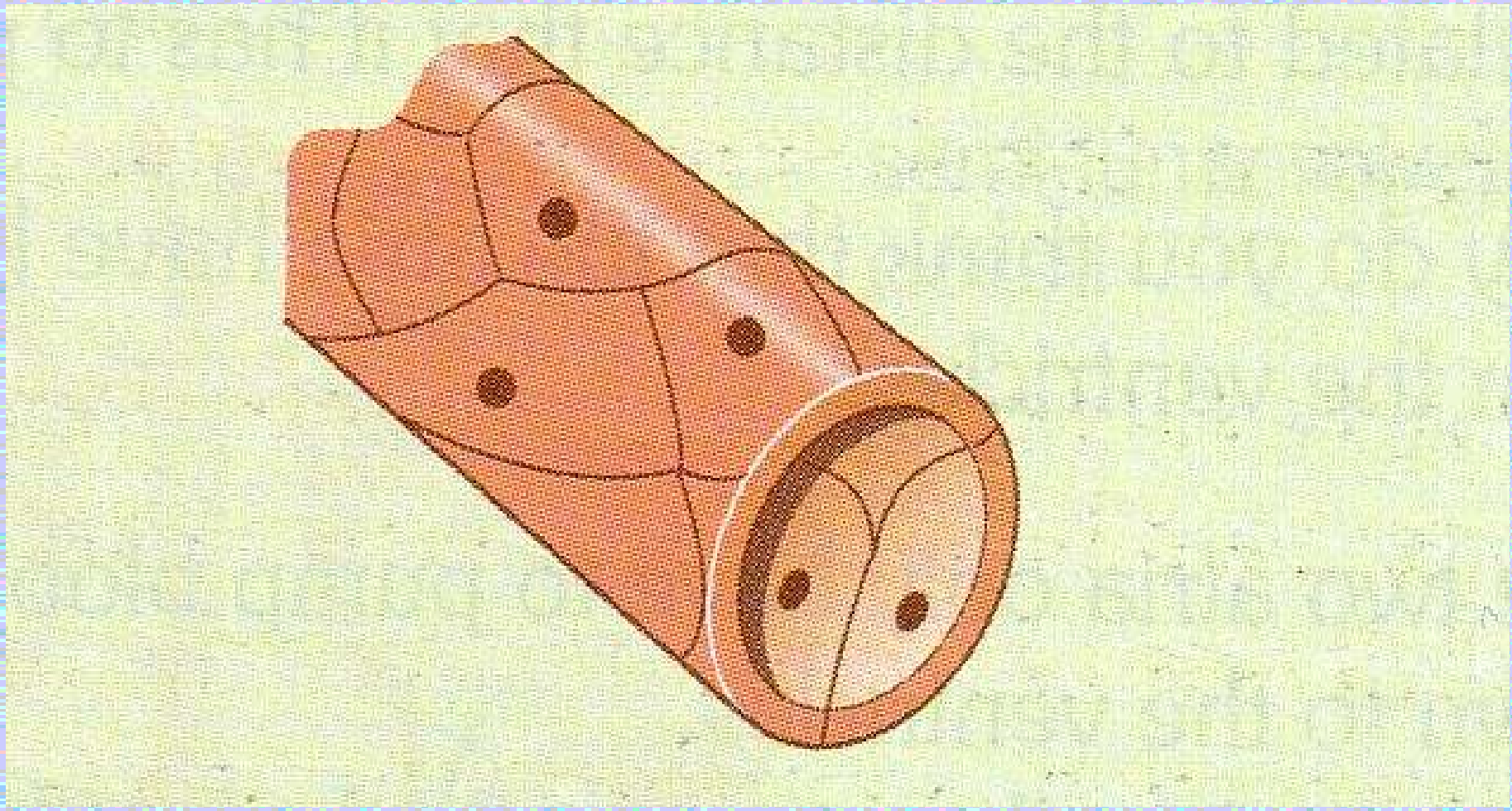
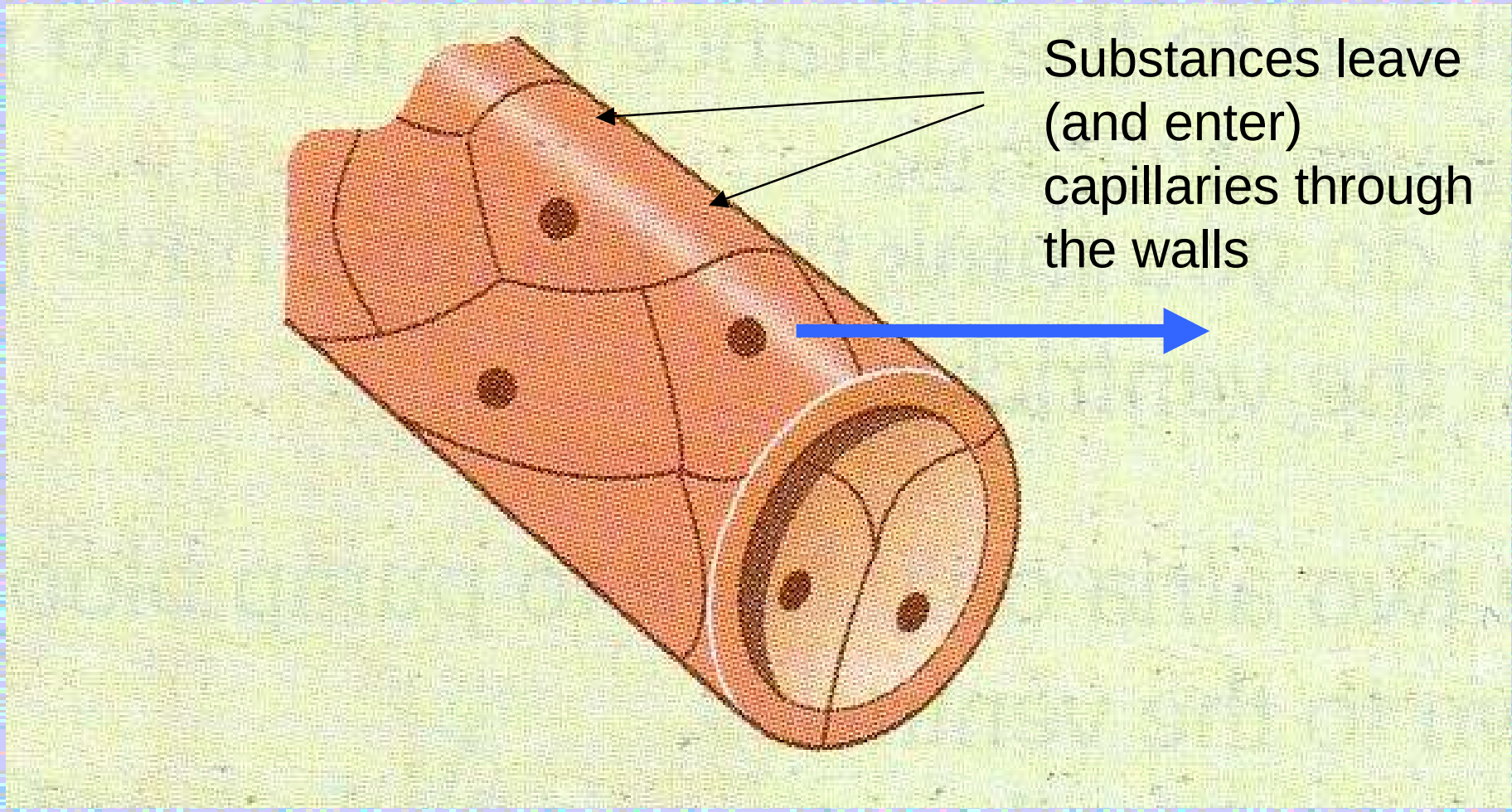
Tissue Fluid and Lymph

1. Exchange across the capillaries
2. Formation of tissue fluid
3. Lymph

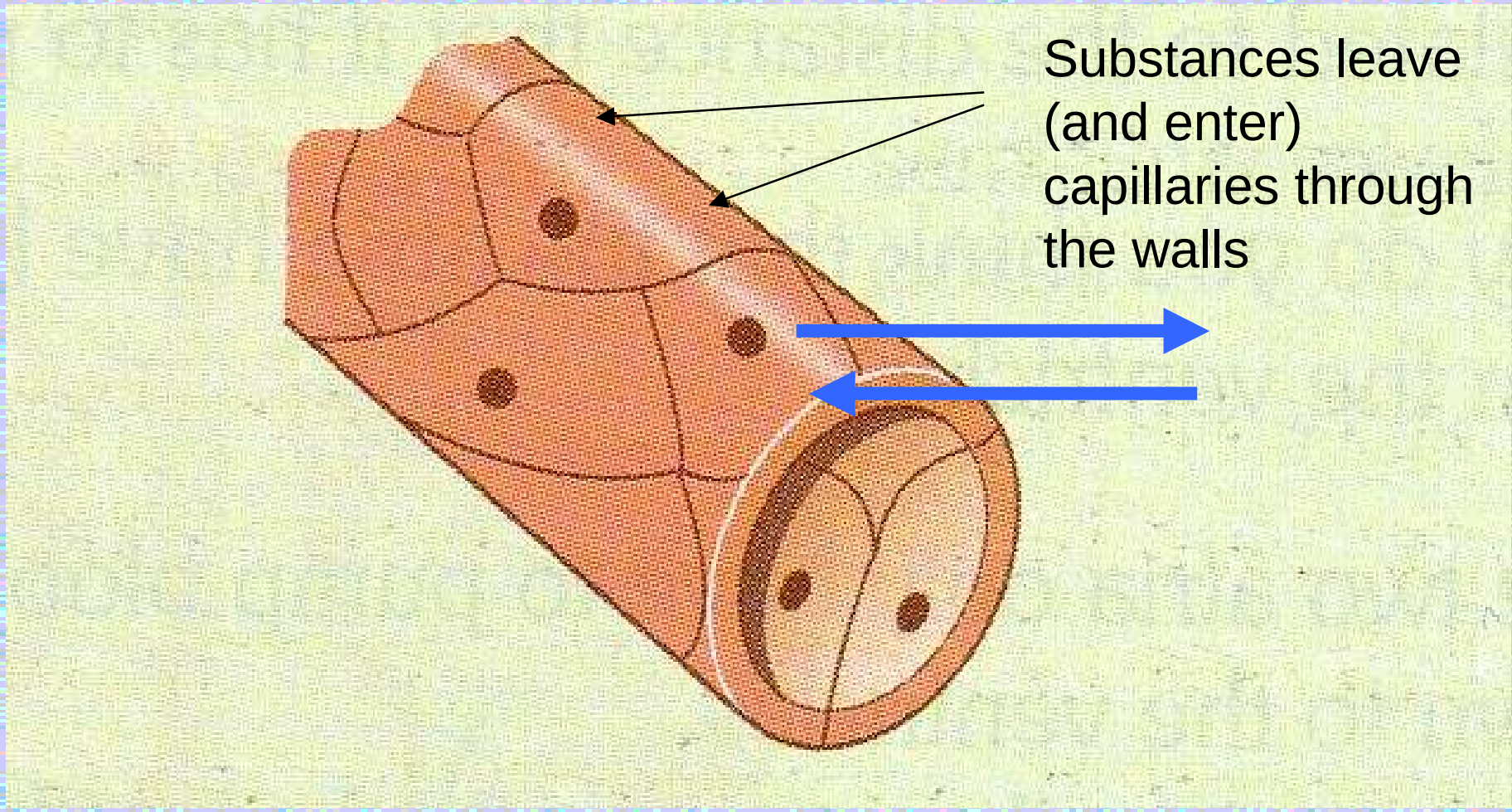
Exchange across the capillaries



Exchange across the capillaries



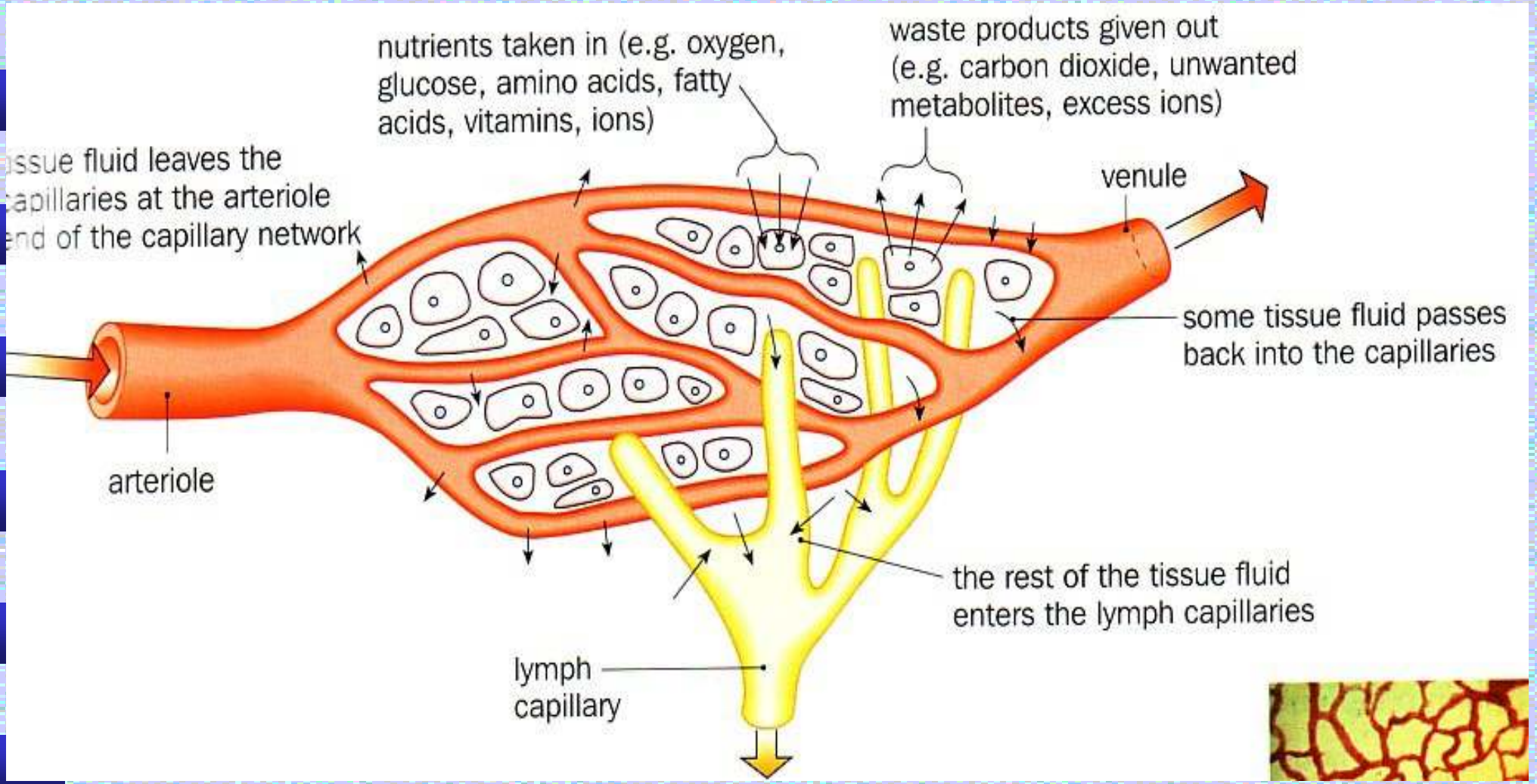
Exchange across the capillaries



Formation of tissue fluid

- As blood flows through the capillaries some plasma passes into the tissues
- This **tissue fluid** is very similar to plasma but does not have large plasma protein molecules in it. Why?
- This fluid bathes every cell in the body supplying them with glucose, amino acids, fatty acids, salts and oxygen

Exchange across the capillaries



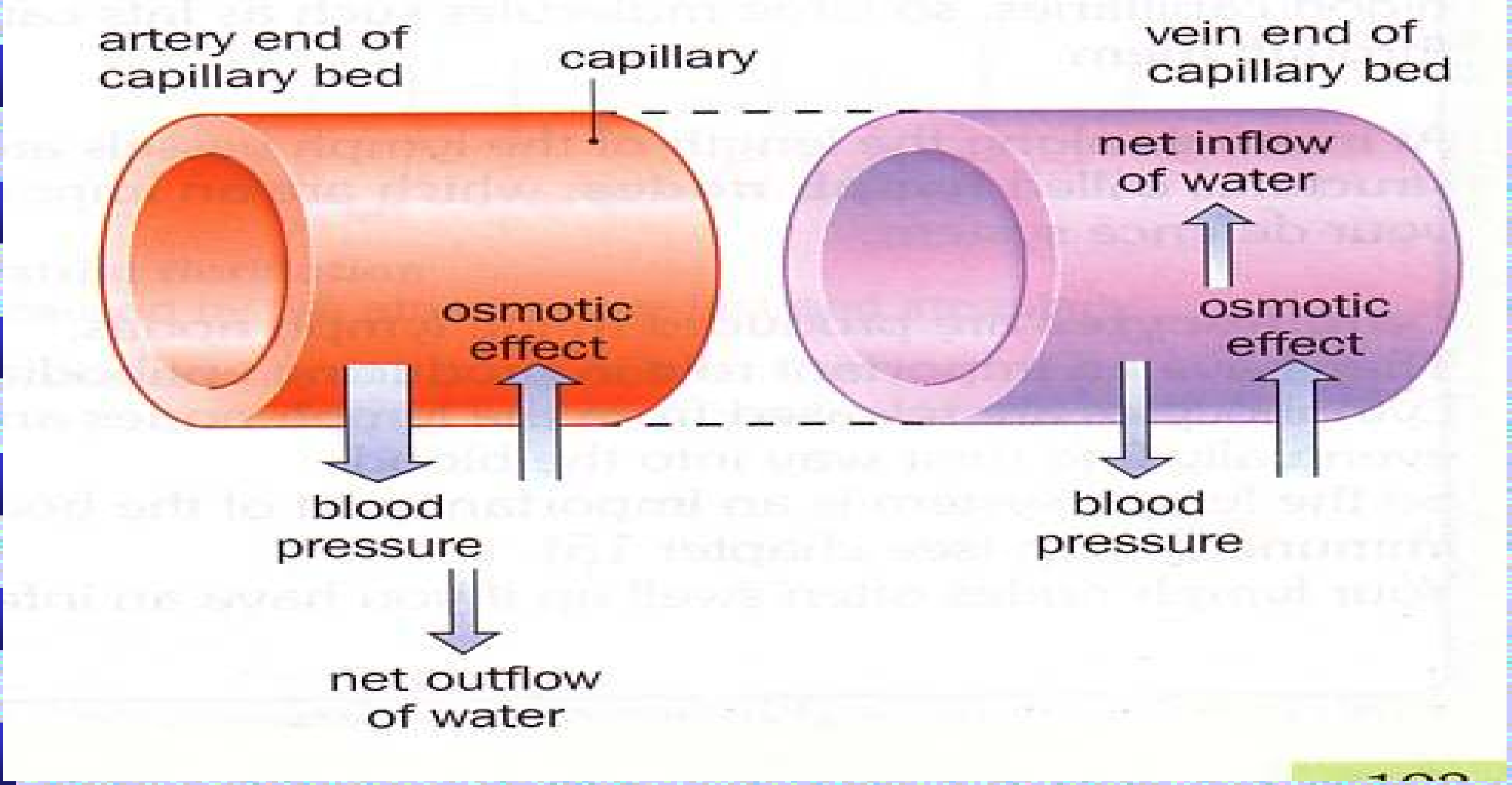
Formation of tissue fluid

- Tissue fluid also removes carbon dioxide an other waste material from cells
- As blood enters the narrow capillaries the build up of pressure forces water through the capillary walls into the cells.
- Other substances move out by diffusion or active transport

Formation of tissue fluid

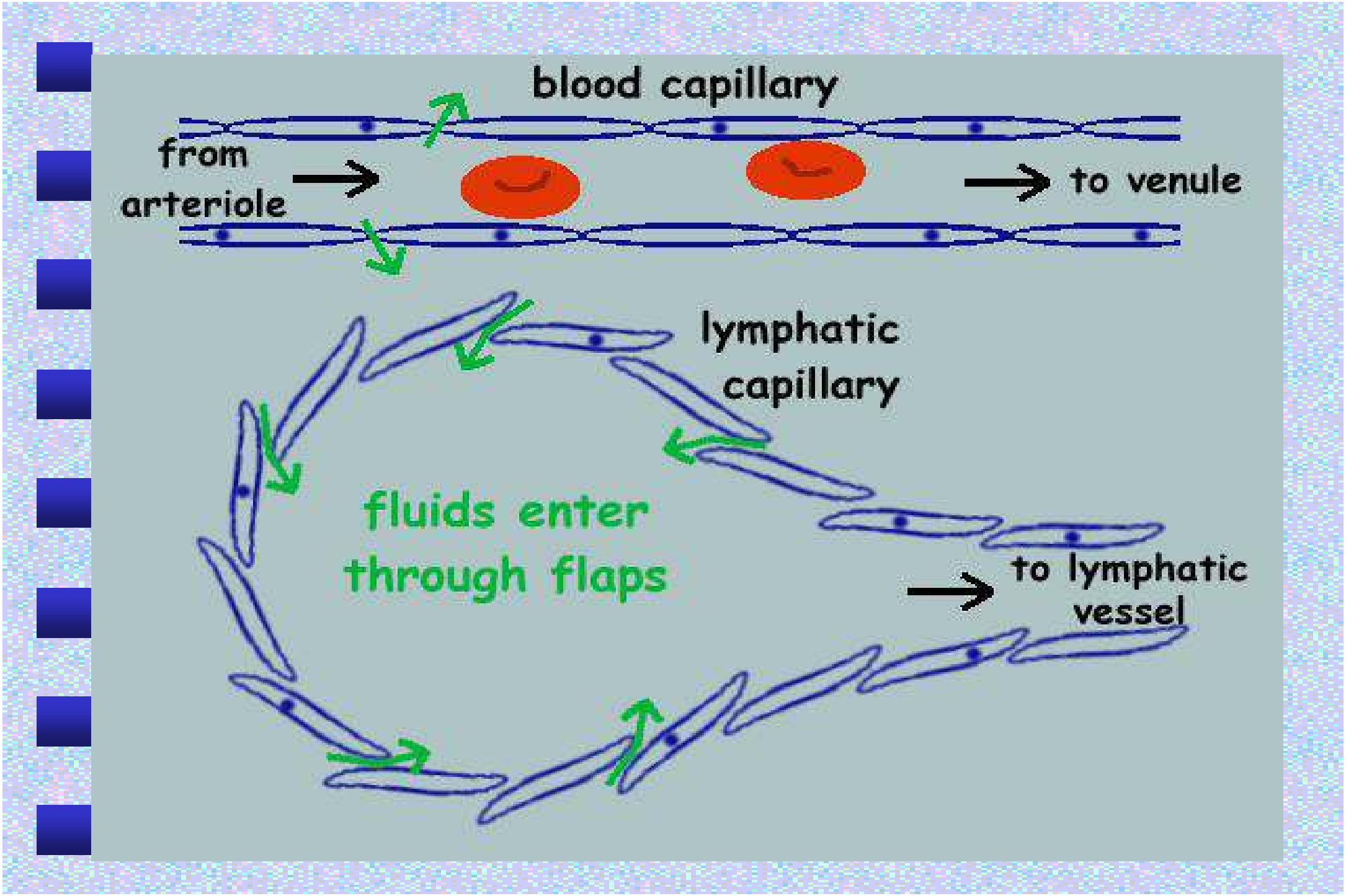
- As blood leaves the capillaries into has lost a lot of its water and so is far more concentrated
- So water passes back into the capillary by osmosis
- Waste products leave the cells and enter the capillaries by diffusion

Exchange across the capillaries



Lymph

- Not all the fluid returns to the blood capillary
- 10% enters a separate system of microscopic tubes called **lymph capillaries**
- These are part of the **lymph system**
- The lymph capillaries join to form **lymph vessels**
- Lymph vessels have valves that allow fluid to flow only in one direction that leads back to the blood system


blood capillary
from arteriole
to venule
lymphatic capillary
fluids enter through flaps
to lymphatic vessel

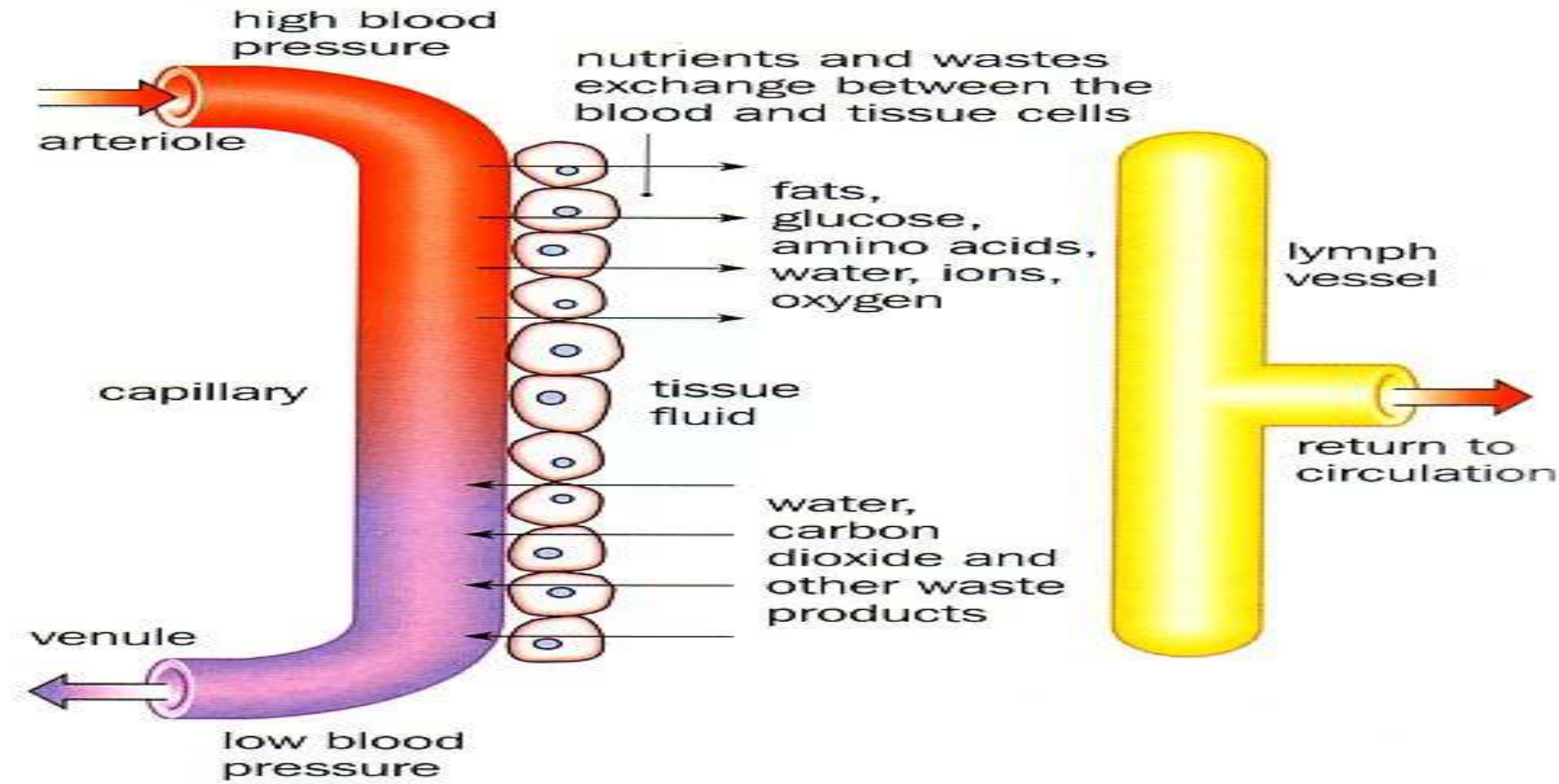
Lymph

Fluid in the

- Blood is called **plasma**
- Surrounding the cells is called **tissue fluid**
- In the lymphatic system is called **lymph**

- There is very little difference between these three!

Lymph



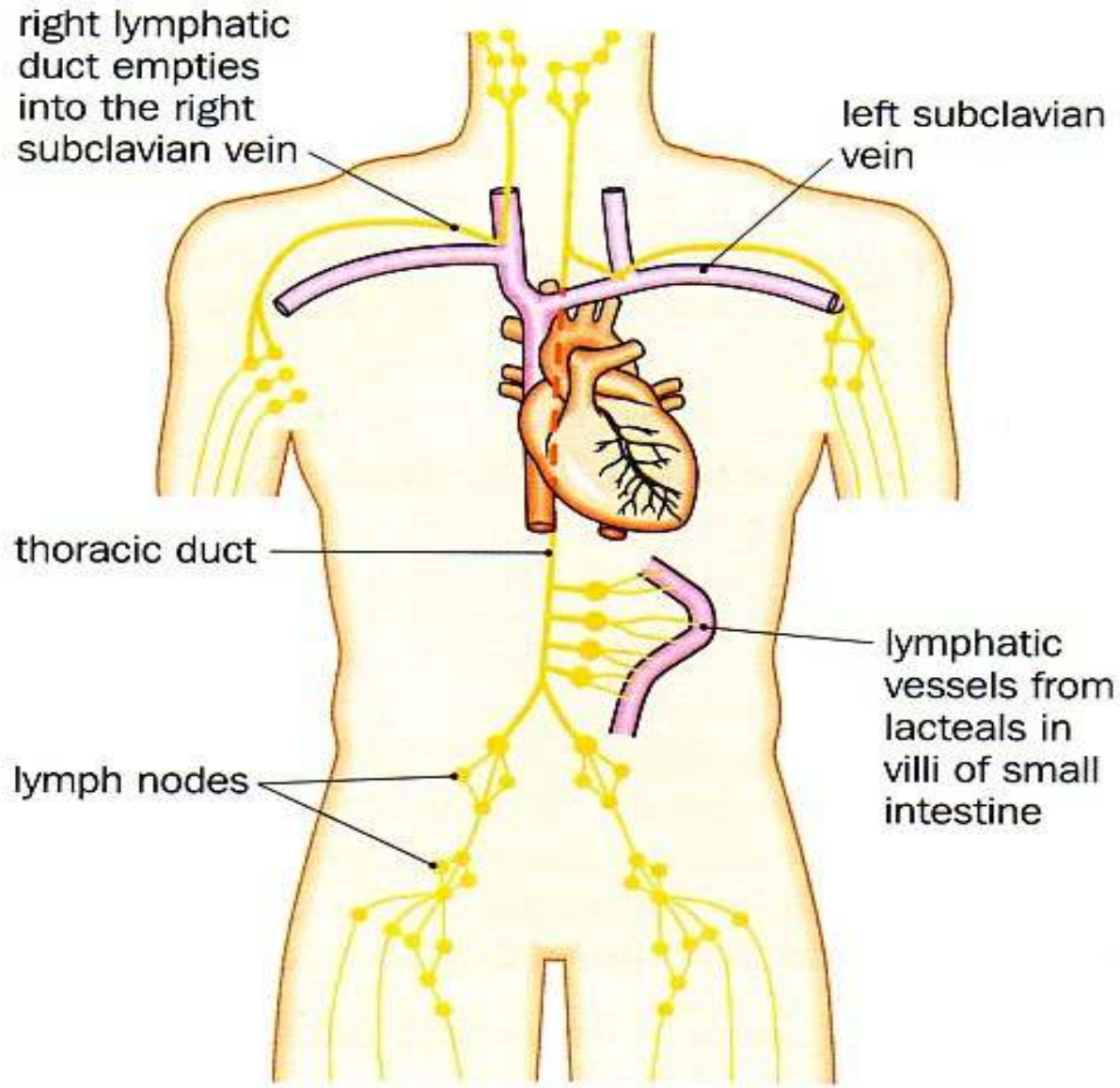
The relationship between blood, tissue fluid and lymph at a capillary network

Lymph

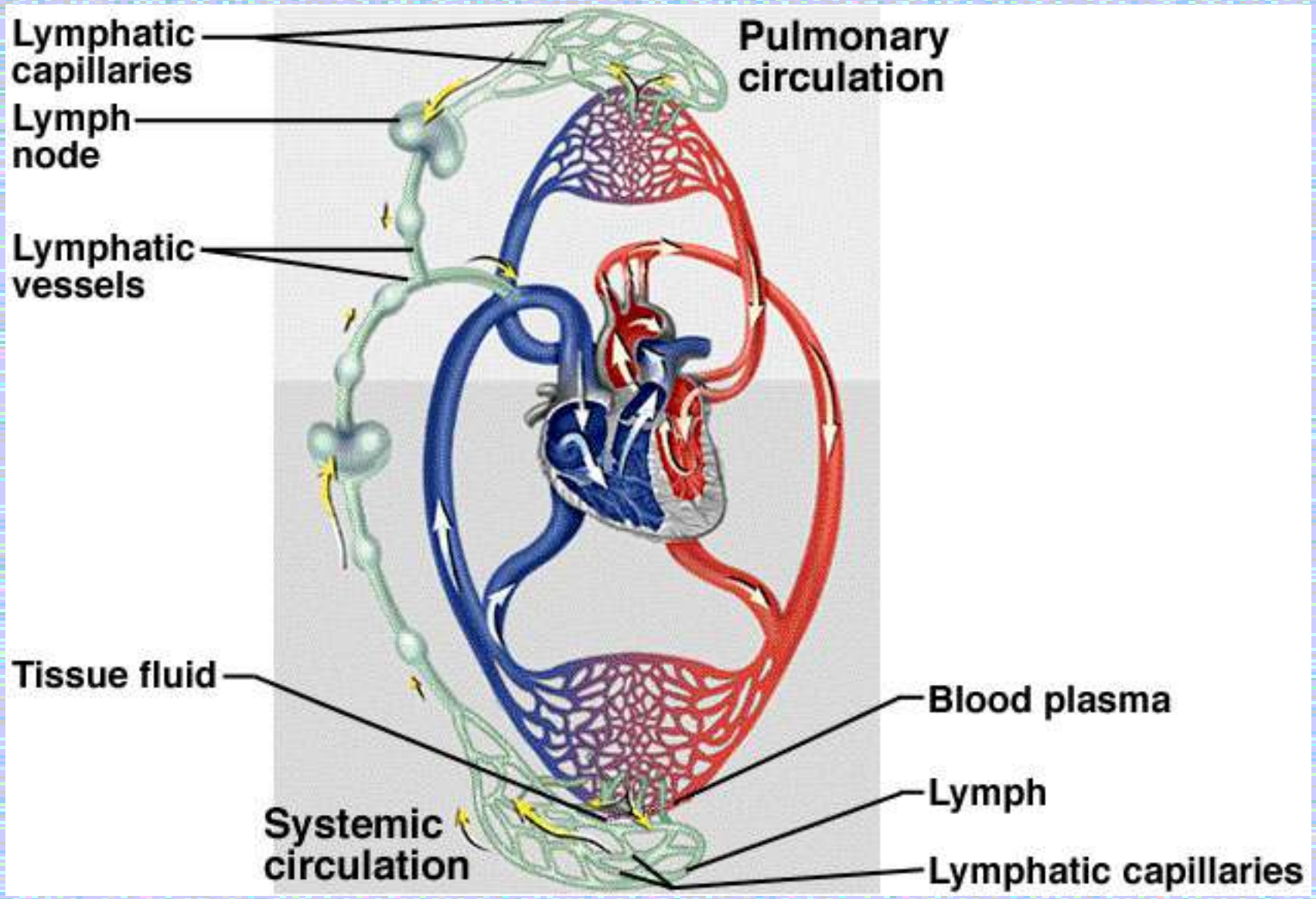
- Flow of liquid through the lymph system is very slow
- It depends on movement of our muscles, the valves in the vessels and the lower pressure in chest when we breath in.
- Flow is in one direction only, from tissues towards the chest where the lymph vessel join the blood sysem.

Lymph

- Most of the lymph re-enters the blood stream at the subclavian veins under the collar bones
- Lymph is a milky looking fluid
- Digested fat is absorbed into the lymph through the lacteals in the villi of the small intestine

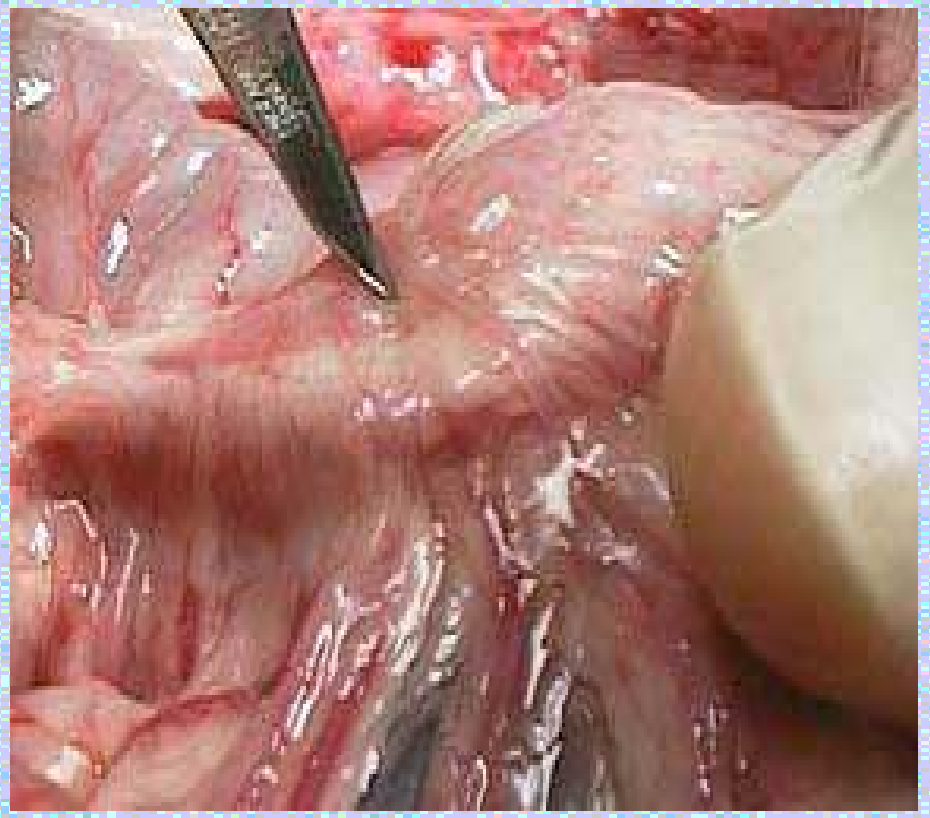


The lymph system

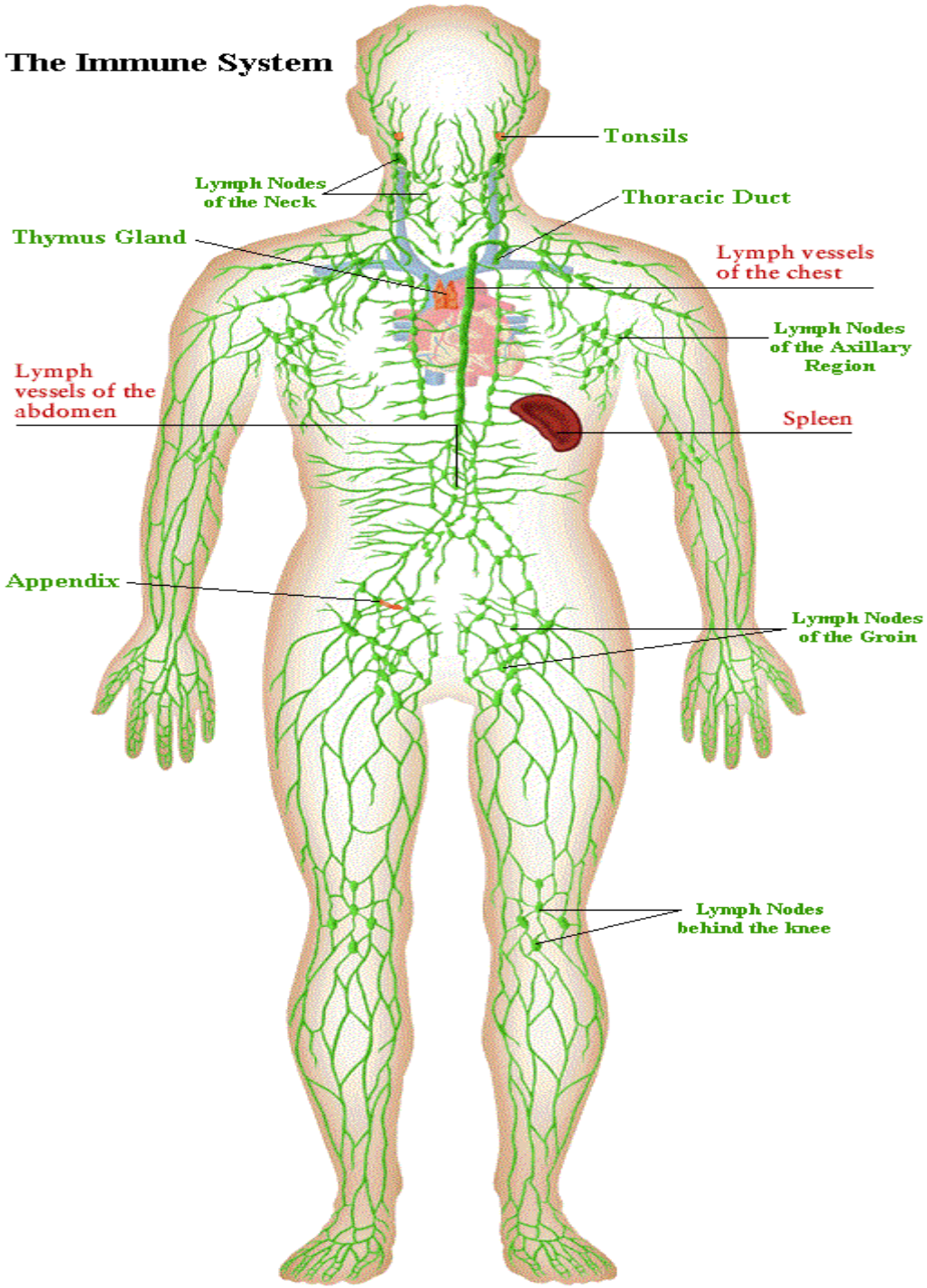

Lymphatic capillaries
Lymph node
Lymphatic vessels
Pulmonary circulation
Tissue fluid
Systemic circulation
Blood plasma
Lymph
Lymphatic capillaries

Lymph

- At intervals along the lymph vessels are structures called **lymph nodes**
- These are part of the immune system
- **Lymphocytes** are produced in the lymph nodes



The Immune System



Lymph

- Lymphocytes are white blood cells that produce antibodies
- The lymph nodes swell up at times of infection