

### Absorption of breakdown products in small intestine

**Carbohydrates**- absorbed as monosaccharides into capillaries of villi (glucose is taken up by active transport). Blood vessels drain into hepatic portal vein which carries blood to liver and the liver converts carbohydrates into glycogen which is stored in liver.

**Proteins**- absorbed into capillaries as amino acids which are taken up directly by cells which are synthesizing proteins. Excess is de-aminated by liver which uses nitrogen to form urea for excretion.

**Water, salts and alcohol**- maybe absorbed directly to underlying blood vessels irrespective of need, the excess is excreted by kidneys

**Fats**- absorbed as glycerol and neutralized fatty acids into lacteals and then via lymphatics back to major veins near the heart. Excess is stored in adipose tissue.

### **Digestive Glands**

The liver produces bile which enters the hepatic duct and into the gall bladder where it is stored. When needed the bile enters the bile duct and into the duodenum. Bile emulsifies fats, lipids and increase the surface area. Pancreas produces bicarbonate required to neutralize pH of chyme released from the stomach and bicarbonate enters the duodenum through the pancreatic duct.

### **Pancreas (Small Intestine Digestive Gland)**

<u>Enzyme</u>	<u>Substrate</u>	<u>End Product</u>
-Amylase	Carbohydrates	Maltose
-Lipase	Triacylglycerol	Fatty acids, glycerol
-Trypsin Chymotrypsin	Polypeptide bonds	Large Peptides
-Carboxypeptidases	COOH end of peptides	Small peptides + amino acids
-Aminopeptidases	NH <sub>2</sub> end of peptides	Small peptides + amino acids

### **5) Large Intestine (colon)**

-Absorption of water and inorganic ions

-Formation and storage of feces from indigestible material and periodically secreted through the rectum

### **Summary of Digestion...**

Carbohydrates > (amylase) > Disaccharides > (maltase/ sucrase/ lactase) > Monosaccharides

Proteins > (pepsin/trypsin) > Peptides > (peptidases) > Amino Acids

Fats (emulsified by bile) > (lipase) > Fatty Acid and Glycerol

Digestion converts large organic molecules present in food into small molecules that can pass through cell membranes.

### **Control of Digestive Secretion**

Hormonal and nervous control ensure sequential release of enzymes

-Salivation is under nervous control, it is triggered by arrival of food in the mouth and so is peristalsis and swallowing

-Food entering the stomach stimulates release of the hormone **gastrin** from the **stomach mucosa** into the blood and this causes release of HCl and pepsin from the stomach mucosa into the blood

-Acid in the duodenum causes release of the hormone **secretin** from **intestinal mucosa** into the blood and this causes the pancreas to release HCO<sub>3</sub><sup>-</sup> (bicarbonate) and the gall bladder to release bile

### **Respiration**

Animals rely on aerobic metabolism (requiring O<sub>2</sub>) to sustain their resting energy requirements (20 times as much ATP is synthesized by aerobic metabolism compared to anaerobic metabolism)