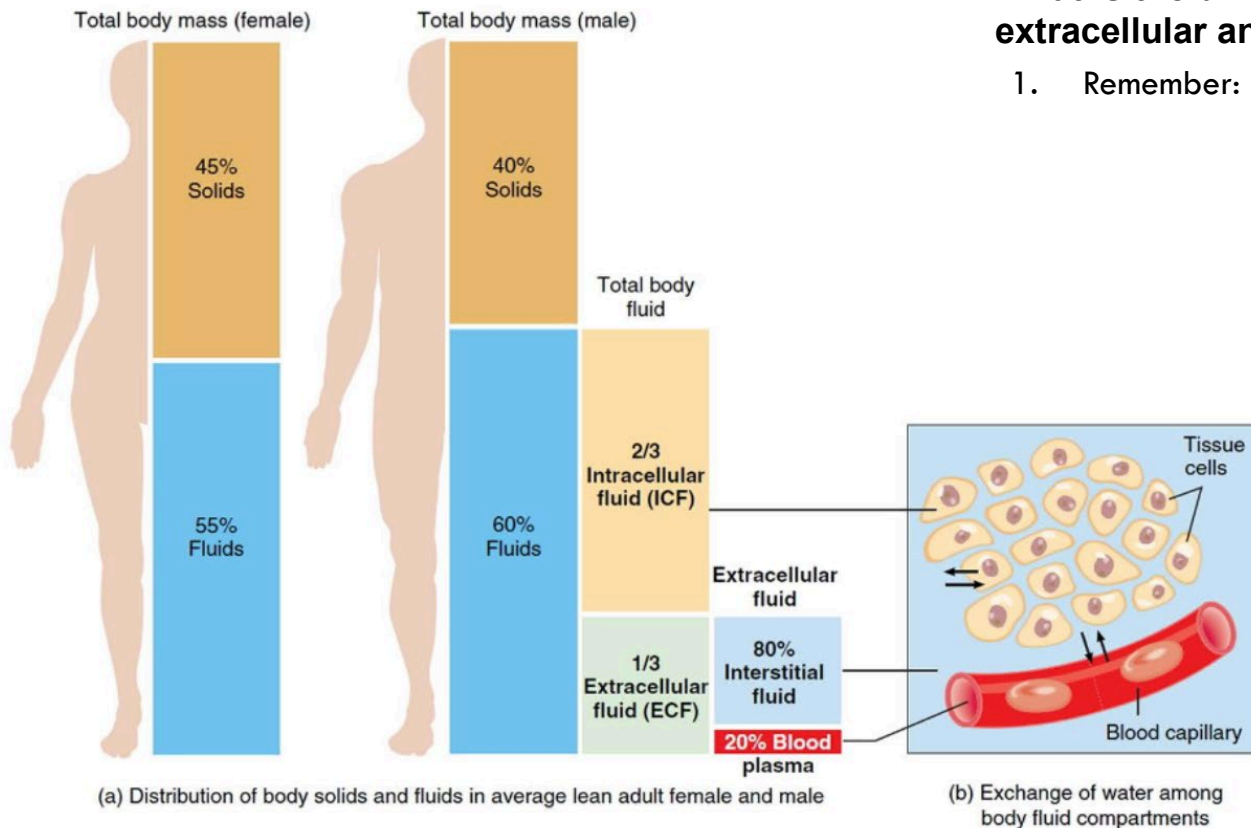
# Lecture 1 – Fluid distribution

1. Describe how much of our mass (as humans) is fluid, how much is intracellular and how much is extracellular

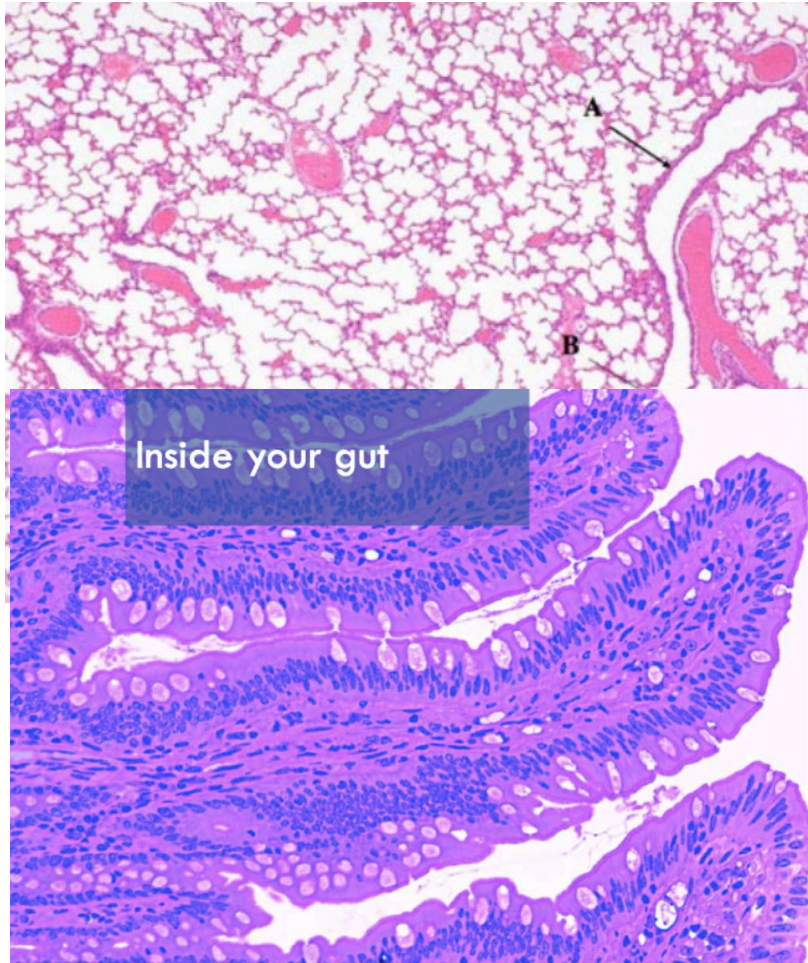
1. WHERE is this 'extracellular space'
2. Ok but where is it really?

2. What is the difference between extracellular and intracellular fluid?

1. Remember: The cell floats inside a sea



## Lecture 1 – High surface area ratios



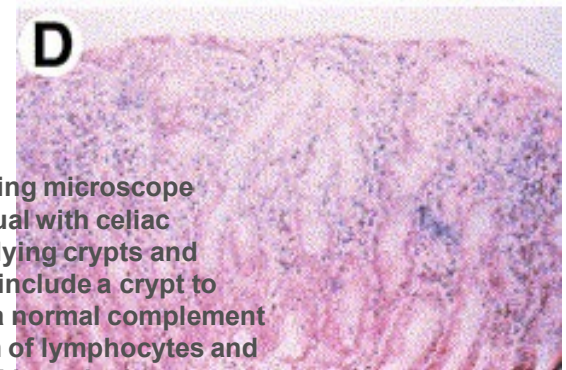
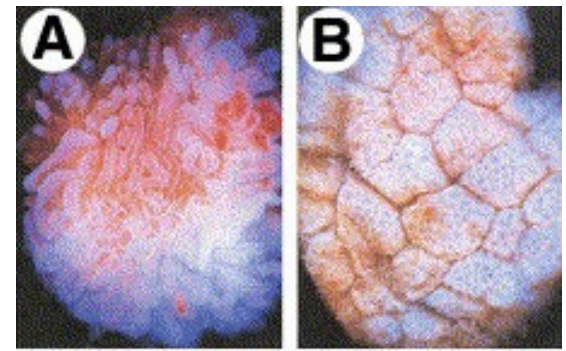
1. What structure in the lung is responsible for the massive surface area allowing for diffusion of O<sub>2</sub> into and CO<sub>2</sub> out of the blood?
2. What is the structure in the gastrointestinal tract (mainly in small intestine) which allows for absorption of nutrients from digested food?
  1. What is the structure made up of cells
  2. What is the structure incorporated in the cell?



## Clinical correlation – Coeliac disease

Coeliac disease is an intolerance towards gluten-based compounds in food. On consumption, the gastrointestinal tract of a patient with Coeliac's will undergo total villous atrophy. On microscopy, you will see a loss of villi (diagnostic).

Explain why a patient with coeliac's disease is at risk of experiencing malnutrition.



**Figure 1** Small intestinal mucosal biopsy. Small intestinal mucosal biopsy viewed through a dissecting microscope (A and B). The normal biopsy (A) shows numerous surface villi, whereas a biopsy from an individual with celiac disease and total villous atrophy shows, in place of the villi, numerous surface openings to underlying crypts and surface ridges (B). (C) H&E-stained section of a normal small intestinal mucosal biopsy. Features include a crypt to villous ratio of approximately 4–5:1, columnar villous epithelial cells with basally oriented nuclei, a normal complement of intraepithelial lymphocytes (approximately 1 per 6–10 enterocytes) and a normal representation of lymphocytes and plasma cells in the lamina propria characteristic of the “physiologic” inflammation in normal small intestinal mucosa. (D) A small intestinal mucosal biopsy from an individual with celiac disease and total villous atrophy. Note the abnormal surface epithelial cells that are flattened rather than columnar, the complete loss of villi, marked lengthening of the crypt compartment, the increase in intraepithelial lymphocytes, lymphocytes, and plasma cells in the lamina propria, and increased crypt mitoses.