
بسم الله الرحمن الرحيم

GIT Module

LGIS PHYSIOLOGY)

2nd Year MBBS (2025)

Liver Function Test, Portal HTN, Jaundice, Portal HTN

Dr. Ali Zain
PGT physiology

Date: 00-00-0000

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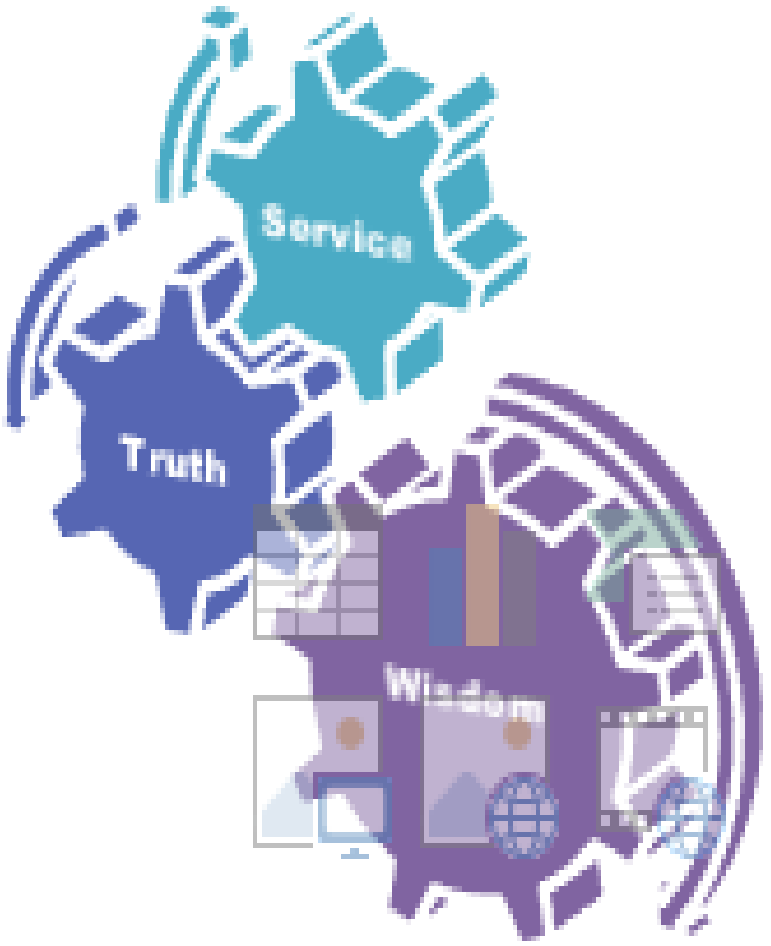
Vision; The Dream/Tomorrow

To impart evidence-based research oriented medical education

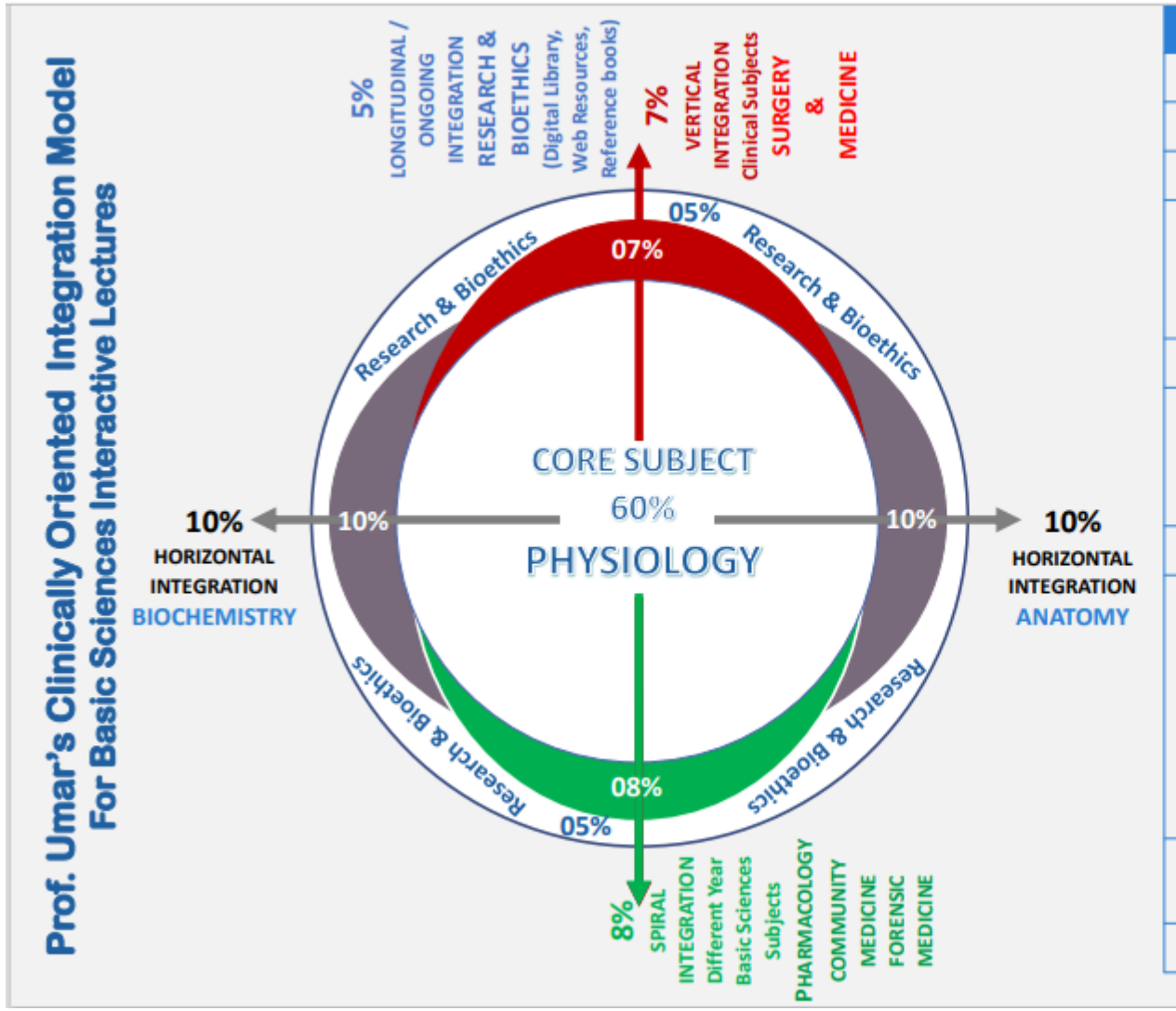
To provide best possible patient care

To inculcate the values of mutual respect and ethical practice of medicine



General Format for Large Group Interactive Session of Physiology:

S. No.	Headings	Domains/Type of Integration	Approximate %
1.	Title	• Introduction of GIT • Concept about it's Electrical Activity • Enteric Nervous System & GIT Reflexes	Lecture No.1 out of 10
			slide
3.	Physiologic Anatomy (Histology)	• Brain Storming/ Horizontal Integration • Interactive	15%
4.	Core Concepts of the Topic	Core concepts of Physiology	60%
5.	Concept explained through Animations	Core Concepts of Physiology	10%
	topic with key	• Interactive	
7.	Research article relevant to the topic with reference	• Promotion of research culture • Use of Digital Library • Critical Thinking • Self-directed Learning	5%
8.	PM&DC Code of Ethics/Professionalism/Communication Skills with reference	• Professional Ethics • Self-directed Learning • Interactive	5%



Model 1st Year PHYSIOLOGY LGIS (≈30 slides)	
Core Subject – 60% (≈ 18-20 slides)	
Physiology(≈ 18-20 slides)	
Horizontal Integration – 20% (≈ 5-6 slides)	
Same Year Subjects	• Anatomy (10%) (≈ 2-3 slides) • Biochemistry (10%) (≈ 2-3 slides)
Vertical Integration – 07% (≈ 2-3 slides)	
Clinical Subjects	• Medicine (3-5%) (≈ 1-2 slides) • Surgery (3-5%) (≈ 1-2 slides)
Spiral Integration – 08% (≈ 2-3 slides)	
Different Year Basic Sciences Subjects	• Pharmacology(1-3%) (≈ 1-2 slides) • Community Medicine (1-3%) (≈ 1-2 slides) • Forensic Medicine (1-3%) (≈ 1-2 slides)
Longitudinal / Ongoing Integration – 05% (≈ 1-2 slides)	
Research, Bioethics & AI(≈ 1-2 slides)	

BLOOM'S TAXONOMY : DOMAINS OF LEARNING

Sr. #	Domain of learning	Abbreviation	Levels of the domain	Meaning
1	cognition	C	C1	Recall / Remembering
2			C2	Understanding
3			C3	Applying / Problem solving
4	Psychomotor	P	P1	Imitation / copying
5			P2	Manipulation / Follows instructions
6			P3	Precision / Can perform accurately
7	Attitude	A	A1	Receiving / Learning
8			A2	Respond / Starts responding to the learned attitude
9			A3	Valuing / starts behaving according to the learned attitude

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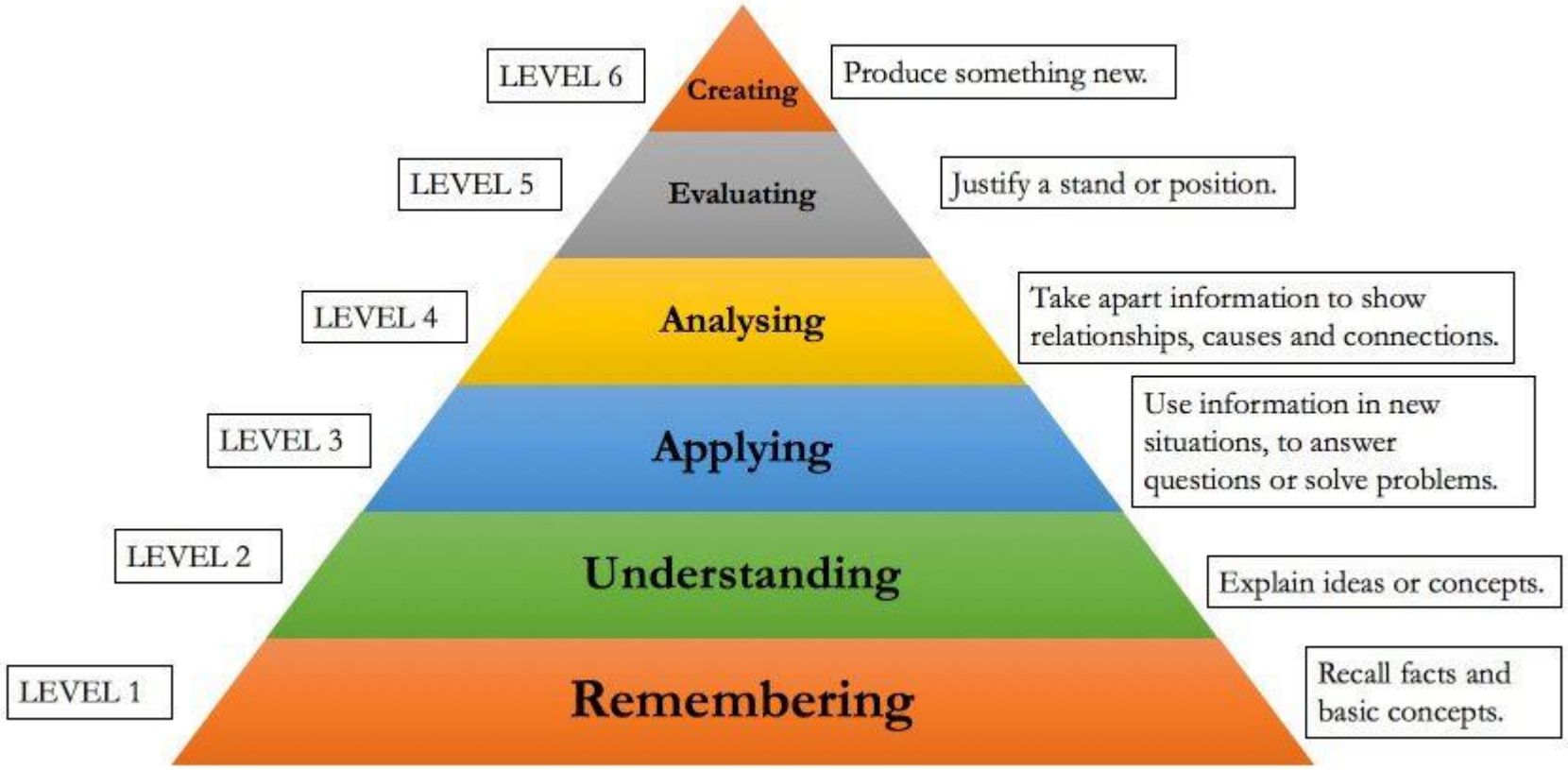
BLOOM'S TAXONOMY OF THE COGNITIVE DOMAIN



Learning objectives

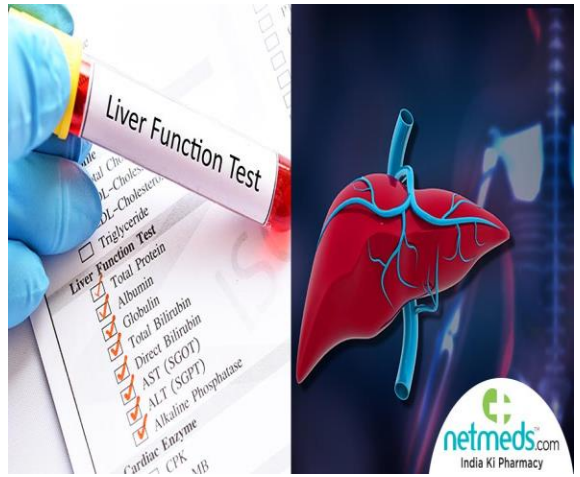
1. recall steps of erythropoiesis	**C1**
2. Recall structure of hemoglobin	C1
3. Describe fate of red blood cells In detail	C2
4. Describe metabolism of bilirubin	C2
5. Define jaundice, and elaborate its types	C1+C3
6. Enlist clinical features of jaundice	C3

Horizontal integration
(Anatomy)

Horizontal integration with Anatomy

Liver Function Tests

- Liver function tests (LFTs) measure various chemicals in the blood made by the liver. An abnormal result indicates a problem with the liver, and may help to identify the cause. Further tests may be needed to clarify the cause of the liver problem.



Liver Function Tests

- No one test reflects overall hepatic function.
- Each test generally reflects one aspect of hepatic function and must be interpreted in conjunction with other tests alone with clinical assessment of patient.
- Liver abnormalities can be divided into

1. Obstructive substances affect biliary excretion of substance.

2. Parenchymal - result in generalized hepatocellular dysfunction.

Horizontal integration with Anatomy /histology

Horizontal integration with Anatomy

As the liver performs its various functions, it makes chemicals that pass into the bloodstream and bile. Various liver disorders alter the blood level of these chemicals. Some of these chemicals can be measured in a blood sample. Some tests that are commonly done on a blood sample are called liver function tests (LFTs). These usually measure the following:

Silverthorne page 579

Serum Aminotransferase

core concept

Enzymes are released into circulation as a result of hepatocellular injury or death.

- AST is present in many tissues - liver, heart, skeletal, muscle & kidneys.
- ALT is primarily located in liver & more specific for hepatic dysfunction.
- Normal levels - 35 to 45U/L
- Mild elevation can be seen in cholestasis or metastatic liver disease.
- Absolute levels correlate poorly with degree of hepatic injury in chronic conditions, but are of great importance in acute liver disease. E.g.- drug overdose, ischemic injury and fulminant hepatitis.

Serum Alkaline Phosphatase

Core concept

- Is produced by liver, bone, small bowel, kidneys & placenta.
- Excreted into bile
- Normal level - 25 to 85IU/L
- Most of circulating enzymes are derived from bone.
- Biliary Obstruction more hepatic alkaline phosphatase is synthesized and released into circulation.
- Increased levels indicate intrahepatic cholestasis & biliary obstruction.
- Increased levels in pregnancy & Paget's disease.

Serum Bilirubin

- Normal total bilirubin - <1.5mg/dl Reflects balance between production & biliary excretion.
- Jaundice is usually clinically obvious when total bilirubin exceeds 2mg/dl
- >50% Conj. Hyperbilirubinemia is ass. with urinary urobilinogen & may reflect hepatocellular dysfunction, Intrahepatic Cholestasis or extrahepatic biliary obstruction
- >50% unconjugated Hyperbilirubinemia may be seen with hemolysis or conjugated, Or acquired defects in bilirubin conjugation

Core Concept

A raised blood level of 'conjugated' bilirubin occurs in various liver and bile duct conditions. It is particularly high if the flow of bile is blocked. For example, by a gallstone stuck in the common bile duct, or by a tumor in the pancreas. It can also be raised with hepatitis, liver injury, or long-term alcohol abuse.

A raised level of 'unconjugated' bilirubin occurs when there is excessive breakdown of red blood cells - for example, in hemolytic anemia.

Core concept

Serum Albumin

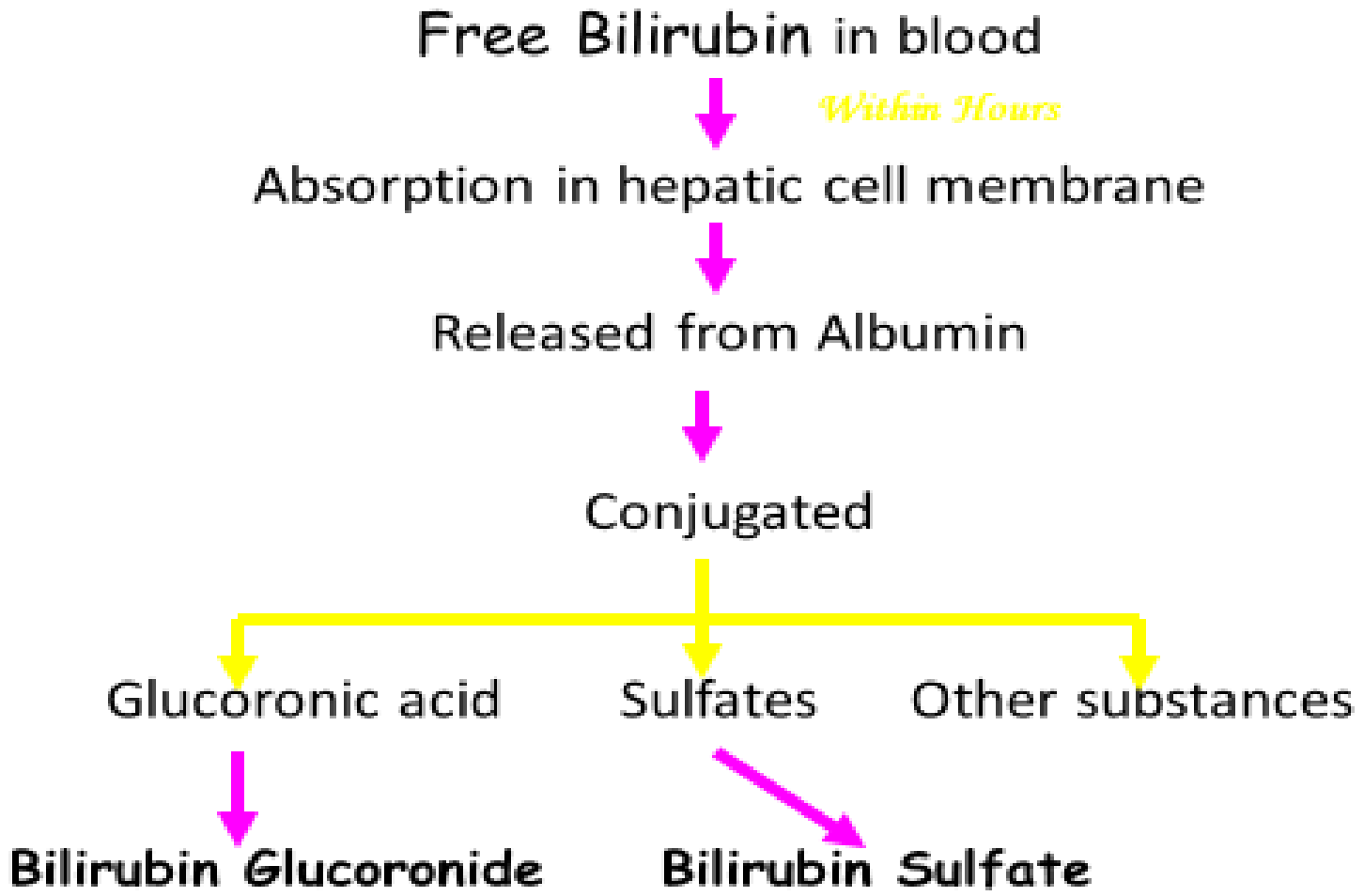
Normal level - 3.5 to 5.5g/dl
Albumin level may be normal with Acute Liver Disease.
Albumin values <2.5g/ dl are generally indicative of CLD, acute stress or severe malnutrition.
Increased losses of albumin in urine is suggestive of Nephrotic Syndrome.

Core concept

Other Tests of The Liver

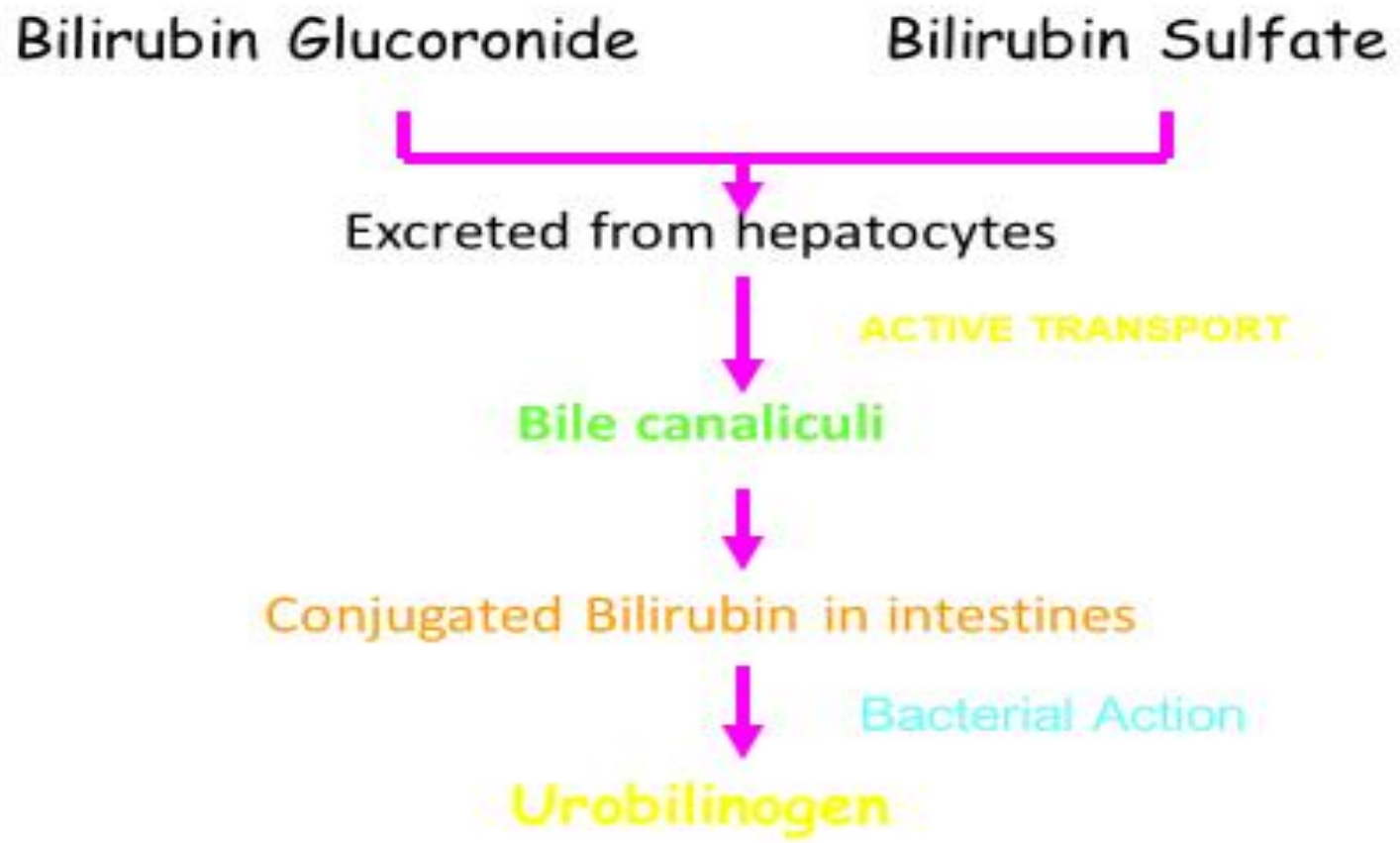
Blood clotting tests. The liver makes many of the proteins needed to make blood clot. In certain liver disorders the liver cannot make enough of these proteins and so blood does not clot so well. Therefore, blood clotting tests may be used as a marker of the severity of certain liver disorders.

Core concept



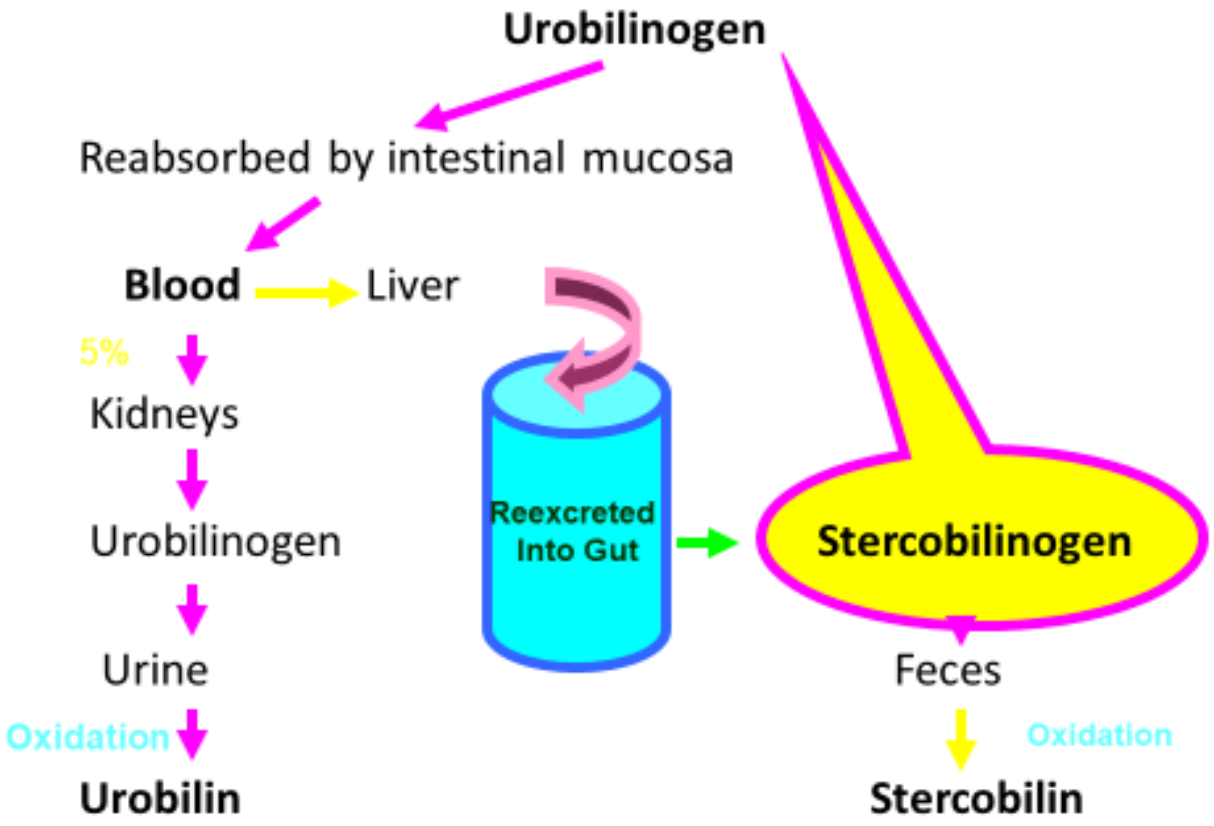
Fate of red blood cells

Core concept and horizontal integration with biochemistry



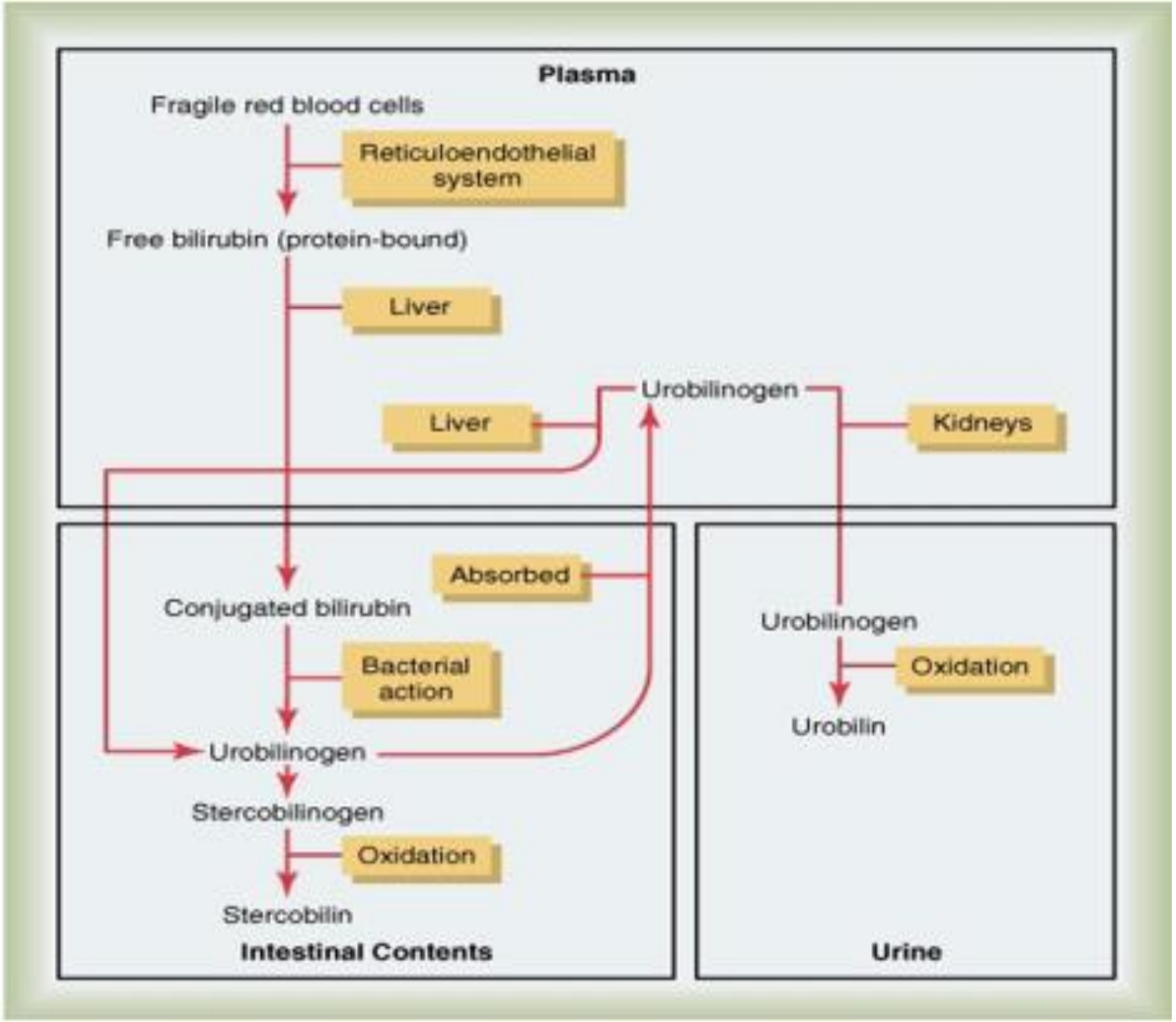
Fate of red blood cells

Core concept and horizontal integration with biochemistry



Fate of red blood cells

Core concept and horizontal integration with biochemistry



Fate of red blood cells

Core concept and horizontal integration with biochemistry

Iron metabolism

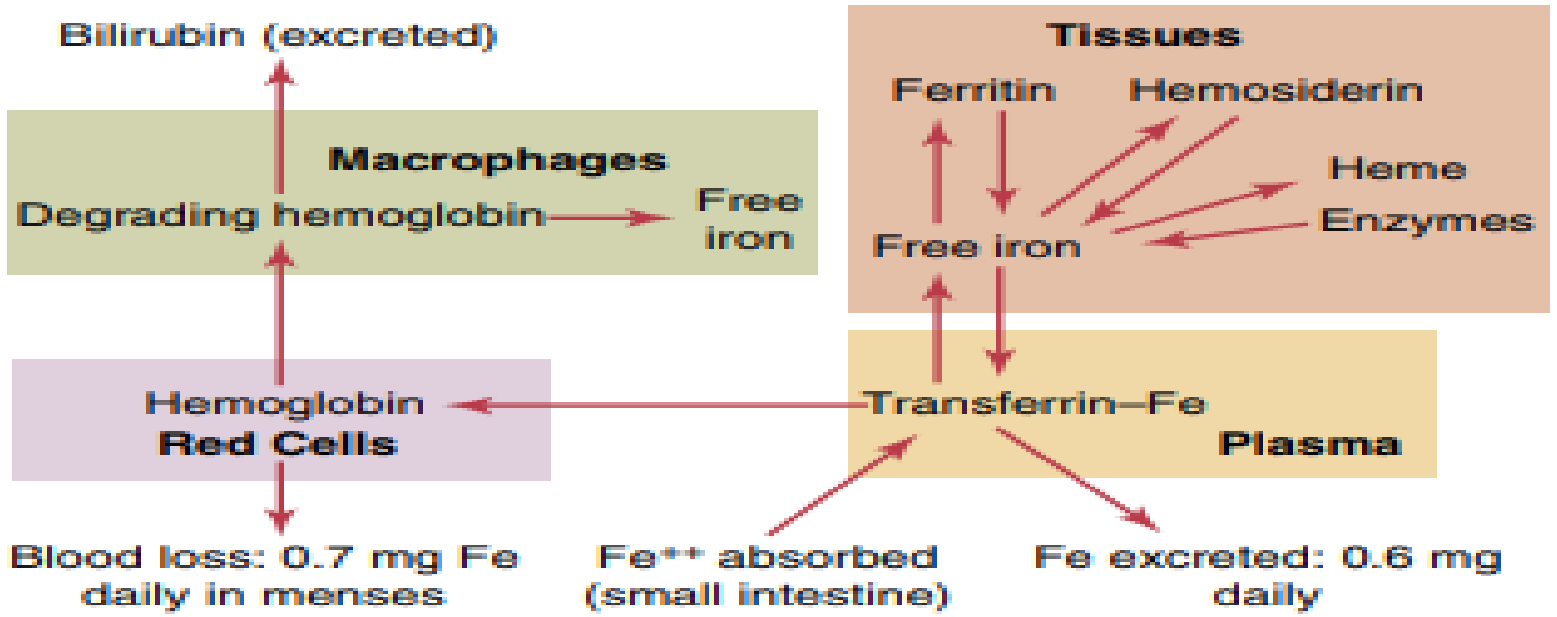


Figure 33-7. Iron transport and metabolism.

core concept

Sherwood 9th Edition page 255

Serum bilirubin levels

Serum Bilirubin

- Total: **0.3 to 1.0 mg/dl**
- Conjugated/lipid soluble: **0.1 to 0.4 mg/dl**
- Unconjugated /water soluble: **0.2 to 0.7 mg/dl**

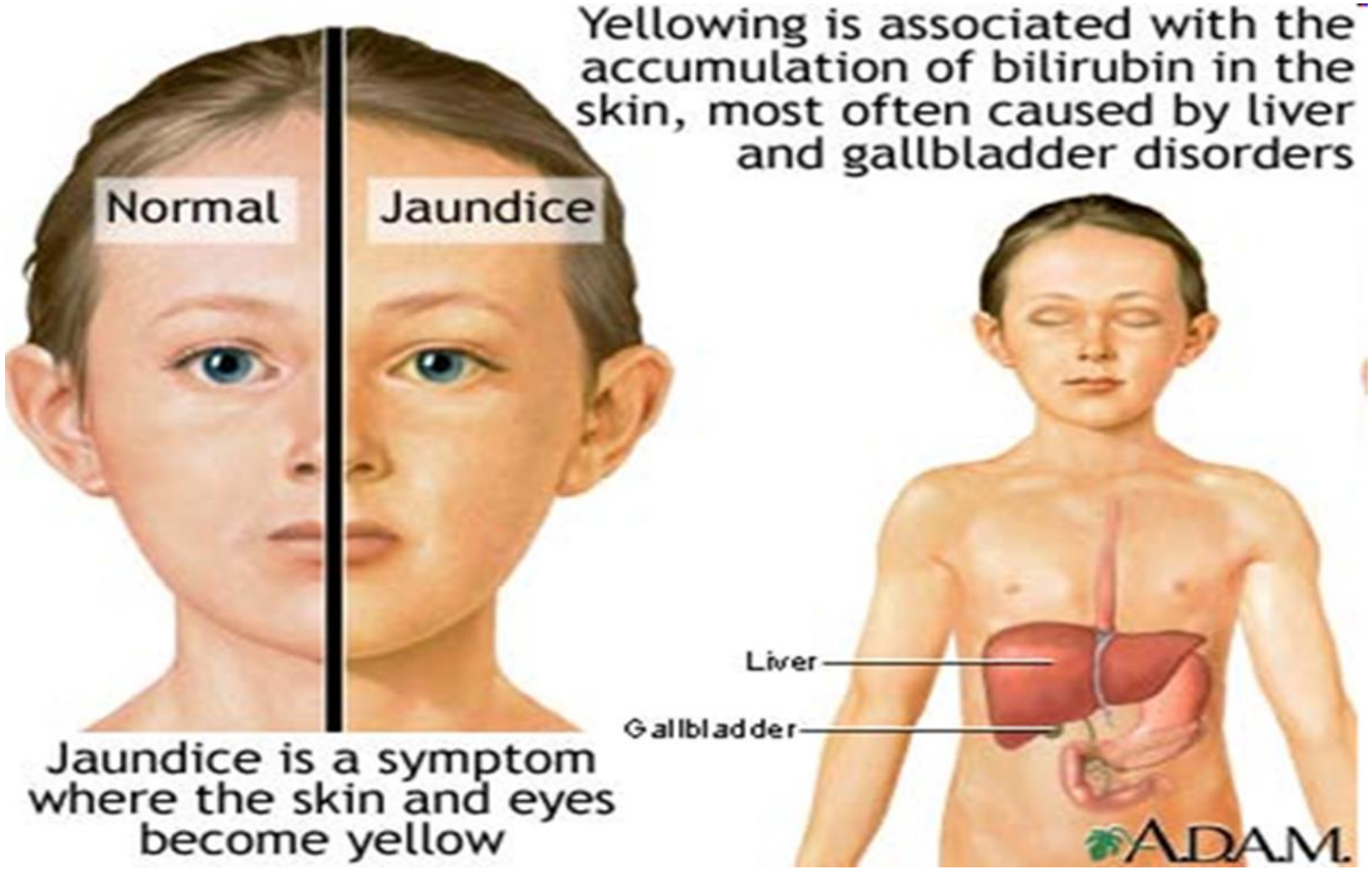
Core concept

Vertical integration with medicine

Jaundice

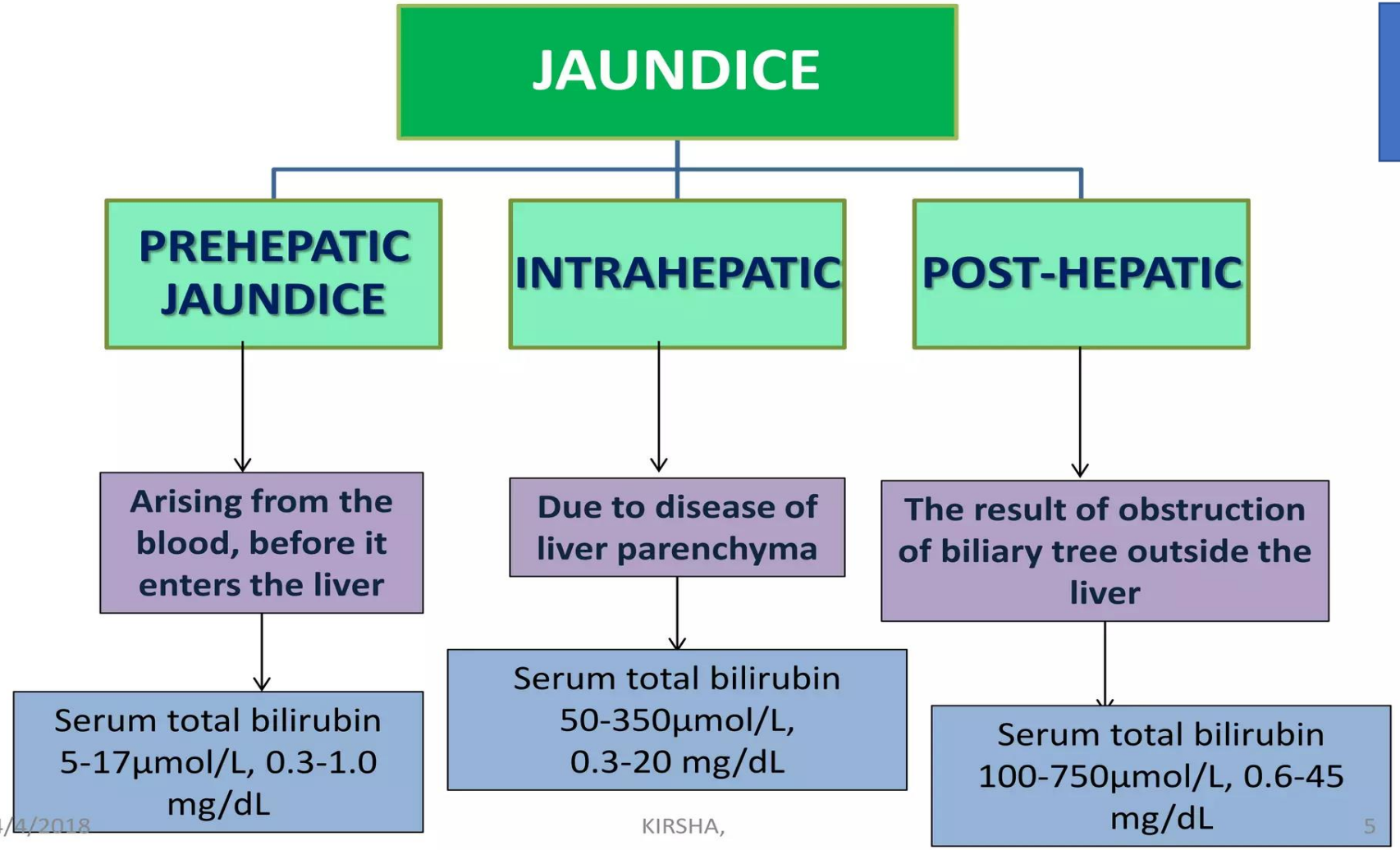
- **Definition ----- yellow discoloration of skin, sclerae and mucous membranes resulting from increased bilirubin concentration in ECF of body**
- **Normal Bilirubin 0.1 – 0.5 mg / dl**
- **Types**
  - **Pre hepatin or Haemolytic**
  - **Hepatic**
  - **Post hepatic or Obstructive**

Vertical integration with medicine



Vertical integration with medicine

TYPES OF JAUNDICE



Types of jaundice

Vertical integration with medicine

Causes of Jaundice

- **Excessive Haemolysis**
- **Impaired Bilirubin Transport**
  - **Cogenital Hyperbilirubinemia**
- **Hepatocellular Damage**
  - **Viral ,Toxins, Drugs, Alcohol, Shock, Congestion, Hypoxia, Mushrooms**
- **Impaired Bile flow – Cholestasis**
  - **Obstruction --- intra hepatic & extra hepatic**
- **Reduced Functional Tissue Mass**
  - **Cirrhosis**

Vertical integration with medicine

SITE OF ORIGIN	MECHANISM	CAUSES
Prehepatic	Increased heme liberation	• Hemolytic Anemia • Malaria • Reduced red cell lifespan
Intrahepatic	Defective liver metabolism	• Congenital enzyme defects • Iron storage disease • Reduced hepatic bilirubin uptake
	Obstruction of small bile ducts	• Alcoholic Cirrhosis • Autoimmune Liver Disease • Drugs and environmental chemicals • Hepatic Tumors • Pregnancy • Viral or other infections • Gall Stones • Primary Biliary Cirrhosis

4/4/2018 KIRSHA,

Types of jaundice

Vertical integration with pathology

Post-hepatic	Obstruction of large bile ducts	• Infection or inflammation of the biliary tree • Gall stones • Carcinoma of pancreas, gall bladder, bile ducts • Pancreatitis • Drugs

DRUGS CAUSING JAUNDICE

ACTION	EXAMPLES	
Dose-dependent Hepatocellular Damage	Acetaminophen Salicylates	High Dose Tetracyclines
Dose-independent Hepatocellular Damage	Desulfuran, Isoflurane, Sevoflurane Dantrolene Ketoconazole	Antidepressants Aminosalicylic Acid Isoniacid Pyrizinamide, Ethambutol
Hemolysis	Methyl Dopa	Mefanamic Acid
Cholestasis	Carbimazole Oral Contraceptives Sodium Aurothiomalate	Chlorpromazine Chlorpropamide Erythromycin Estolate

4/4/2018 8

Types of jaundice

Vertical integration with pharmacology

Function test	Pre-hepatic Jaundice	Hepatic Jaundice	Post-hepatic Jaundice
Total bilirubin	Increased	Increased	
Conjugated bilirubin	Normal	Increased	Increased
Unconjugated bilirubin	Increased	Increased	Normal
Urobilinogen	Normal or Increased	Decreased	Decreased / Negative
Urine Color	Normal	Dark (urobilinogen + conjugated bilirubin)	Dark (conjugated bilirubin)
Stool Color	Normal	Normal/Pale	Pale/clay
Alkaline phosphatase levels	Normal	Increased	
Alanine transferase and Aspartate transferase levels		Increased	
Conjugated Bilirubin in Urine	Not Present	Present	
Splenomegaly	Present	Present	Absent

Types of jaundice

Vertical integration with pathology

Test	Pre hepatic	Hepatic	Post hepatic
Vanden Berg's Test***	Indirect	Direct	Direct
Urine Bilirubin	Absent	Present	Present
Urine Urobilinogen	++	+	Absent
Urine Bile Salts	Absent	Present	Present
Feces Urobilinogen	Raised	Decreased	Decreased

***

is a chemical reaction used to measure bilirubin levels in blood. More specifically, it determines the amount of conjugated bilirubin

Vertical integration with pathology

Test	Pre hepatic	Hepatic	Post hepatic
Feces fats	absent	+	+++
Plasma albumin	Normal	Decreased	Normal or decreased
Alkaline phosphatase	Normal	Raised	Raised
Gamma globulin	Normal	Raised	Normal or raised

Vertical integration with pathology

jaundice

Vertical integration with family medicine

- The majority of jaundiced patients may be diagnosed by careful and meticulous history and physical examination. These may either give the diagnosis directly or, at the least, direct diagnostic efforts toward appropriate paths.
- Assessment of constitutional symptoms often provides the first clue to the mechanism of jaundice. **Anorexia, nausea, emesis, or weight loss appearing within 2 weeks prior to onset of jaundice suggests hepatitis or biliary obstruction secondary** to gallstones. The same symptoms occurring continuously for more than 2 weeks prior to the appearance of jaundice suggest a malignant biliary obstruction, chronic hepatitis, or toxin exposure (especially alcohol). Recurrent brief episodes of anorexia, nausea, or emesis extending over months to years, especially when accompanied by right upper quadrant abdominal pain, implicate gallstones.

Vertical integration with family medicine

Brainstorming

Question & Answer

A 45-year-old woman is brought to the emergency room complaining of a 3-day history of colicky epigastric pain that suddenly increased in severity after a meal. Tests reveal she has a gallstone blocking her sphincter of Oddi. Which of the following substances would be found at reduced levels in her circulation?

1.Unconjugated bile acids

2.Conjugated bile acids

3.Cholesterol

4.Phosphatidylcholine

5.Amylase

The correct answer is A.

The patient has symptoms consistent with acute obstructive jaundice. Thus, substances that are normally eliminated in the bile, including conjugated bile acids, cholesterol, and phosphatidylcholine, will reflux into the systemic circulation and accumulate there (rules out options B, C, and D). The location of her gallstone will also prevent the release of pancreatic secretions, and amylase (and other pancreatic products) will rise in the circulation—some of her pain may also be attributable to pancreatitis. On the other hand, since bile cannot reach the small intestine, conjugated bile acids cannot be deconjugated by intestinal bacteria, and the level of unconjugated bile acids in the circulation should fall.

Bioethics

- **Non-maleficence**

The principle of nonmaleficence holds that there is an obligation not to inflict harm on others. It is closely associated with the maxim primum non nocere (first do no harm).

Longitudinal bioethics Curriculum

Suggested Research Article

Research

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Journal List > World J Gastrointest Surg > v.15(7); 2023 Jul 27 > PMC10405123

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World Journal of Gastrointestinal Surgery

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PMCID: PMC10405123
PMID: 37555128

Pathophysiological consequences and treatment strategy of obstructive jaundice

Jun-Jian Liu, Yi-Meng Sun, Yan Xu, Han-Wei Mei, Wu Guo, and Zhong-Lian Li

Author information ▸ Article notes ▸ Copyright and License information PMC Disclaimer

Abstract Go to: ▸

World J Gastrointest Surg

Longitudinal Research Curriculum

Research

Abstract

Go to:

Obstructive jaundice (OJ) is a common problem in daily clinical practice. However, completely understanding the pathophysiological changes in OJ remains a challenge for planning current and future management. The effects of OJ are widespread, affecting the biliary tree, hepatic cells, liver function, and causing systemic complications. The lack of bile in the intestine, destruction of the intestinal mucosal barrier, and increased absorption of endotoxins can lead to endotoxemia, production of proinflammatory cytokines, and induce systemic inflammatory response syndrome, ultimately leading to multiple organ dysfunction syndrome. Proper management of OJ includes adequate water supply and electrolyte replacement, nutritional support, preventive antibiotics, pain relief, and itching relief. The surgical treatment of OJ depends on the cause, location, and severity of the obstruction. Biliary drainage, surgery, and endoscopic intervention are potential treatment options depending on the patient's condition. In addition to modern medical treatments, Traditional Chinese medicine may offer therapeutic benefits for OJ. A comprehensive search was conducted on PubMed for relevant articles published up to August 1970. This review discusses in detail the pathophysiological changes associated with OJ and presents effective strategies for managing the condition.

Longitudinal Research Curriculum

How To Access Digital Library

- Steps to Access HEC Digital Library

1.Go to the website of HEC National Digital Library.

2.On Home Page, click on the INSTITUTES.

3.A page will appear showing the universities from Public and Private Sector and other Institutes which have access to HEC National Digital Library HNDL.

Select your desired Institute. 5. A page will appear showing the resources of the institution

6. Journals and Researches will appear

7. You can find a Journal by clicking on JOURNALS AND DATABASE and enter a keyword to search for your desired journal.

References

- **Books**
- Human Physiology by Dee Unglaub Silver thorn. 8TH Edition. Muscle (Chapter 12,Page 444)
- Guyton textbook of physiology
- Share wood textbook of physiology
- Ganong textbook of physiology
- **Research**
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10405123/
- **Video link/youtube**

https://www.youtube.com/watch?v=j1b5CFa7Dag