

## **Secretion of Bile by the Liver; Functions of the Biliary Tree**

### **Composition of bile:**

Bile is a dark green to yellowish brown fluid produced by liver.

It contains:

- Water (97-98%)
- Bile salts (0.7%)
- Bilirubin (0.2%)
- Fats (0.51%)

### **Function of bile secretion**

Bile Is Important for

(1) Fat Digestion and Absorption and

(2) Waste Product Removal from the Blood

- Fat digestion and absorption. Bile salts help emulsify the large fat particles into minute particles that can be attacked by the lipase enzyme secreted in pancreatic juice. They also aid in the transport and absorption of the digested fat end products to and through the intestinal mucosal membrane.

- Waste product removal. Bile serves as a means for excretion of several important waste products from the blood, especially bilirubin, an end product of hemoglobin destruction, and excess cholesterol synthesized by the liver cells.

### **Regulation of biliary secretion:**

#### **Bile Is Secreted in Two Stages by the Liver**

- The initial portion, which is secreted by liver hepatocytes, contains large amounts of bile acids, cholesterol, and other organic constituents. It is secreted into the minute bile canaliculi that lie between the hepatic cells in the hepatic plates.

- A watery solution of sodium and bicarbonate ions is added to the bile as it flows through the bile ducts. This second secretion is stimulated by secretin, causing increased quantities of bicarbonate ions that supplement pancreatic secretions for neutralizing gastric acid.

#### **Bile Is Concentrated in the Gallbladder.**

Active transport of sodium through the gallbladder epithelium is followed by secondary absorption of chloride ions, water, and most other soluble constituents. Bile is normally concentrated about fivefold in this way.

## **Cholecystokinin Stimulates Contraction of the Gallbladder.**

Fatty foods that enter the duodenum cause cholecystokinin to be released from the local I-cells. Cholecystokinin causes rhythmical contractions of the gallbladder and simultaneous relaxation of the sphincter of Oddi, which guards the exit of the common bile duct into the duodenum.

### **Secretions of the Small Intestine:**

Brunner's Glands Secrete Alkaline Mucus in the Small Intestine. Secretion of mucus is stimulated by the following:

- Tactile stimuli or irritating stimuli of the overlying mucosa
- Vagal stimulation, which causes secretion concurrently with an increase in stomach secretion
- Gastrointestinal hormones, especially secretin

### **Mucus Protects the Duodenal Wall from Digestion by Gastric Juice.**

Brunner's glands respond rapidly and intensely to irritating stimuli. In addition, secretin stimulated secretion by the glands contains a large excess of bicarbonate ions, which add to the bicarbonate ions from pancreatic secretion and liver bile in neutralizing acid that enters the duodenum.

### **Intestinal Digestive Juices Are Secreted by the Crypts of Lieberkuhn.**

The crypts of Lieberkühn lie between the intestinal villi, and the intestinal surfaces of both crypts and villi are covered by an epithelium composed of two cell types.

- Goblet cells secrete mucus, which provides its usual functions of lubrication and protection of the intestinal mucosa.
- Enterocytes secrete large quantities of water and electrolytes in the crypts. They also reabsorb the water and electrolytes along with the end products of digestion over the surfaces of the villi.