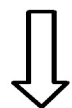
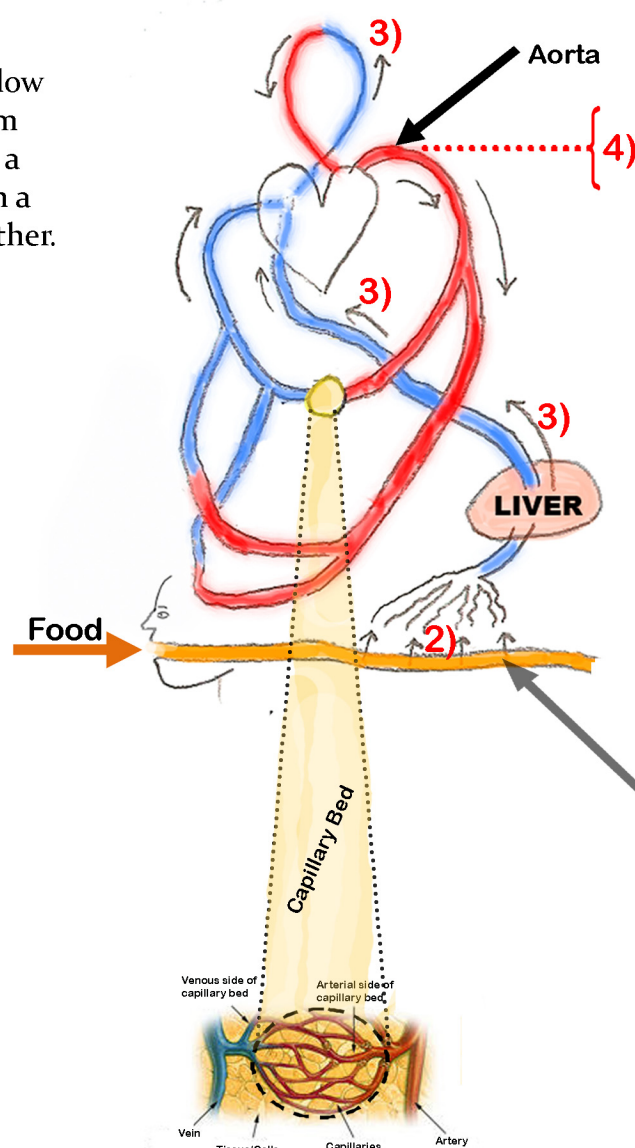


## How Oxygen & Food 'Come Together'

CONCEPT. Your heart and blood flow in your entire cardiovascular system comprise a closed loop system like a garden hose attached to itself, with a pump attaching the two ends together.



1) The passage of food from your mouth, through your entire digestive tract and out the anus is through a hole considered not inside of you and therefore separate from your body.



4) Oxygenated and nutrient rich blood exit into the aorta from the left ventricle of your heart. The aorta progressively breaks into progressively smaller diameter vessels, down to the smallest vessels called **capillaries**.

3) Nutrient rich blood is not yet oxygenated! It loops up to the lungs first, so at this point O<sub>2</sub> from air has not diffused into your bloodstream.

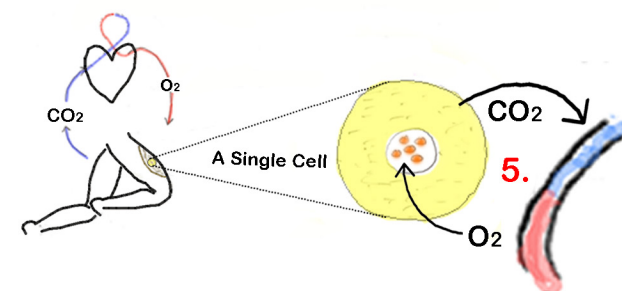
2) Protein (amino acids) and carbohydrate (glucose) - but not fat, absorb 'here' through your small intestine, go to the liver, and then up to the heart.

5. Your blood stream never comes into contact with your cells. The **capillary bed** is the physical destination where foods you have eaten may enter into 'who you really are'.

Nutrients, gases (e.g. O<sub>2</sub>, CO<sub>2</sub>, NO), and fuel substrate, must diffuse out of or literally leak out between gaps in the capillaries in order to 'feed' your cells.

6. The cell is where oxygen and food finally 'come together'.

Food + O<sub>2</sub> --> CO<sub>2</sub> + H<sub>2</sub>O + Heat



The slowest rate of blood flow is through the capillaries. The 'tradeoff' of oxygen and carbon dioxide occurs between the 'live/breathing' parts of your body, called cells, and the blood flowing through the capillaries.



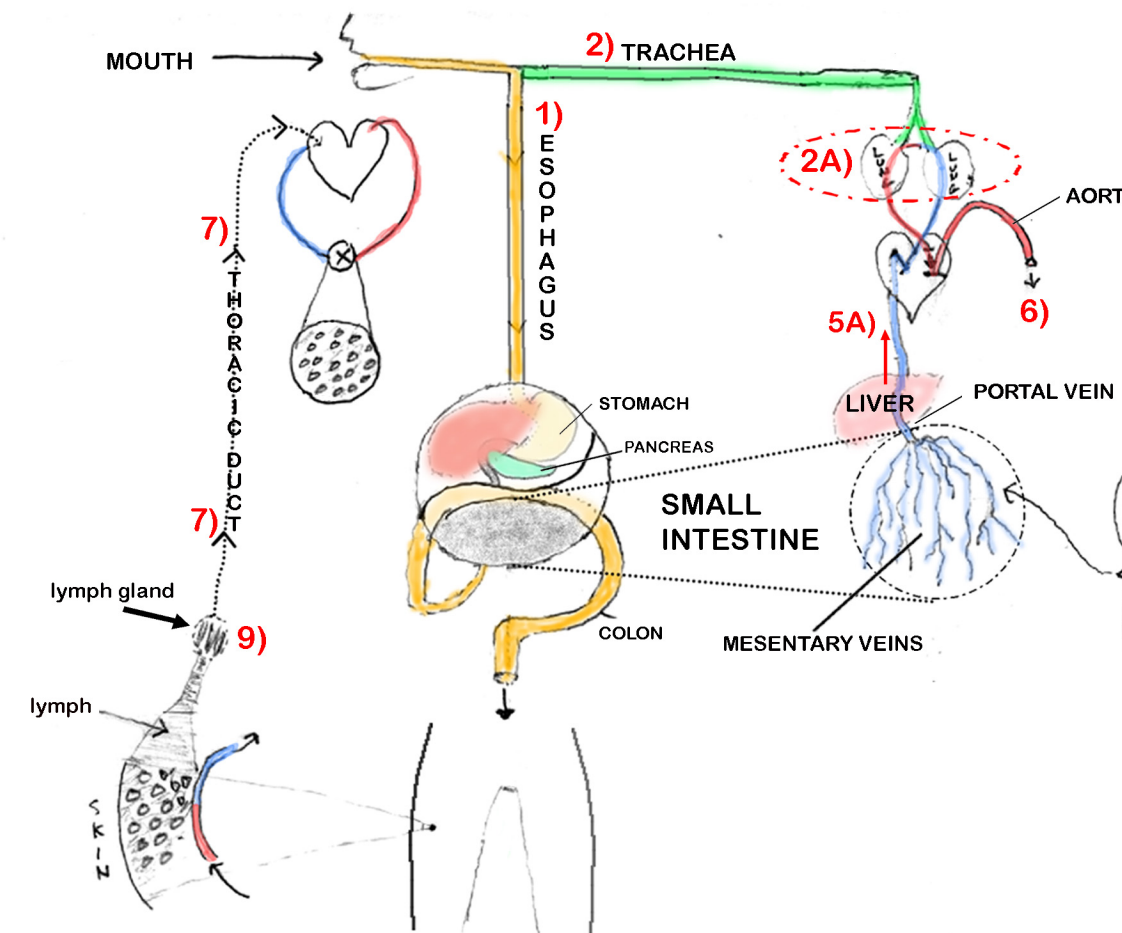
Oxygen breathed into your body remains in its gaseous elemental form within your blood until it combines with food stuff within your cells. Respiration is the sum total of all cell's 'breathing' and we call this **cellular respiration**.

CO<sub>2</sub> expired out of your cells diffuses back into the venous capillary and eventually out your mouth.

Functional nutrition is essentially the science of combusting food.

Respiration is the result of combusting food in a cell.

## The Anatomy of Food and Oxygen Delivery



1) Food enters your **esophagus**.

2) Air enters your **trachea**.

2A) O<sub>2</sub> from air diffuses into blood out of **alveoli** of lungs and into capillaries running through lungs.

3) Stomach acid breaks food down into a 'small chunks/liquified mass'.

4) Pancreatic **enzymes** breakdown protein into amino acids and carbohydrate to glucose.

5) Fat does NOT absorb here. These veins (the **mesentery system**) branch off your small intestines. They converge into one great vein called the **portal vein**, carrying nutrients to your liver for further processing BEFORE going to your heart.

5A) Nutrient rich blood from the liver remains unoxygenated before looping up into the lungs to receive O<sub>2</sub>.

6) Fuel substrate, O<sub>2</sub>, and other nutrients finally exit together into the 'general circulation' out the aorta.

### Special Remarks: On Fat, Lymph, and More

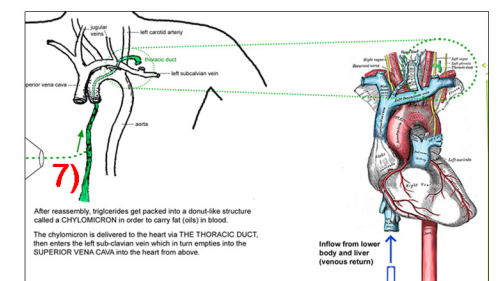
Fat, unlike carbohydrate or protein does not break down into smaller units. Fat from food remains virtually unaltered by the time it gets into your blood stream; approximately 95% of the fat eaten absorbs into the **7) thoracic duct** - not through your 'regular' digestive system. Recall, protein (amino acids) and carbs (glucose) absorb through your 'regular' digestive system, i.e. the **mesentery system/veins**.

The thoracic duct collects all the **lymph** from your lower body. From the lower body, lymph travels up behind the aorta toward your left collar bone, connects with the left subclavian vein, and finally drains across and down into the right atrium of your heart.

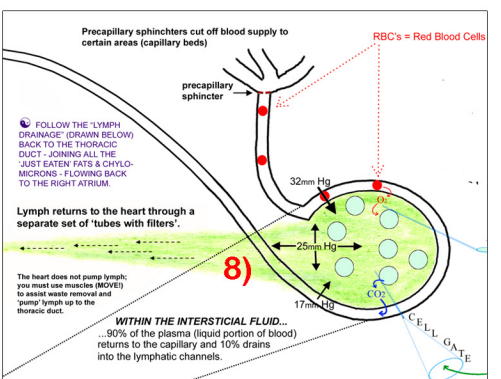
The space between your cells and capillaries used to be called the lymph until around 1912. It is now called **8) extracellular fluid (ECF)** or **interstitial fluid**. Approximately 10% of the blood plasma remains in the **lymphatic channels**, while around 90% of the blood flowing past your cells remains within your cardiovascular system. From this point, the capillaries become progressively larger upon returning to your heart.

The lymphatic channels connect to a series of bulbous shapes called **9) lymph glands** where the white blood cells reside in the highest concentration within your body.

See Grand Schematic: Panels 2 & 3



See Grand Schematic: Panels 5 & 6



### IMPORTANT TO KNOW:

Cells are like farmed raised salmon; each 'eat' and produce waste in the same watery medium in which they live. The proverbial statement, "(Do not) poop where you eat" describes the immediate environment of your cells. A true **'cleansing diet'** is one that first removes wastes and toxins out of cells **and then out of the blood**. Your kidneys filter blood, and you urinate wastes (e.g. toxins, salts, pharmaceuticals) out.