

# Diseases of the bile duct

## Biomedical Engineering - URJC

Rafa Carretero, MD, PhD

Internal Medicine Department

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# Anatomy of Bile System

## Bile

Produced by the liver, transported via bile ducts.

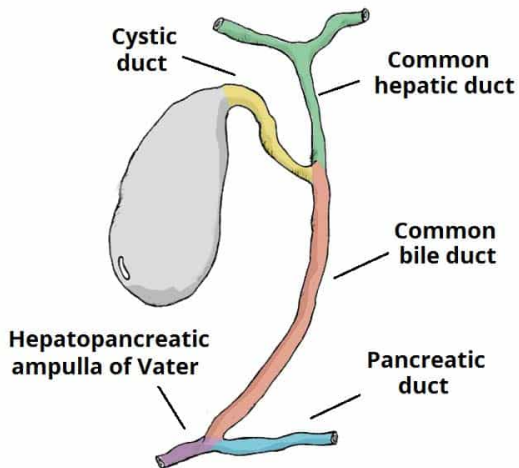
## Biliary Tree

Right and left hepatic ducts merge into common hepatic duct, combining with the cystic duct to form the common bile duct.

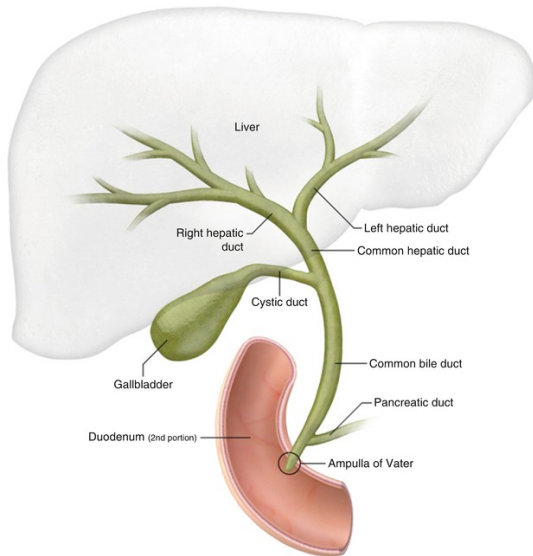
## Function

Bile aids fat digestion, is stored in gallbladder, then released to duodenum

# Anatomy of Bile System



# Anatomy of Bile System



# Symptom: Jaundice

## Jaundice



Jaundice is a condition that causes yellowing of the skin and eyes. It occurs when there is a buildup of bilirubin, a yellow pigment that is produced when red blood cells break down, in the blood. When the levels of bilirubin become too high, it can cause jaundice.

# Symptom: Jaundice

## Jaundice in other languages

- Italian: Ittero
- French: Jaunisse
- German: Gelbsucht
- Nederlands / Dutch: Geelzucht
- Turkish: Sarılık

## Jaundice

- Jaundice: **Yellow discoloration** due to bilirubin accumulation.
- Bilirubin Components: Unconjugated and conjugated.
- Pathophysiology: Bilirubin metabolism stages explained.

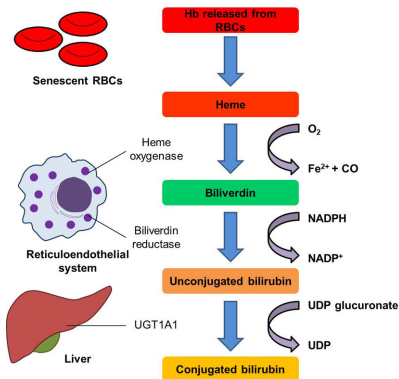
# Bilirubin metabolism

- 1 **Production:** Bilirubin is released by red blood cells.
- 2 **Hepatic uptake:** Bilirubin in its unconjugated form gets transported to the liver.
- 3 **Conjugation of bilirubin:** Bilirubin binds to glucuronic acid in the liver.
- 4 **Bile secretion** from liver into the gut.

# Symptom: Jaundice

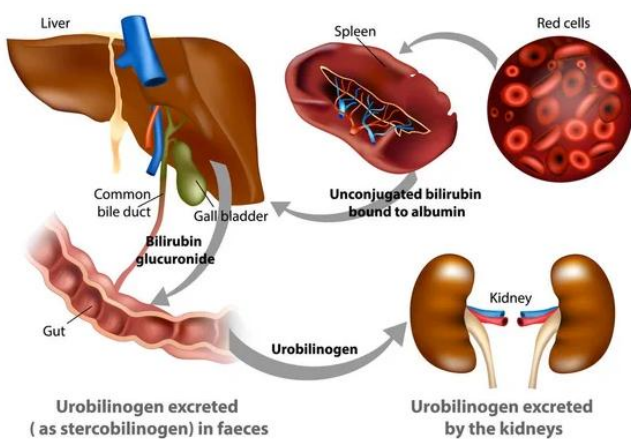
## Bilirubin Production

- Originates from senescent or defective red blood cells
- Released during the death of red blood cells, typically in the spleen





# Symptom: Jaundice



# Symptom: Jaundice

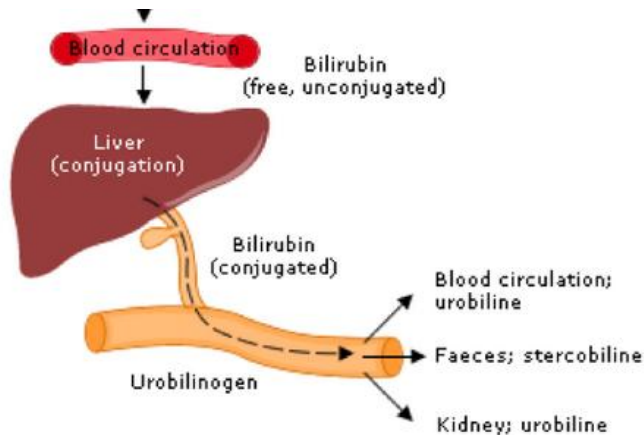
## Hepatic uptake

- Unconjugated bilirubin transported to the liver

## Conjugation of bilirubin

- 1 Unconjugated bilirubin undergoes conjugation to glucuronic acid
- 2 Formation of soluble conjugated bilirubin, which binds to glucuronic acid

# Symptom: Jaundice

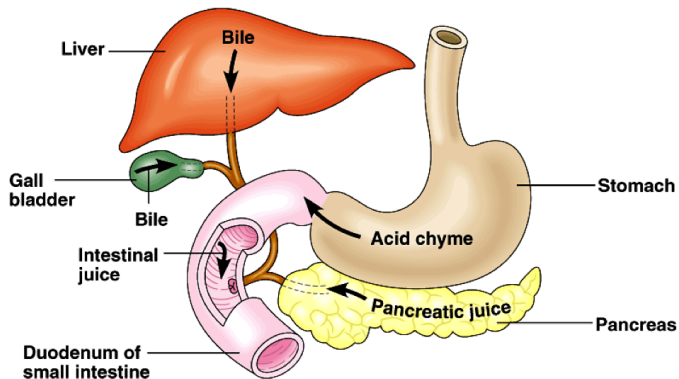


# Symptom: Jaundice

## Conjugation of bilirubin

- 1 Conjugated bilirubin released into the bile duct
- 2 Stored in the gallbladder, enters the small bowel, and reaches the colon

# Symptom: Jaundice



# Symptom: Jaundice

- 1 Production
- 2 Hepatic uptake
- 3 Conjugation of bilirubin
- 4 Bile secretion from liver

## Dysfunction in the first two phases

Results in elevated unconjugated bilirubin

## Dysfunction in the last two phases

Results in elevated conjugated bilirubin

## Diseases of the bile duct

Jaundice is related to elevated **conjugated** bilirubin

## Conjugated Hyperbilirubinemia (**Cholestasis**)

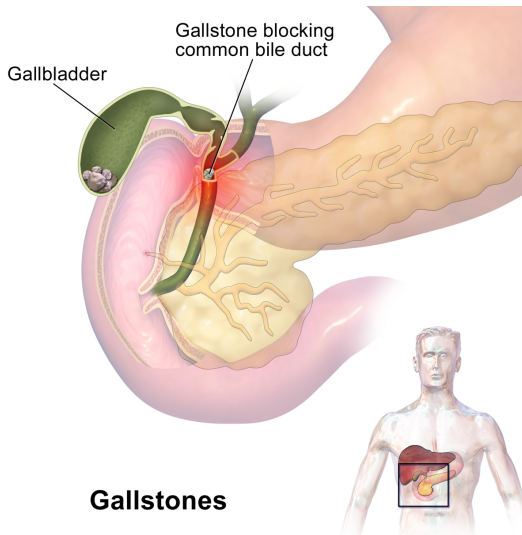
- Causes: Marked reduction in bile secretion and flow
- Biliary Obstruction: Common cause - gallstones obstructing ducts
- **Cholestasis** due to functional impairment of hepatocytes or obstruction in the excretory pathway
- Consequences: Jaundice, acholic stools (pale, white stools), infectious complications.

# Clinical Significance

- 1 **Cholelithiasis** means gallstones present within the gallbladder, which can cause...
- 2 **Biliary colic** is the intermittent, dull pain due to transient blockage of bile flow, which can cause...
- 3 **Choledocholithiasis** means gallstones situate within the common bile duct, which can cause...
- 4 **Gallstone pancreatitis** is pancreatic inflammation from gallstone blockage of the pancreatic duct
- 5 **Cholangitis** is an infection of the bile ducts
- 6 **Cholecystitis** is inflammation of the gallbladder due to prolonged obstruction of the cystic duct



# Clinical Significance



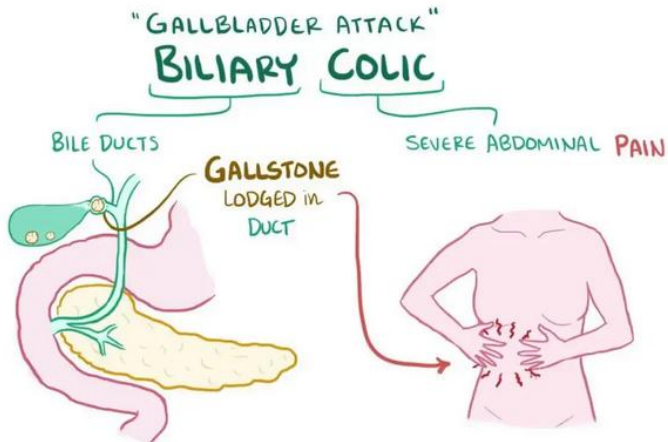
# Cholelithiasis

- **Gallstones:** Hardened deposits in gallbladder.
- Complications: Cholecystitis, cholangitis, choledocholithiasis, gallstone pancreatitis.
- Composition: Bilirubin, bile lipids, cholesterol.

# Biliary Colic

- **Abdominal pain** due to transient bile flow blockage.
- Triggered by large, fatty meals.
- Treatment: Primarily surgical, gallbladder removal.

# Biliary Colic



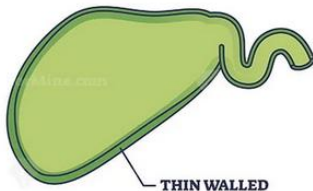
# Infectious complications

- Acute Cholecystitis: Inflammation due to cystic duct occlusion.
- Acute Cholangitis: Life-threatening bacterial infection of the biliary tree.
- Diagnosis: Clinical presentation, laboratory results, imaging studies.

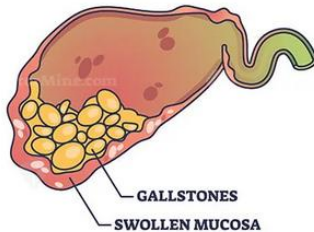
## CHOLECYSTITIS



**HEALTHY  
GALLBLADDER**

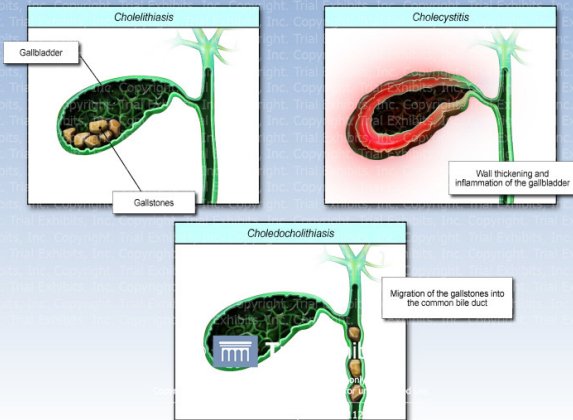


**INFLAMED  
GALLBLADDER**



# Infectious complications

## Cholelithiasis, Cholecystitis and Choledocholithiasis



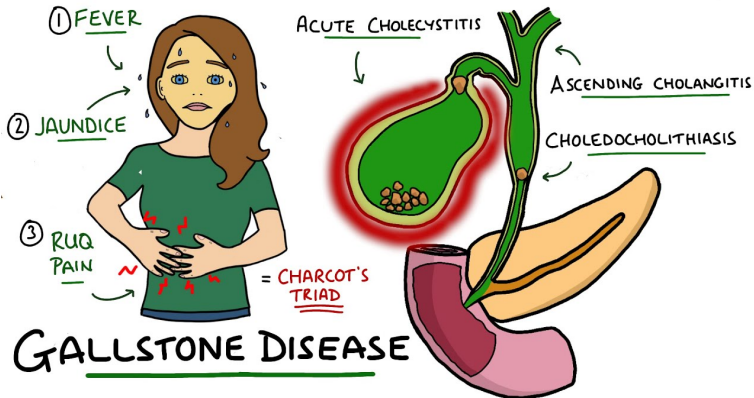
# Diagnosis

## Gallstone diseases

- Presentation: Right upper quadrant pain, bloating, food intolerances, fever if infected.
- Lab Tests: Elevated WBC, liver enzymes, bilirubin. CT scan and ultrasound for imaging.



# Infectious complications



# Treatment and Management

## Gallstone diseases

- Cholecystitis Management: Laparoscopic cholecystectomy.
- Emergency Cases: Immediate biliary drainage for sepsis.
- Biliary Decompression: Endoscopic retrograde cholangiopancreatography (ERCP) as gold standard.