

A Guide to Physiology & Bio-Chemistry

# Reflex

MCQ & COLOUR ATLAS

*Bangladesh is my Pride*

14th Edition

*Dr. Reza*

*Dr. Anza*

*Dr. Ranza*



Following New Curriculum

*14th edition*

A Guide to Physiology and Bio-chemistry

# Reflex

MCQ & Colour Atlas

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## Preface

It is well known that the students of medical sciences are greatly handicapped to the want of a concise and comprehensive text book on the subject as a whole. A beginner has therefore, no other way than to go through a number of voluminous text books on each one of the various branches of medical sciences and in doing so, he/she is very often confused about how much he/she should read and know. This confusion obviously leads to undue wastage of time and energy on the part of the student. Reflex, a promising guide to *Physiology & Biochemistry*, which thought about this problem & was published in May 1989. Since its publication in 1989, Reflex has garnered considerable response from medical students & doctors.

In this 14th edition I have tried my best to give the reference of different authorized books e.g. '*Text Book of Medical Physiology* 11th edition' by Arthur C. Guyton, M.D & Hall; '*Review of Medical Physiology*- 22th edition by William F. Ganong, MD; MD Samson Wright's; MD Harold A. Harper; Davidson's *Medicine*; Robbins *Pathologic Basis of Disease*; in addition to some necessary diagrams & sketches with question's answer following the new curriculum so that the student will not have to face any problem in their study, together with their both written examinaion & viva voice.

All the chapters have been revised thoroughly, added some new figure & sketches, some new aspects on the basis of the latest edited "Physiology text books" mentioned above specially- '*Text Book of Medical Physiology- 11th edition*' by Arthur C. Guyton, M.D & Hall, and '*Review of Medical Physiology- 22th edition* by William F. Ganong, MD. All the systems are rearranged.

Multiple choice questions are added with their answers which will aid the students & doctors in particular content.

*Color Atlas of physiology* is added for medical students who want to master large amounts of information in a limited amount of time and review specific topics quickly & easily.

**In this fourteen edition**, MCQ portion is shifted from paper I and paper II to the Reflex, and paper I (written-SAQ), paper II (written-SAQ), and viva & practical (SOE, OSPE, & practical) is rearranged into one book named "**Reflex- Written & Viva** (SAQ, SOE, OSPE & practical).

Efforts will be worthwhile if students find the work helpful in introducing this to the realm of the *vast science of medicine*. Please go through the text books.

With best wishes to all-

Dr. Md. Mustafizur Rahman Ranzu

10 April 2006



*Dedicated  
To  
Our Beloved Parents*

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## New curriculum

### Notable features of new curriculum

- M.B.B.S course will be of 05 (Five) years duration plus 01 (one) year Internship training.
- There will be 3 professional Examinations during the M.B.B.S course :
  - At the end of 1 & 1/2 years : 1st professional.
  - At the end of 3 & 1/2 years : 2nd professional.
  - At the end of 5 years : Final professional.
- There will be 2 (two) professional examination in one year.
  - In 1st week of January
  - In 1st week of July

### Subjects with marks allocated for different professional examination will be as follows :

#### i. In 1st Professional :

1. Anatomy	: 500 Marks
2. Physiology	: 400 Marks
3. Biochemistry	: 400 Marks
<b>Total</b>	<b>= 1300 Marks</b>

#### ii. In 2nd professional :

1. Pathology (300) + Microbiology (300)	: 600 Marks
2. Community Medicine	: 300 Marks
3. Pharmacology & Therapeutics	: 300 Marks
4. Forensic medicine & toxicology	: 300 Marks
<b>Total</b>	<b>= 1500 Marks</b>

#### iii. In Final Professional :

1. Medicine	: 500 Marks
2. Surgery	: 500 Marks
3. Obs. & Gynae	: 500 Marks
<b>Total</b>	<b>= 1500 Marks</b>

\* Pass Mark will be 60% in each written, Oral, & Practical/Clinical Exam, Separately.

\* Marks and pattern of questions in written examination in each subject will be as follows -

- 10% Marks of written examination of each paper of each subject is allocated for formative assessment.
- 20% Marks are allocated for MCQ for each paper. There will be separate Answer script for MCQ examination. Time allocation is 1 (one) minute for each question consisting of 5 stems (20 questions).
- 70% Marks are allocated for SAQ (Except in Community medicine) for each paper.

\* For oral, clinical & practical the examination system & Marks distribution is shown against each subject (See the Curriculum).

\* Oral part of the examination will be structured oral.

\* **In Medicine** : There will be 2 boards consisting of 4 examiners for oral, clinical & practical examination.

Board - I : 1 examiner from Internal Medicine  
: 1 examiner from pediatrics

Board - II : 1 examiner from Internal Medicine  
: 1 examiner from sub specialities (e.g. dermatology/Psychiatry)

There will be No Temp-Chart, slides and specimen in the Practical Examination.

\* **In Surgery** : Oral, Practical & clinical examination will be held in Two separate days.

One Day : General Surgery

Another day : Ophthalmology + ENT

### Assessment of Physiology

#### Summative Assessment (First Professional Examination)

Components	Marks	Total Marks
i. Formative assessment :	10+10	20
ii. Written Examination :		
Paper - I :		
a. MCQ	20	180
b. SAQ	70	
Paper - II :		
a. MCQ	20	100
b. SAQ	70	
iii. Practical Examination :		
a. OSPE	40	100
b. Traditional practical methods and experiments	50	
c. Practical Note Book	10	
iv. Oral Examination (Structured) :		
a. 2 boards (4 examiners) :		100
I. 2 internals		
II. 2 externals		
<b>Grand Total :</b>		<b>= 400</b>

#### Paper I :

- General Physiology
- Blood
- Cardiovascular
- Respiratory System
- Alimentary System.

















#### Paper II :

- Renal Physiology & body fluid
- Endocrine & reproductive
- Nervous System & Temp. Regulation
- Special senses.

There will be separate Answer Script for MCQ & SAQ  
Pass marks 60% in each of theoretical oral and practical.



## Content in brief

-  1. General Physiology
-  2. Vitamin
-  3. Minerals
-  4. Bio-chemistry
-  5. Blood System
-  6. Cardio Vascular System
-  7. Respiratory System
-  8. Endocrinology
-  9. Reproductive
-  10. Digestive System
-  11. Food Nutrition
-  12. Body Fluid
-  13. Urinary System
-  14. Metabolism
-  15. Temperature
-  16. Nervous System
-  17. Special Senses



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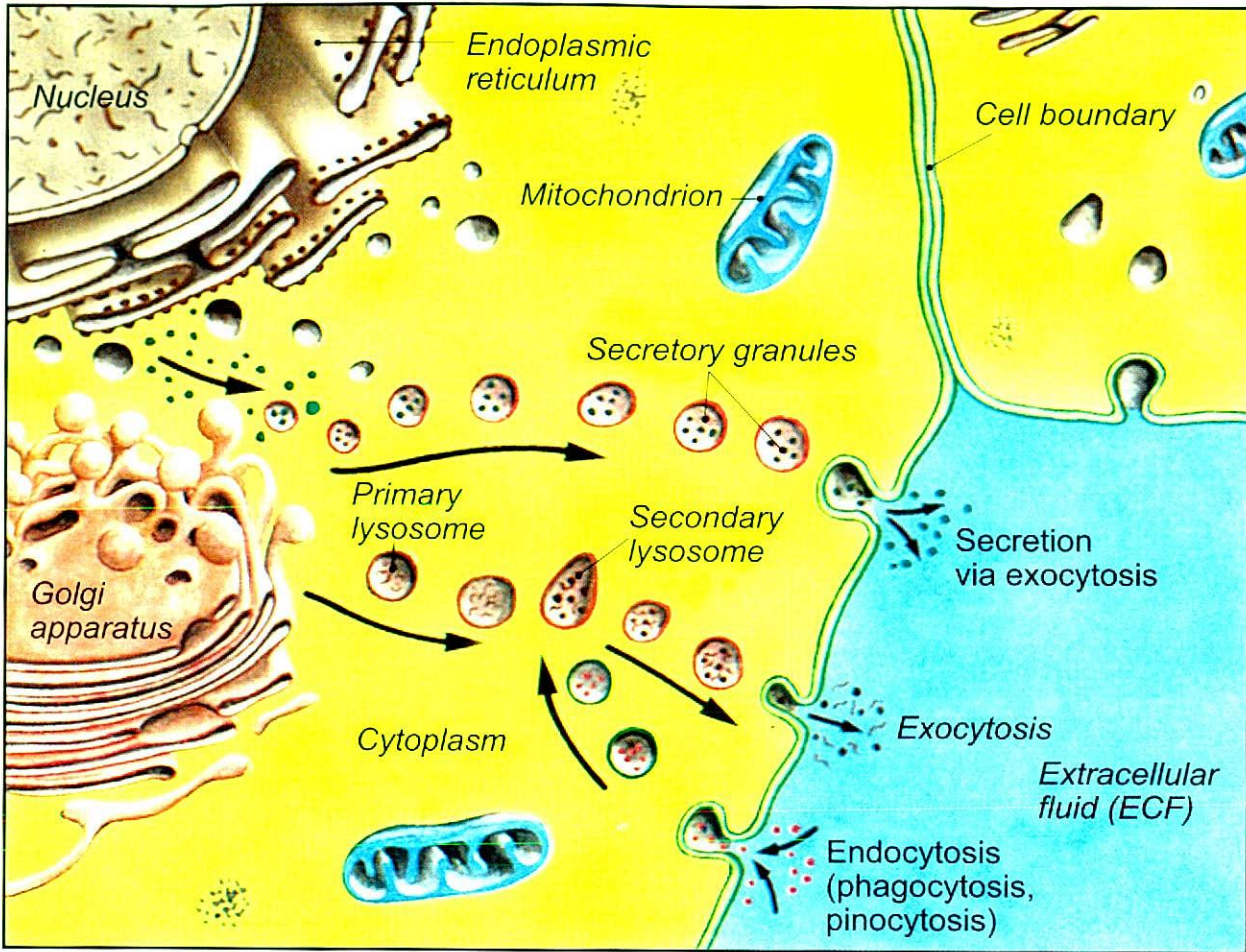
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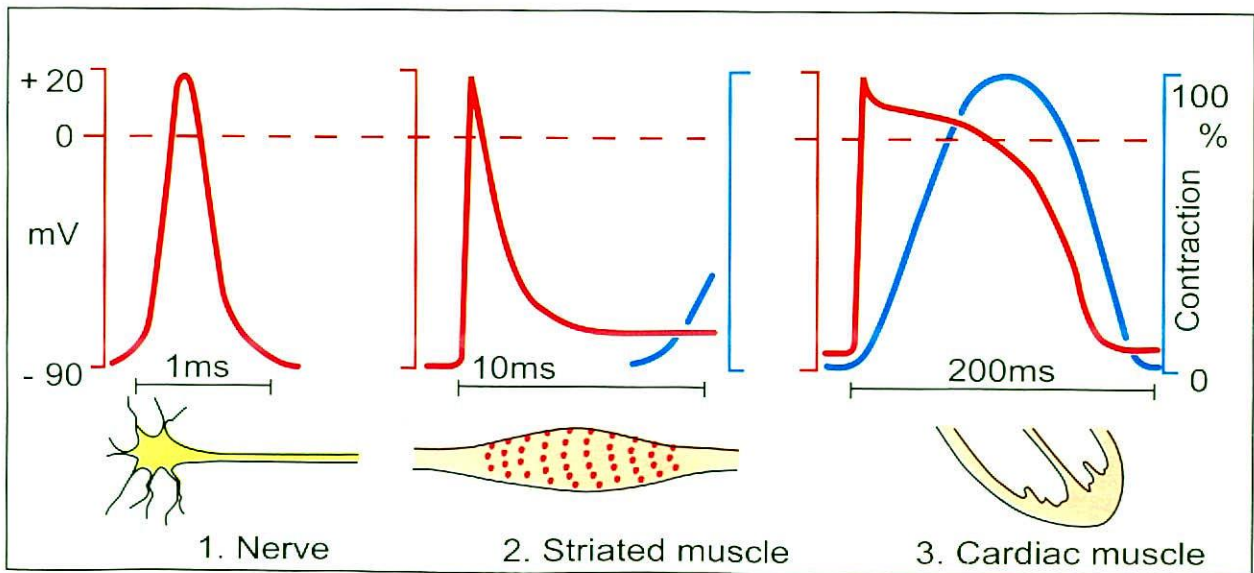
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**A. The cell. Endocytosis and exocytosis**

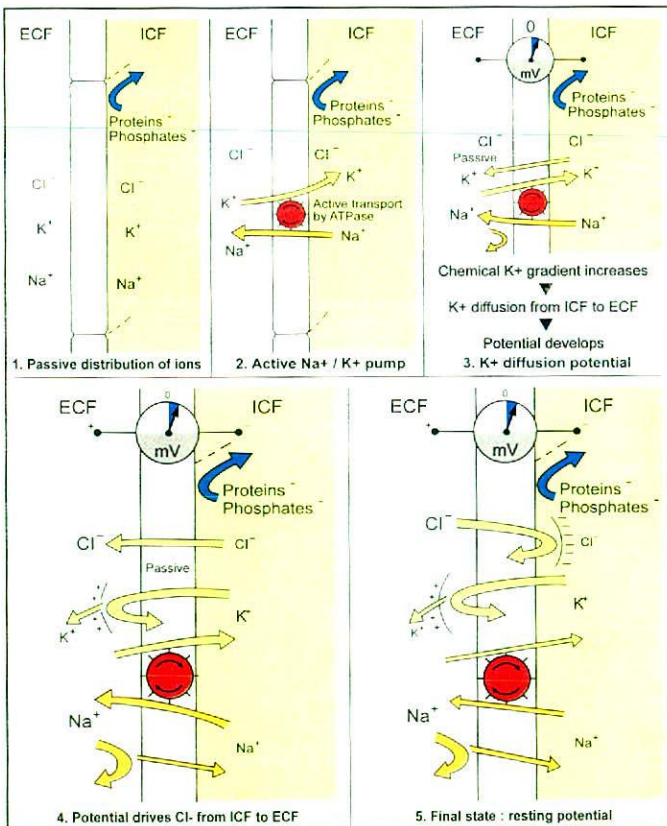


**B. Action potential - nerve and muscle**



**A. Structure and function of 3 classes of muscle**

	Smooth muscle	Cardiac muscle	Skeletal muscle	
Structure	Motor end-plate	None	Yes	
	Fiber	Fusiform, short (max 0.4mm)	Branched	Cylindrical, long (max. 15 cm)
	Mitochondria	Few	Many	Few
	Nucleus/fiber	1:1	1:1	Several per fiber
	Sarcomere	None	Yes-max. length 2.6 μm	Yes-max. length 3.65 μm
	Syncytium	Yes (bridges)	Yes (functional)	No
	Sarcoplasmic reticulum	Poorly developed	Well developed	Extensively developed
Function	ATPase	Little	Average	Much
	Pacemaker	Yes (slow)	Yes (fast)	No (requires neural impulse)
	Response	Graded	All or none	Graded
	Tetanus	Yes	No	Yes
Response	Operating range	Variable length-tension curve	On rising portion of length-tension curve	On peak of length-tension curve
	Potential			
Mechanical tension				

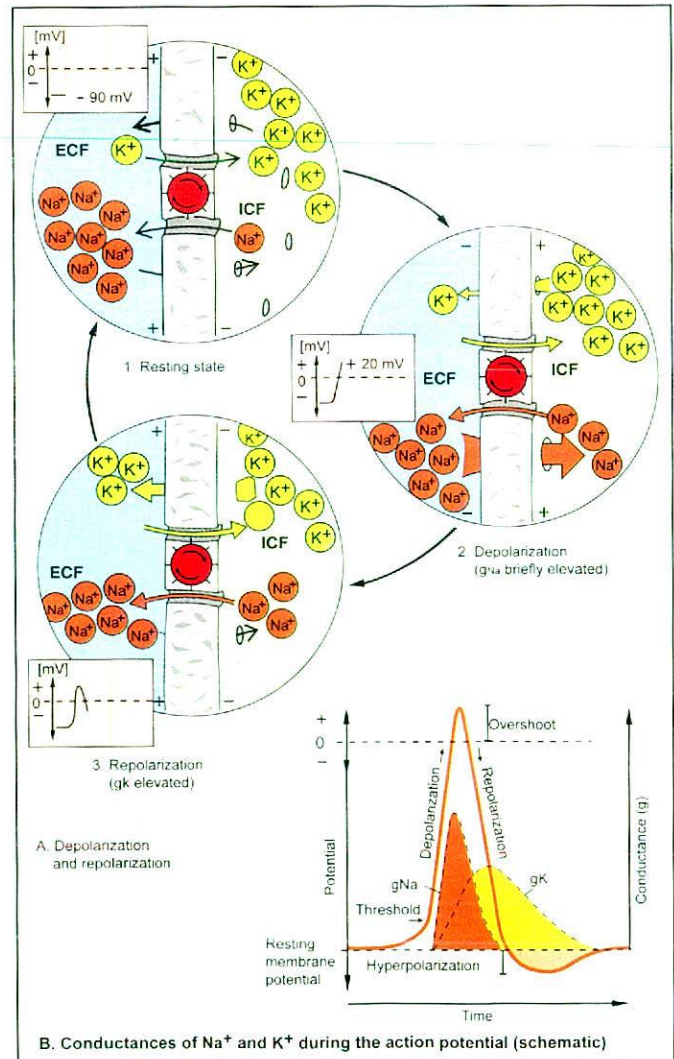


A. Causes and consequences of the resting potential

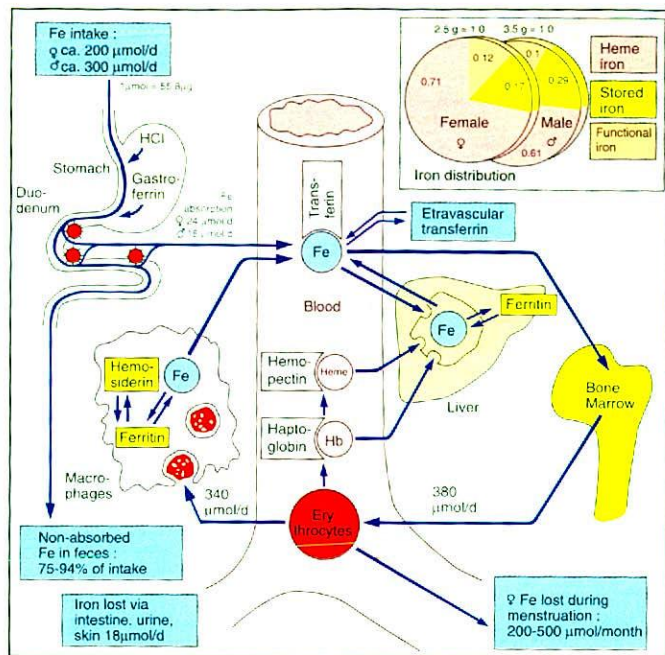
	"Effective" concentration (mmol/kg H <sub>2</sub> O)		Equilibrium potential
	Interstitial (ECF)	Cell (ICF)	
K <sup>+</sup>	4.5	160	-95 mV
Na <sup>+</sup>	144	7	+80 mV
H <sup>+</sup>	4 × 10 <sup>-5</sup> (pH 7.4)	10 <sup>-4</sup> (pH 7.0)	-24 mV
Cl <sup>-</sup>	114	7	-80 mV
HCO <sub>3</sub> <sup>-</sup>	28	10	-27 mV

B. Typical "effective" concentrations and equilibrium potentials of important ions in skeletal muscle (37°C)

(after Corwax)

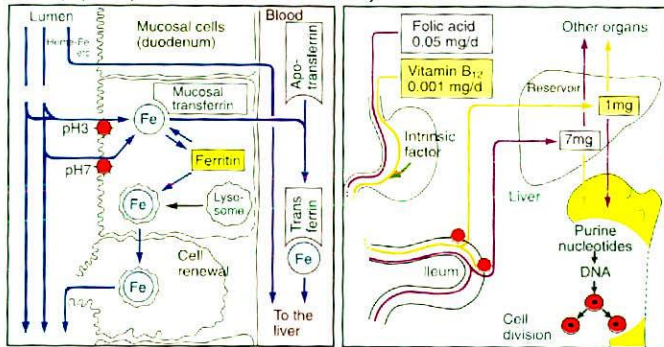






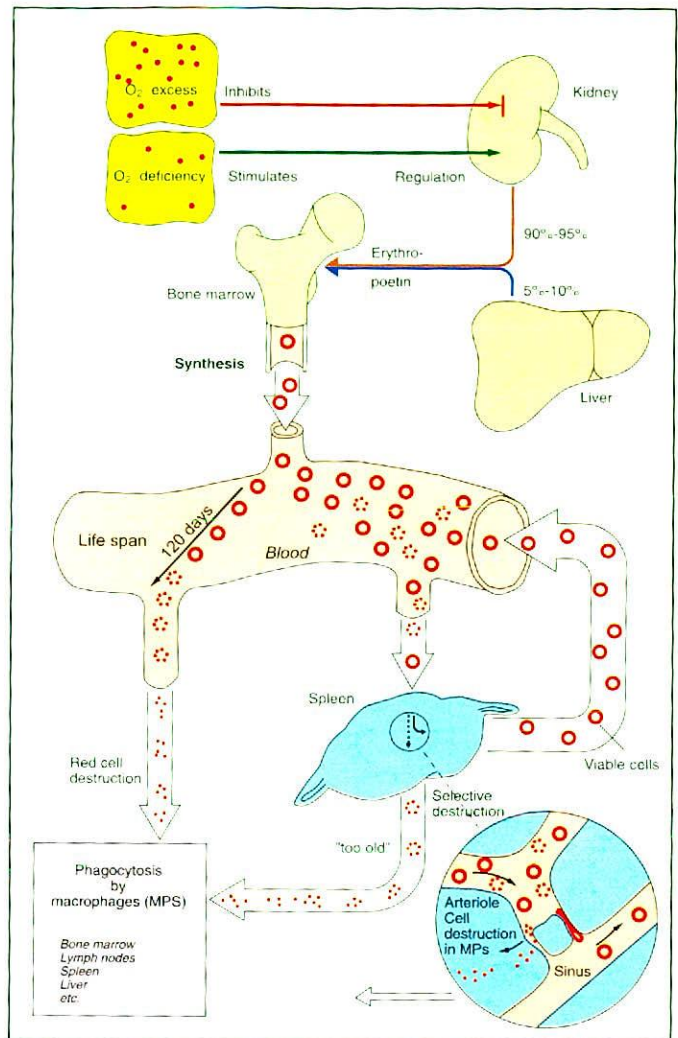
A. Iron (Fe) absorption and redistribution in the body

(after Munro and Leifer)

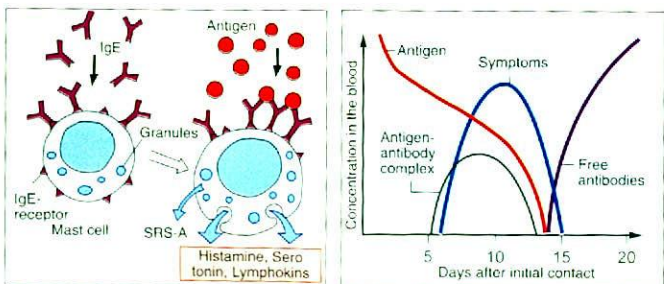


B. Iron (Fe) absorption

C. Folic acid and vitamin B<sub>12</sub> (cobalamine)

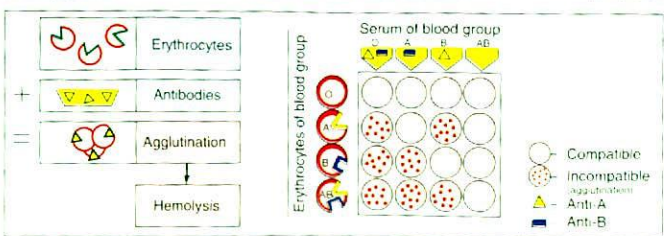


A. Synthesis and destruction of erythrocytes in adults

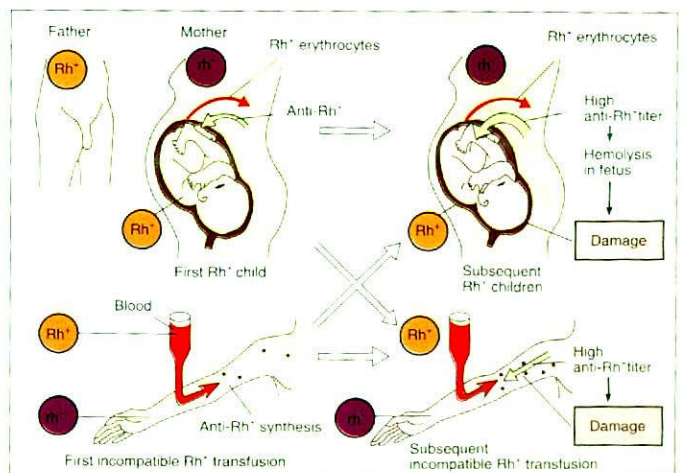


E. Anaphylaxis

F. Serum disease

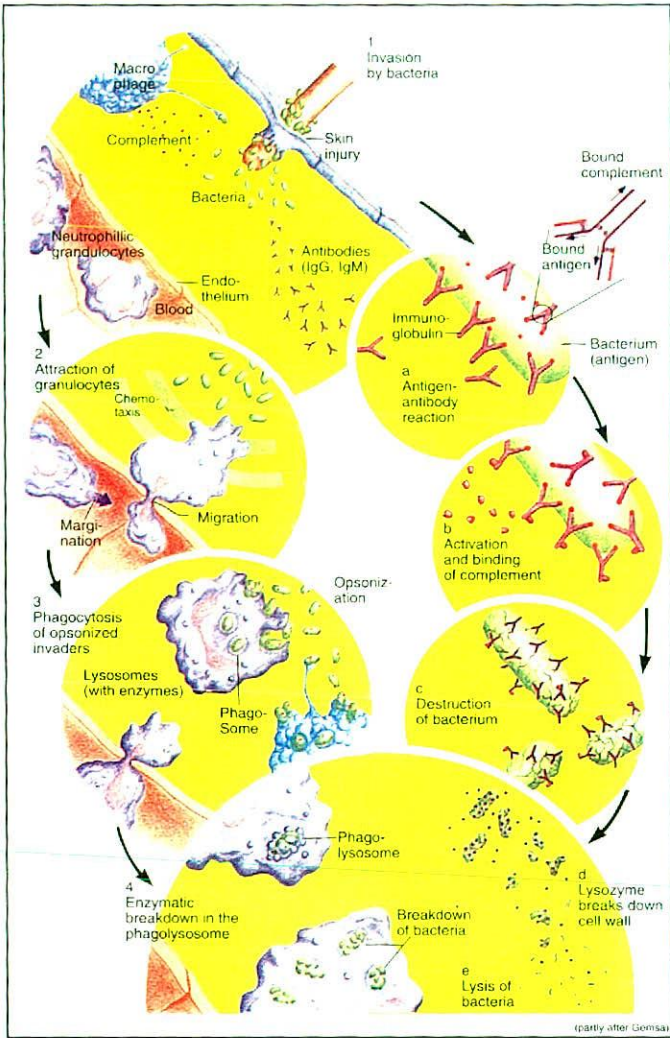


G. ABO blood group compatibility

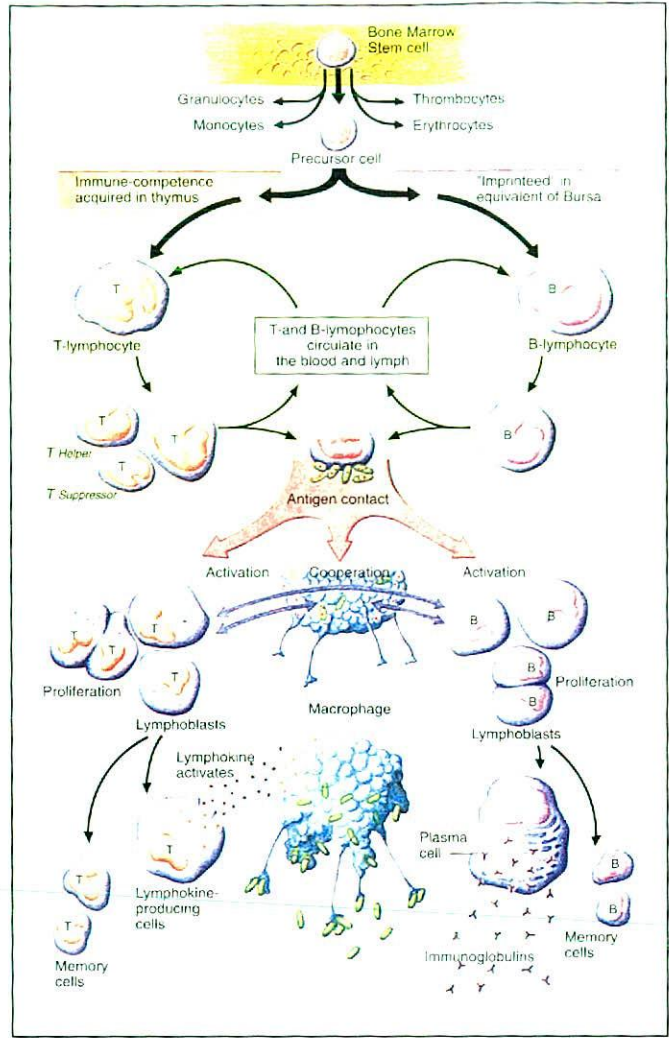


H. Rh sensitization (pregnancy or transfusion)

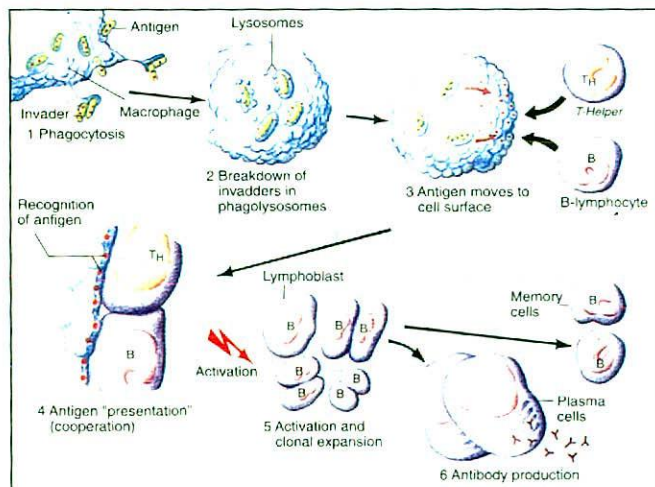




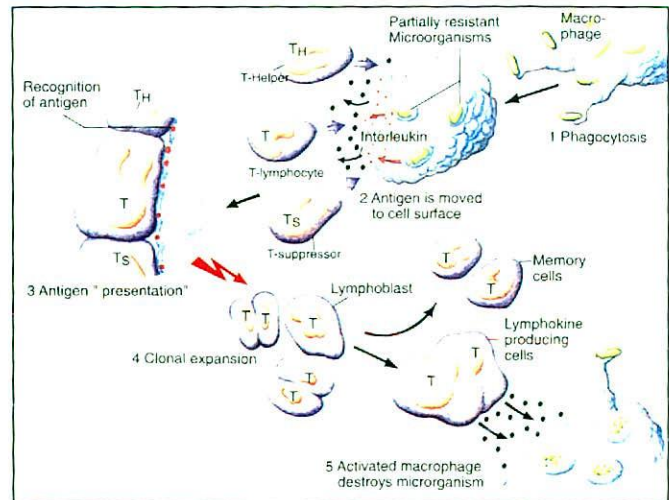
A. Mechanisms involved in defense against bacteria : phagocytosis (1-4) : extracellular lysis (1, a-e)



B. Cells involved in Immune system

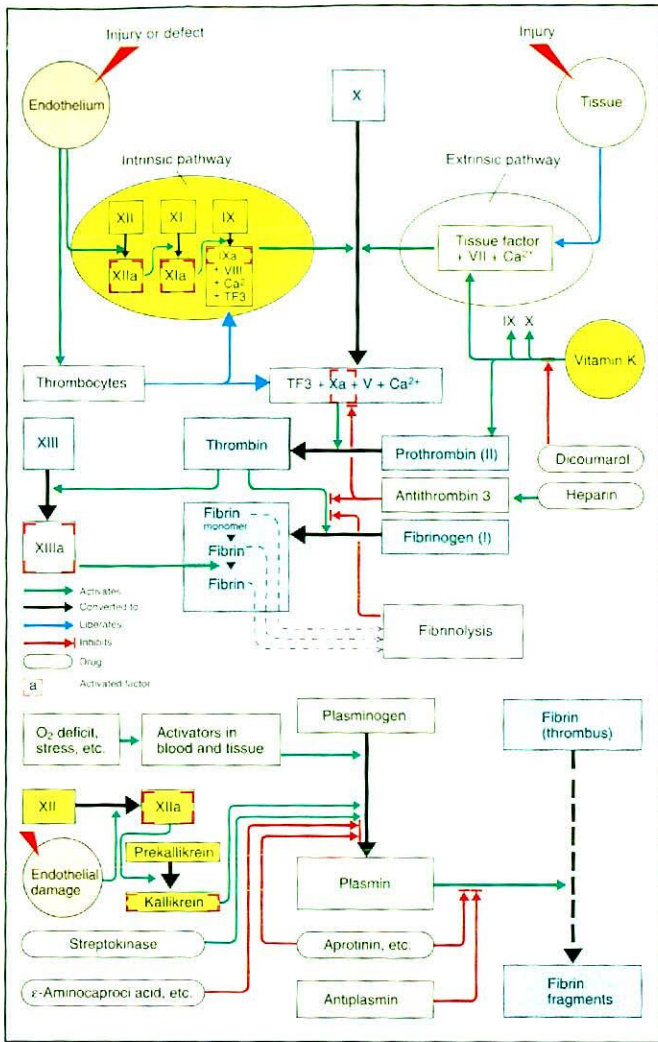


C. Stimulation of the B-lymphocytes : humoral immune defense

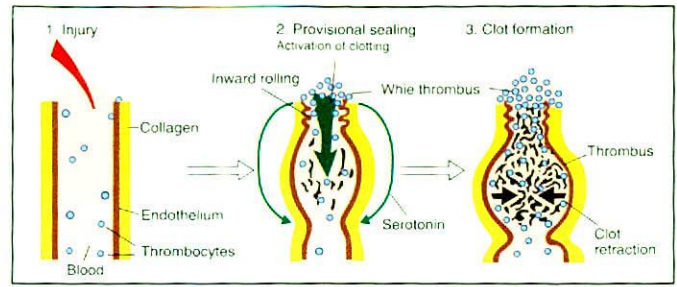


D. Stimulation of the T-lymphocytes and activation of macrophages

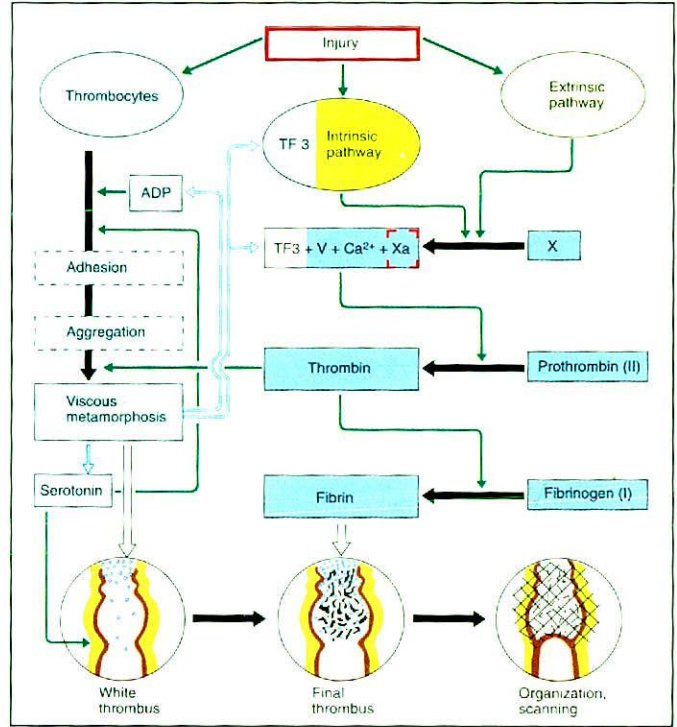




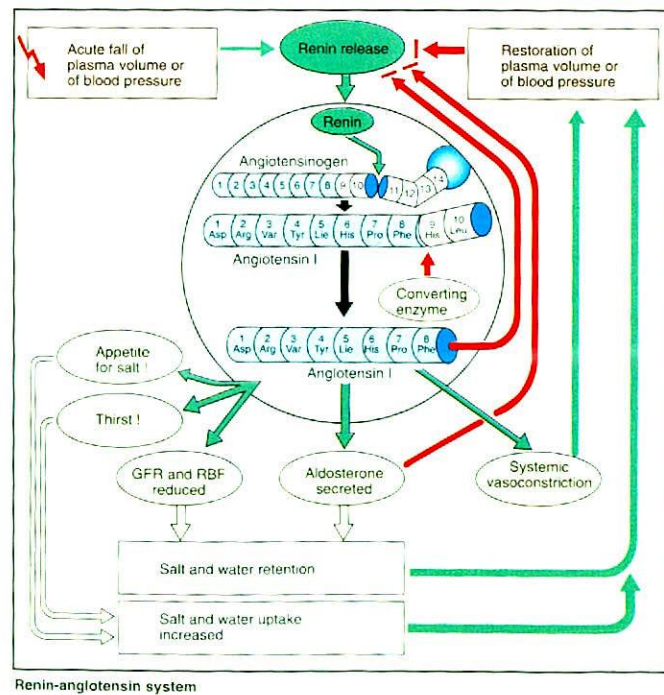
Blood clotting and fibrinolysis



Hemostasis

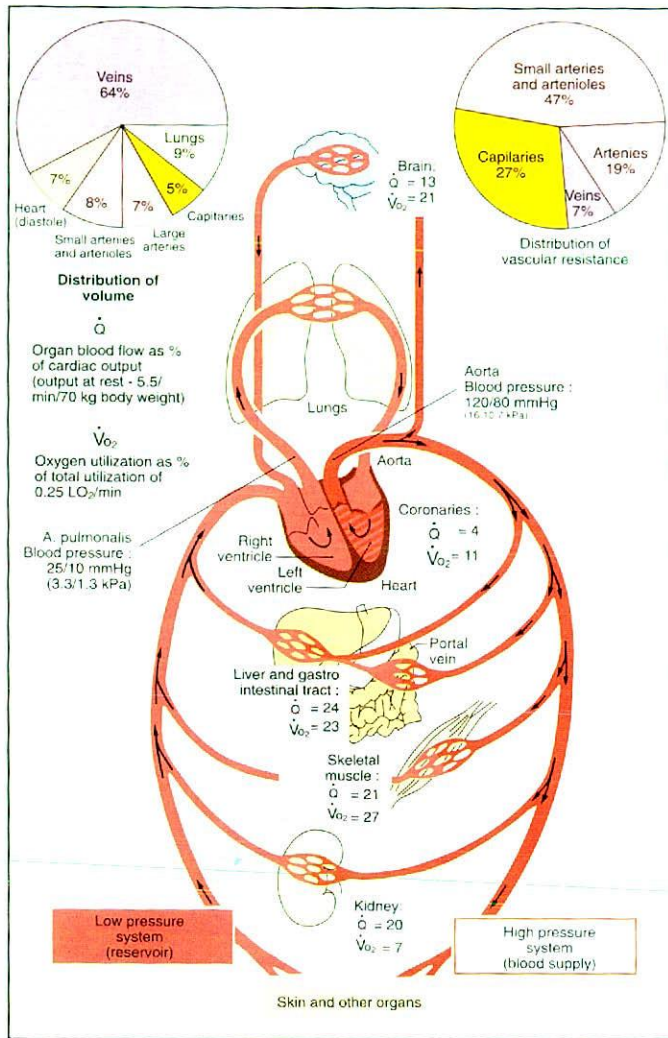


Hemostasis

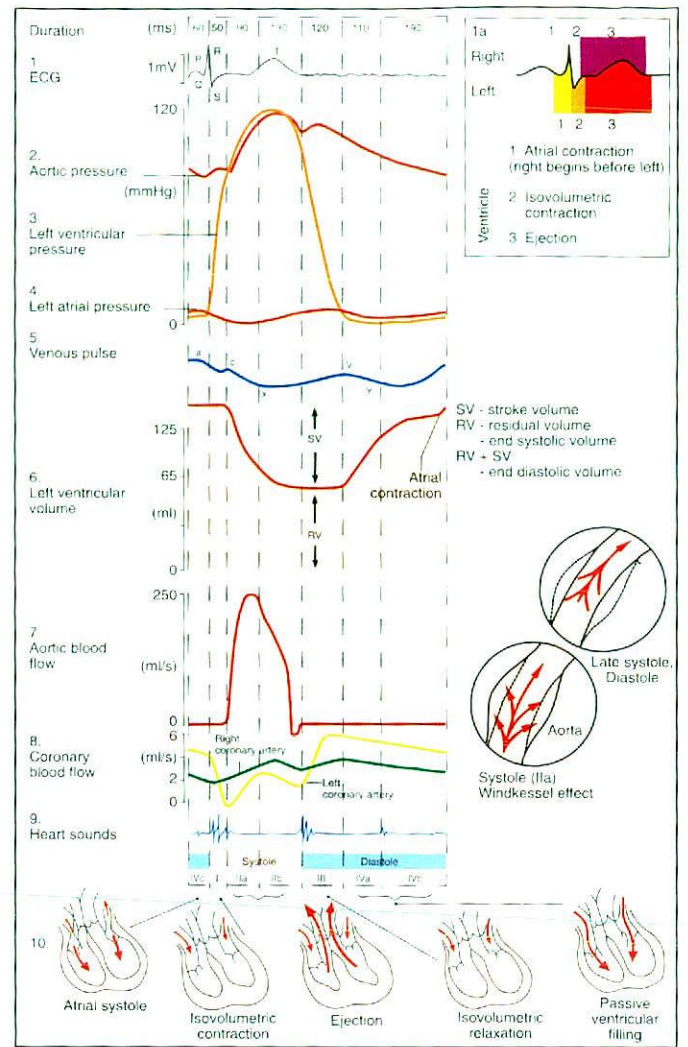


Renin-angiotensin system

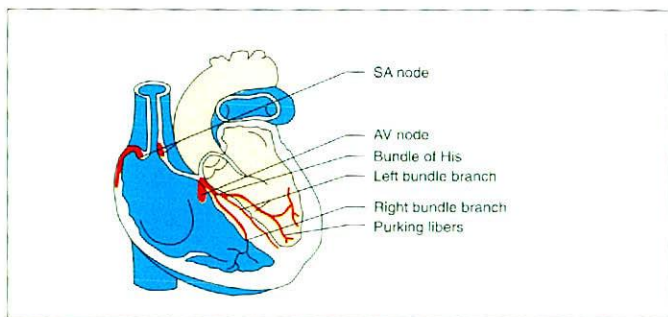




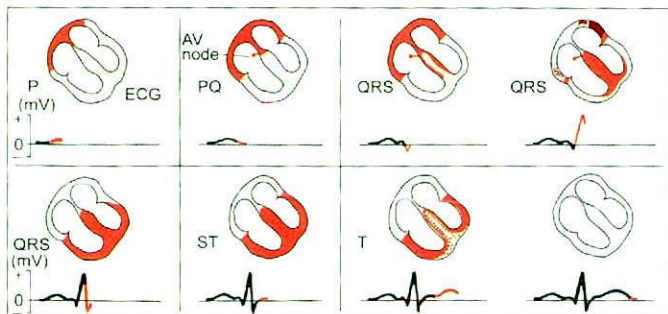
Cardiovascular system



Cardiac cycle



Excitation and conducting systems of the heart

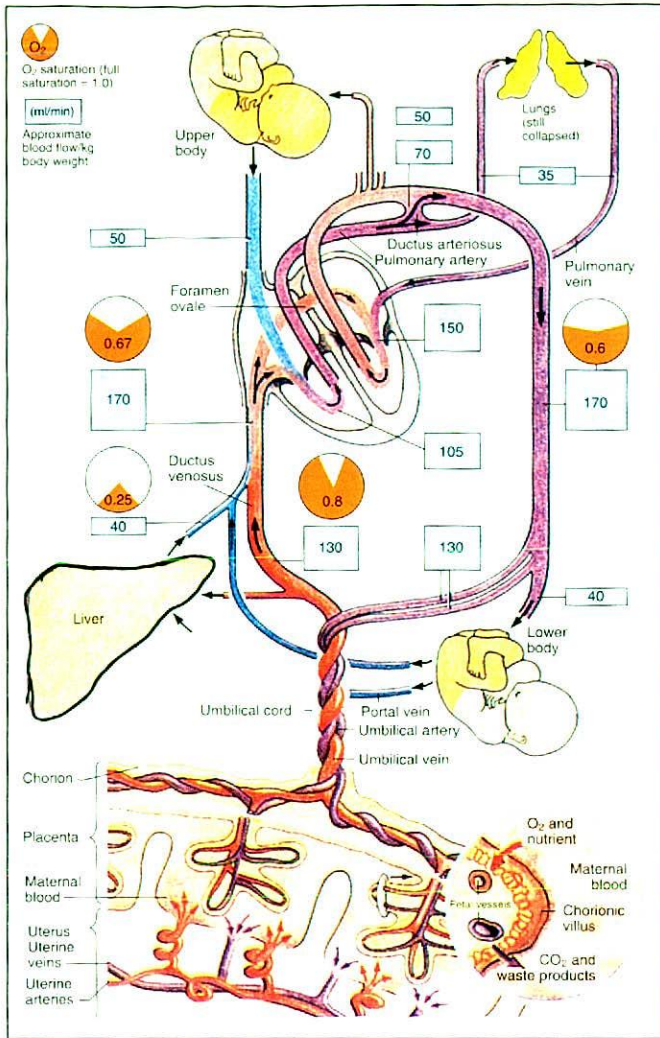


Correlation of ECG with de- and repolarization wave in the heart

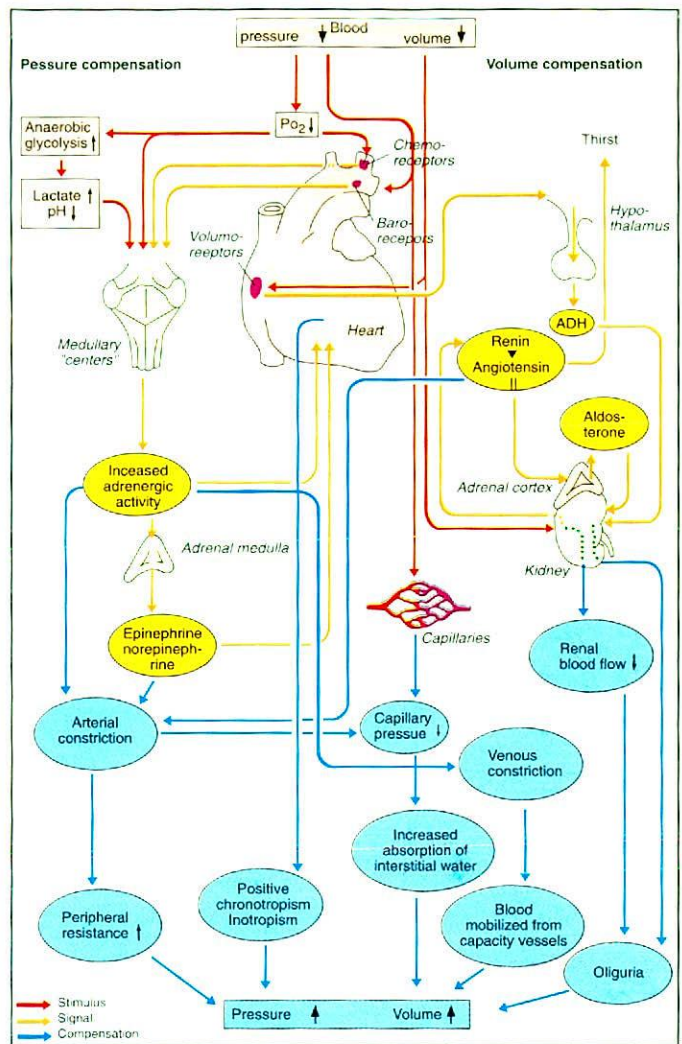
Event	Time (ms)	ECG	Conduction velocity (m/s)	Intrinsic automaticity (min <sup>-1</sup> )
SA node Impulse generated	0	P wave	0.05	70-80
Atrial depolarization	50			
AV node	85	P-Q interval (delay in excitation)	0.05	40-60
Arrival of Impulse	50			
Departure of Impulse	125	QRS complex	1.0 in myocardium	20-40
Bundle of His activated	130			
Bundle branches activated	145			
Purkinje fibers activated	150			
Endocardium depolarized	175			
Myocardium depolarized	190			
Myocardium repolarized	205			
Endocardium repolarized	225			

Excitation of the heart : time course, ECG and conduction velocity

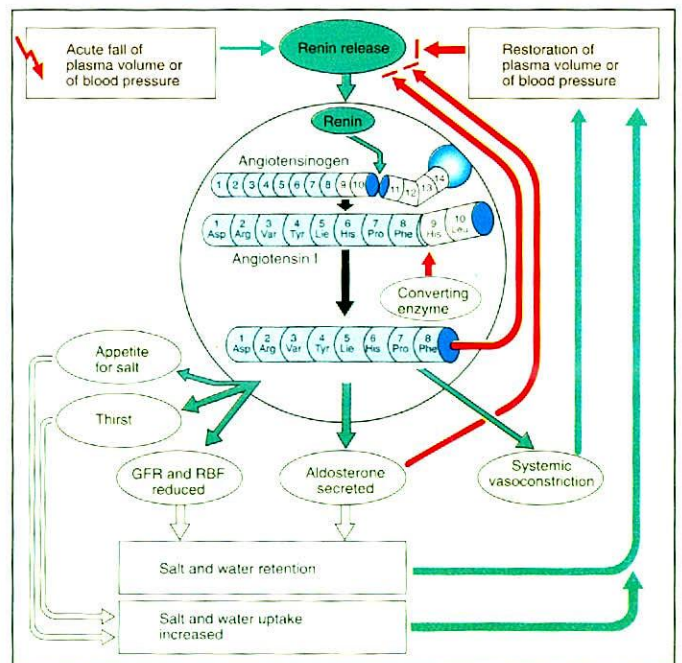
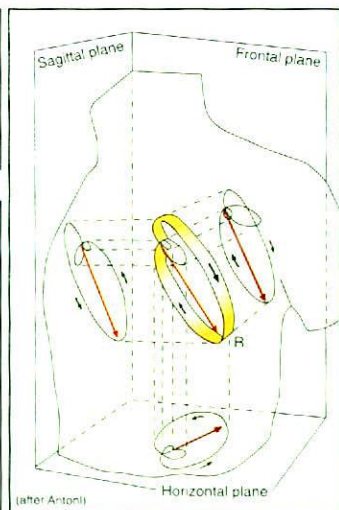
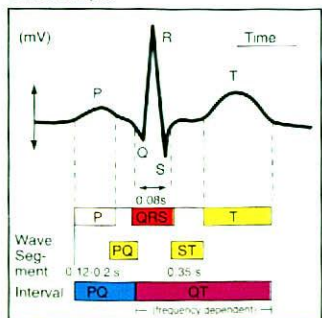
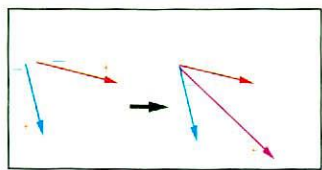




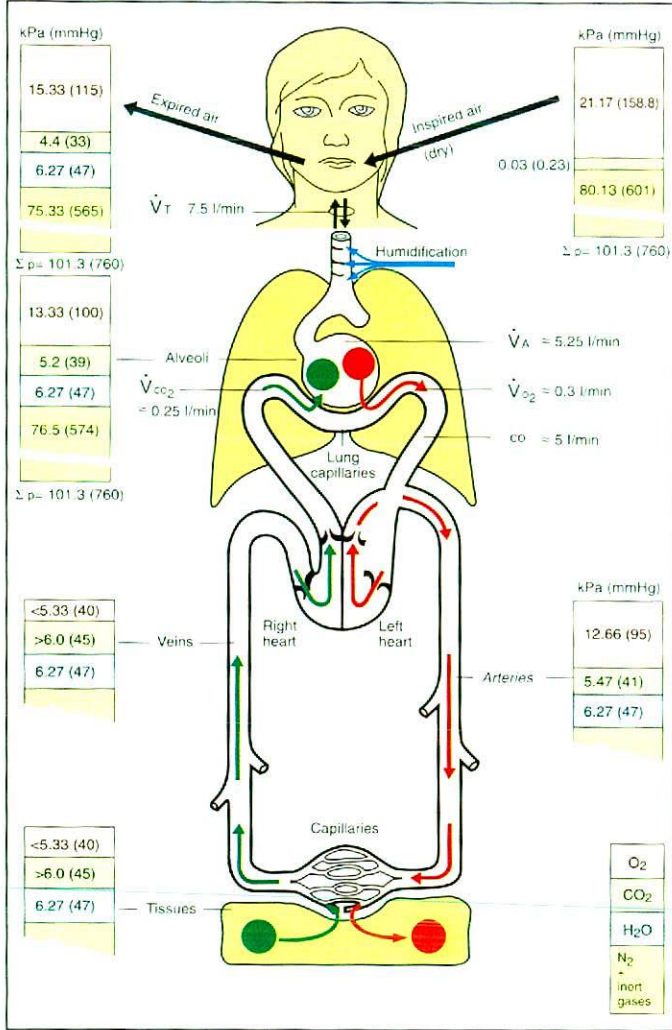
Fetal circulation and placenta



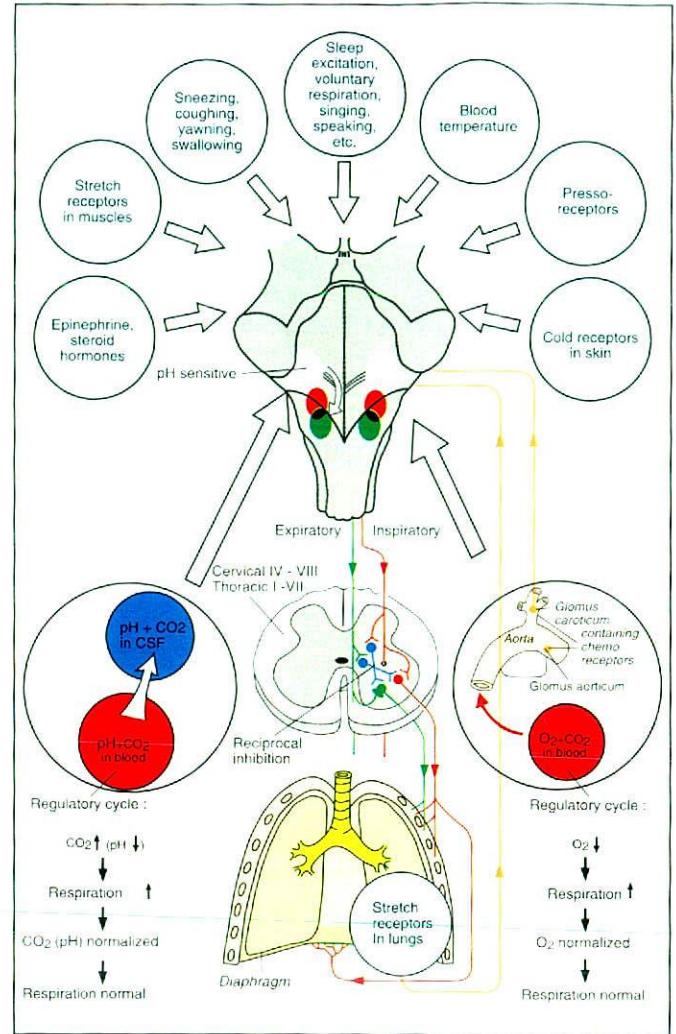
Compensatory responses in reversible hypovolemic shock



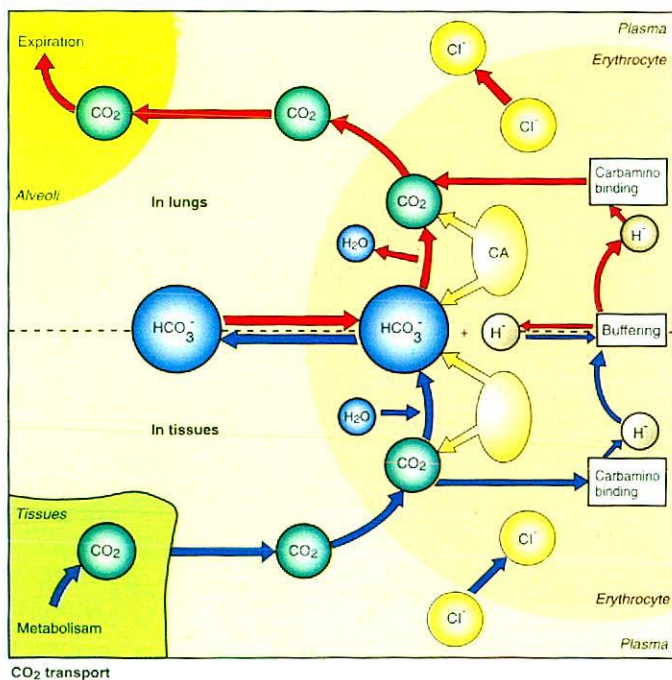




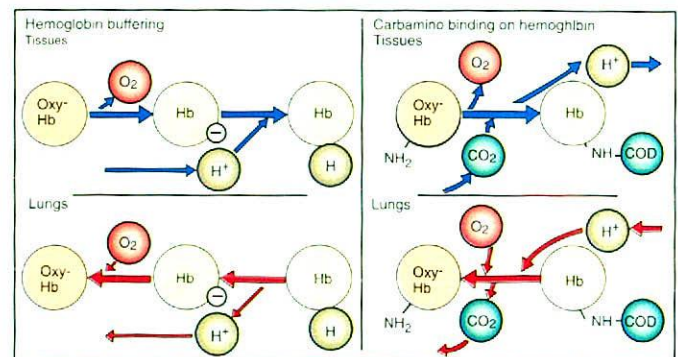
Respiration



Respiratory "centers" and Influences

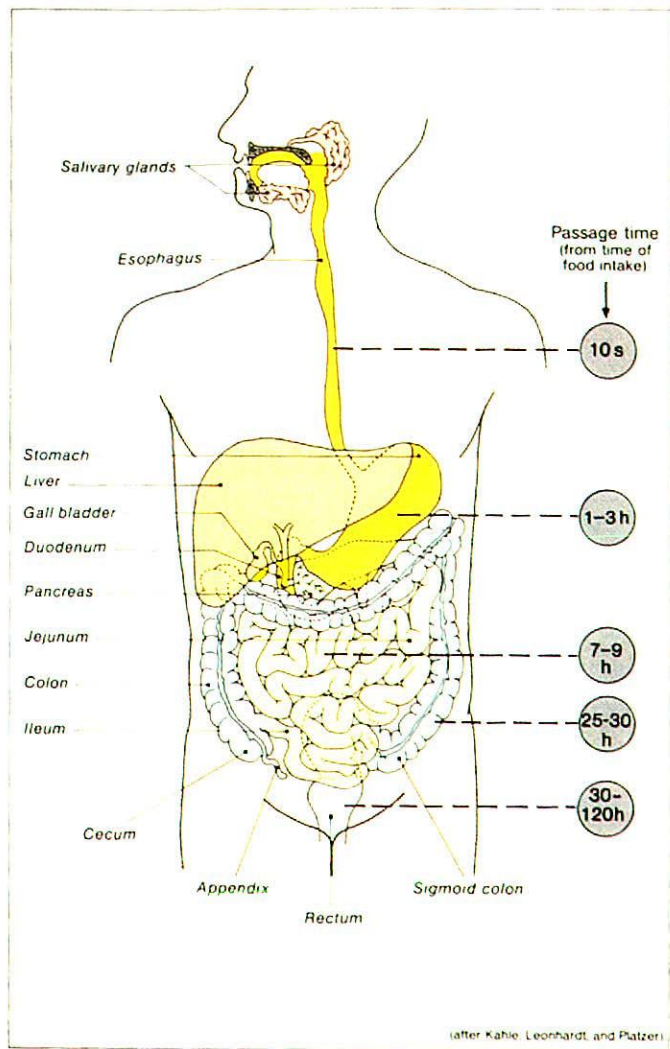


CO<sub>2</sub> transport

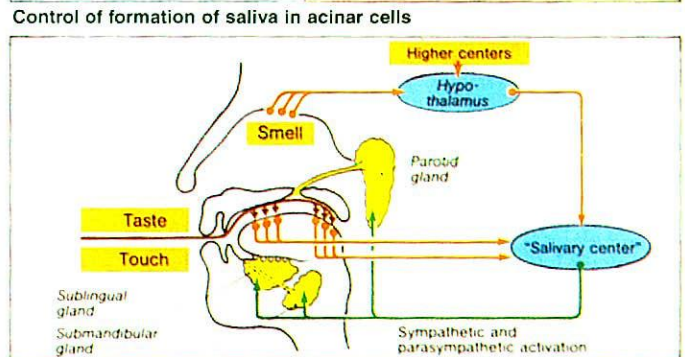
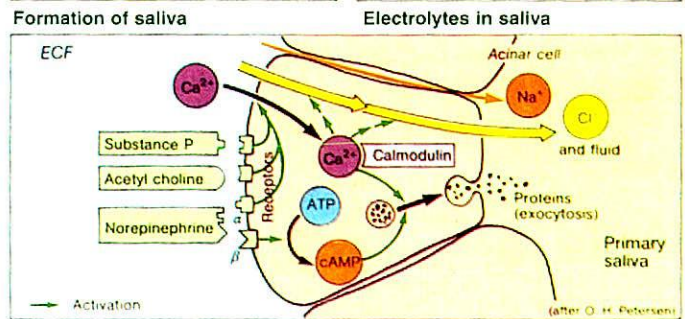
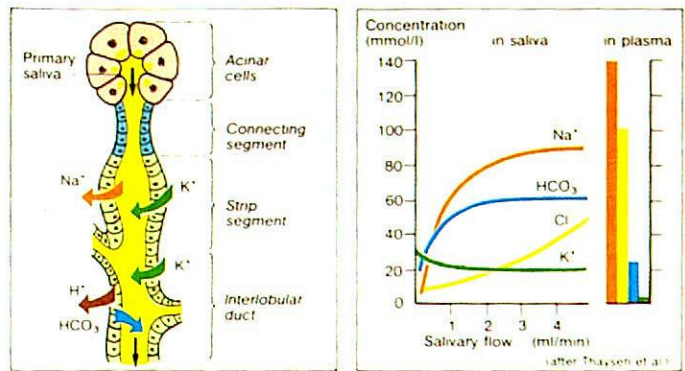


Buffering and carbamino binding in erythrocytes

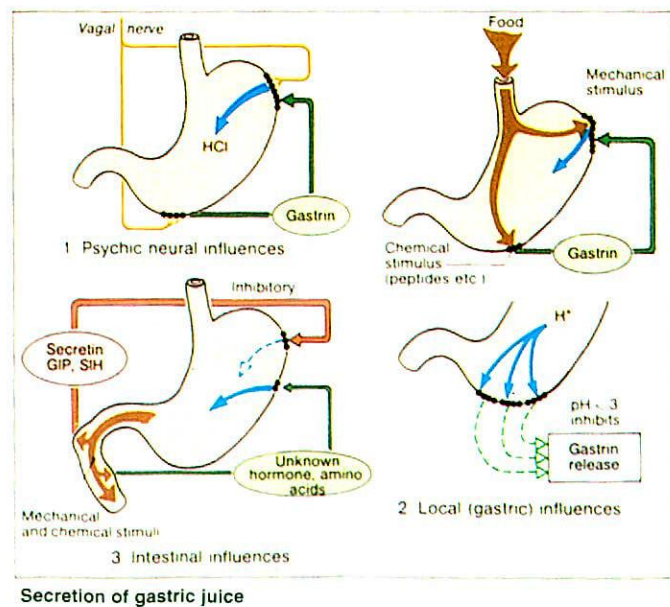




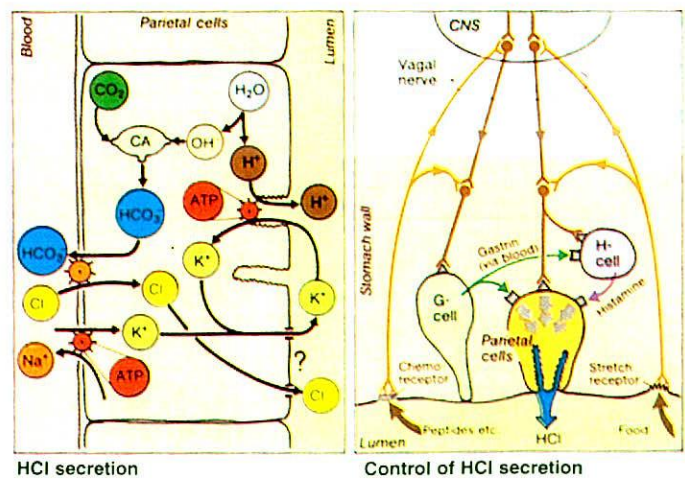
Gastrointestinal tract; organs and passage time



Reflex pathways in salivary secretion



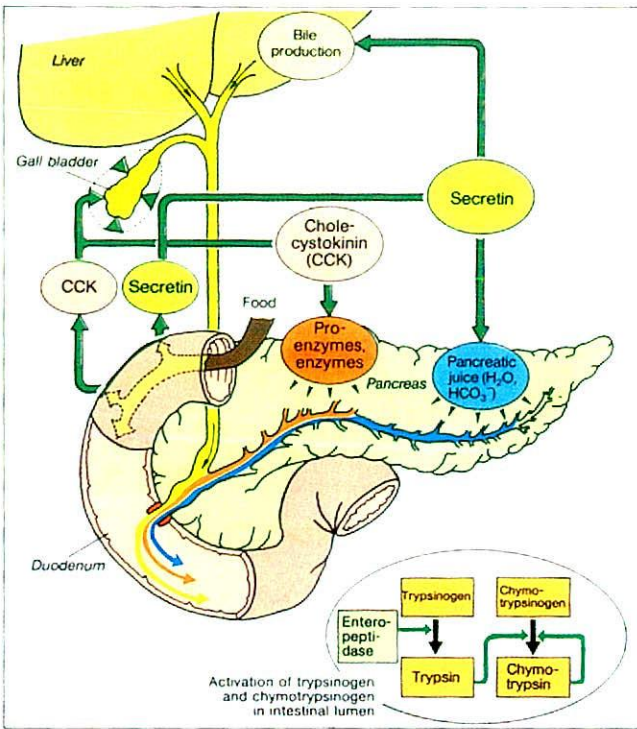
Secretion of gastric juice



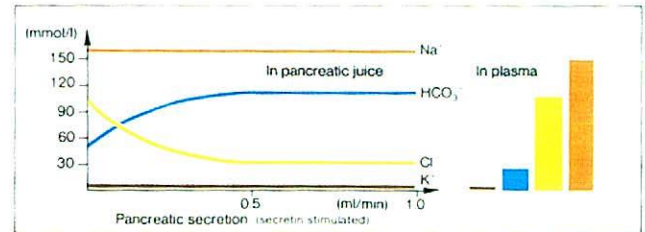
HCl secretion

Control of HCl secretion

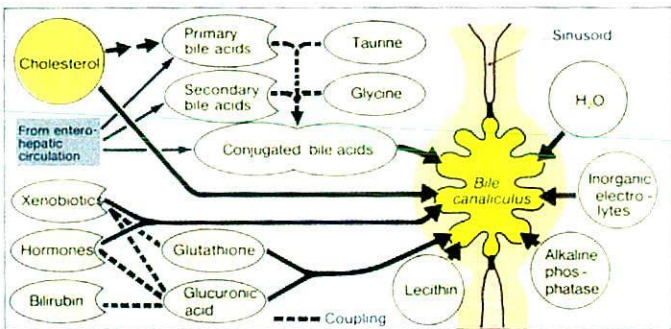




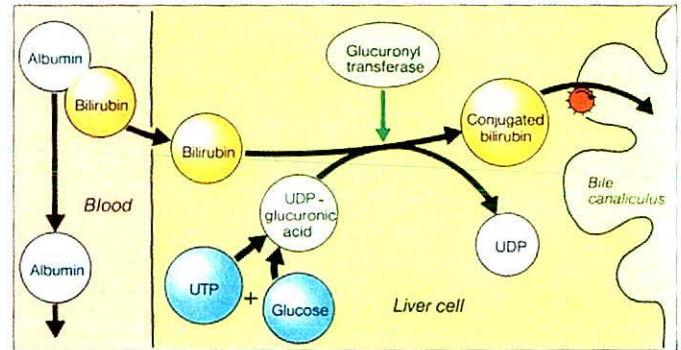
Bile and pancreatic juice



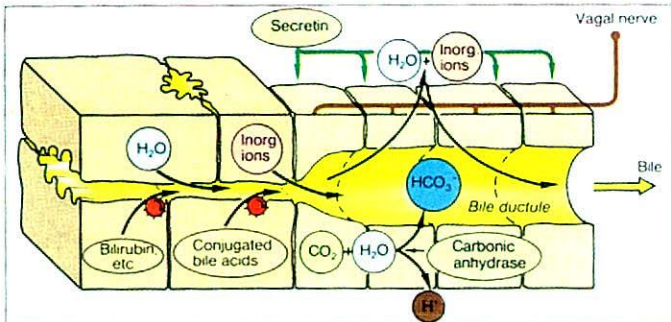
Electrolyte concentrations in pancreatic juice



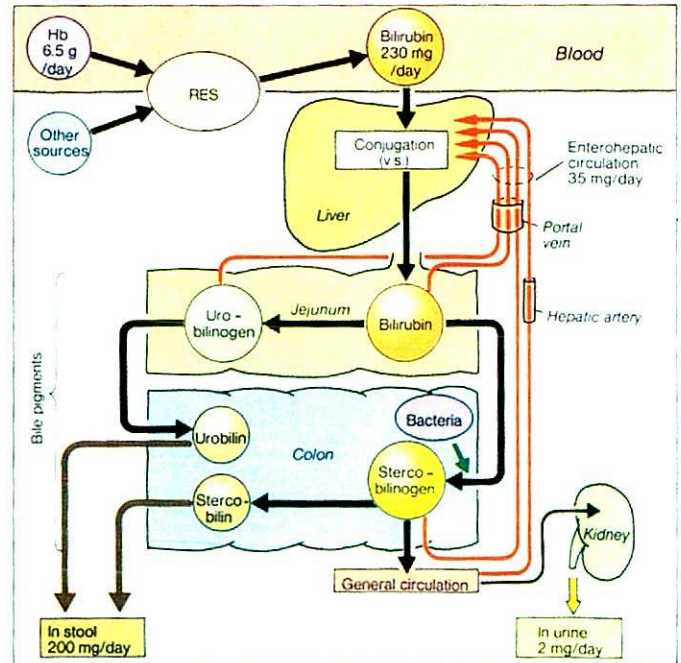
Excretory functions of liver



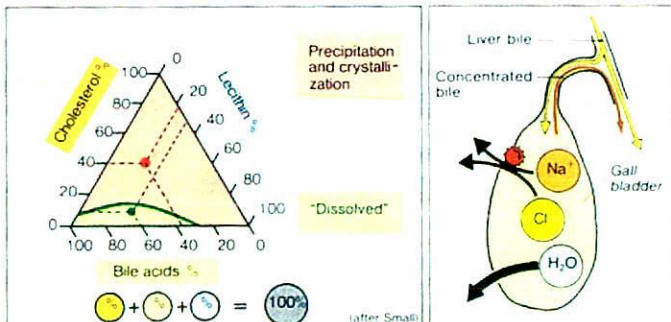
Conjugation of bilirubin in the liver



Transport in bile formation

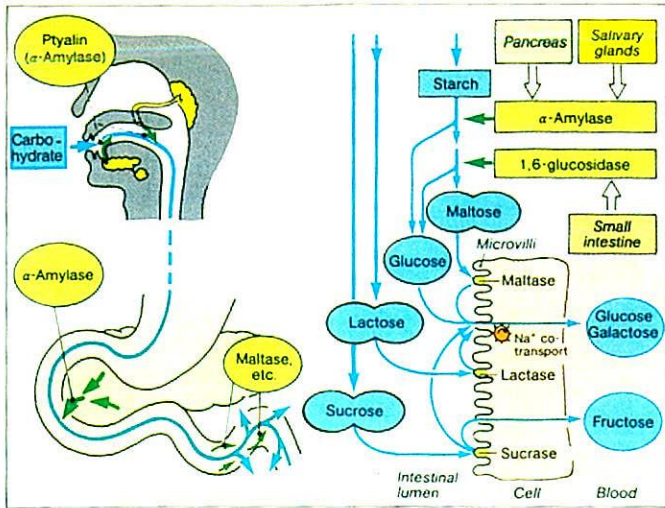


Metabolism and excretion of bilirubin

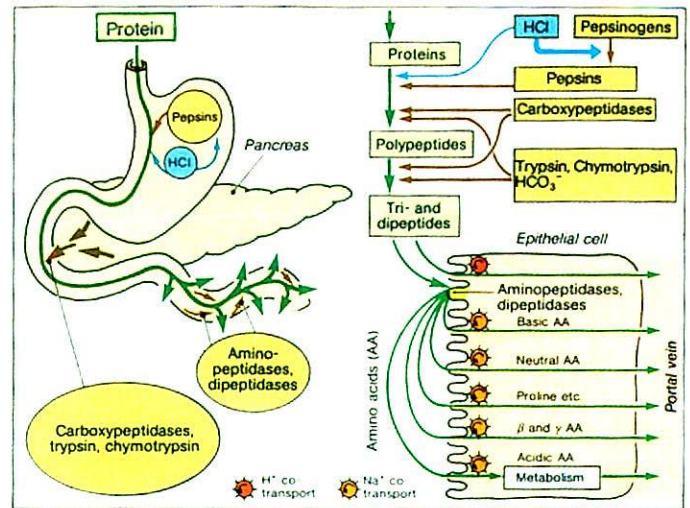


Micellar solution of cholesterol in bile

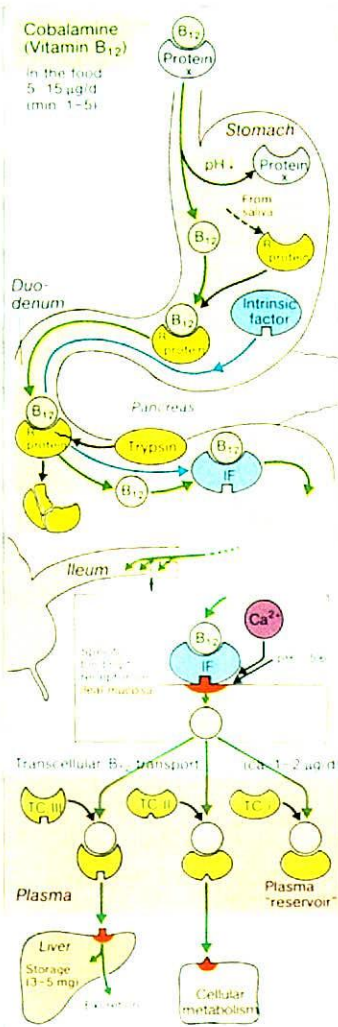




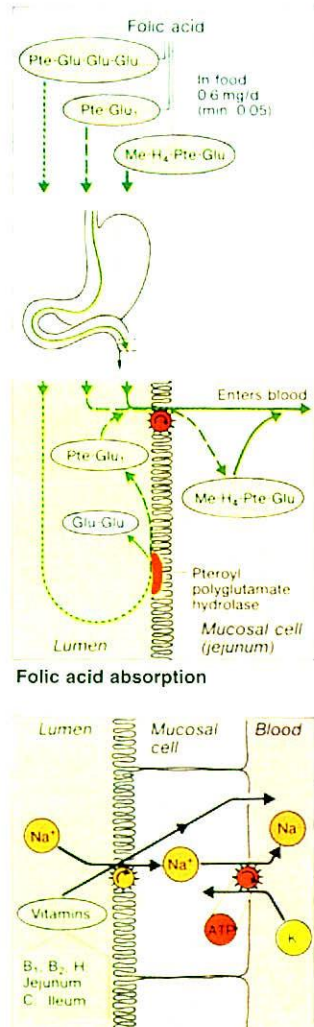
Digestion of carbohydrates and absorption of monosaccharides



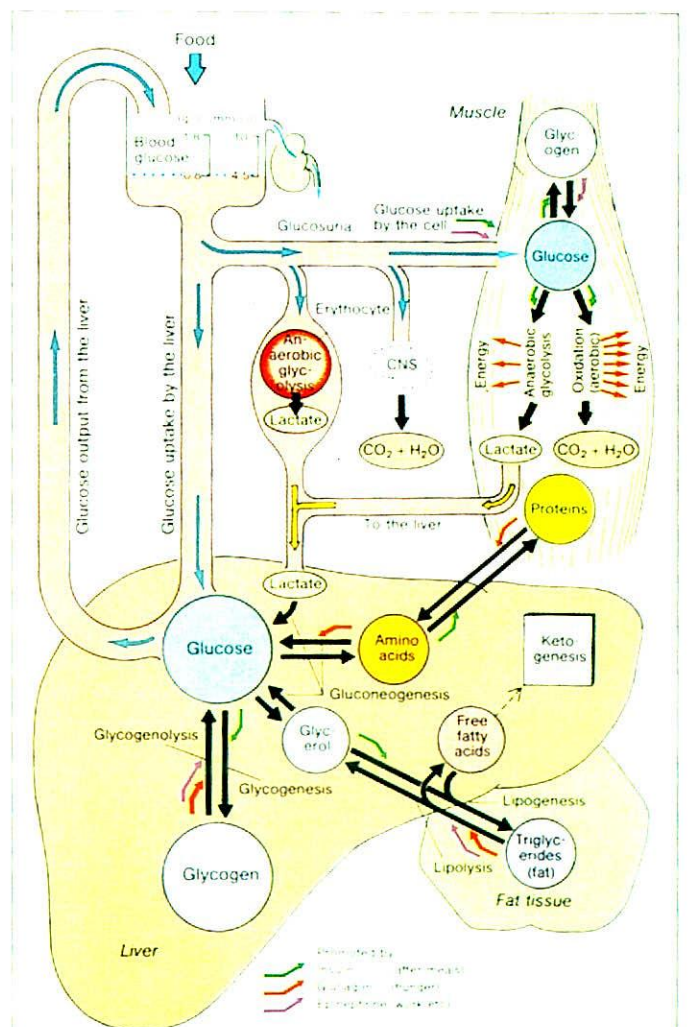
Digestion of proteins and absorption of amino acids and oligopeptides



Cobalamin (B<sub>12</sub>) transport

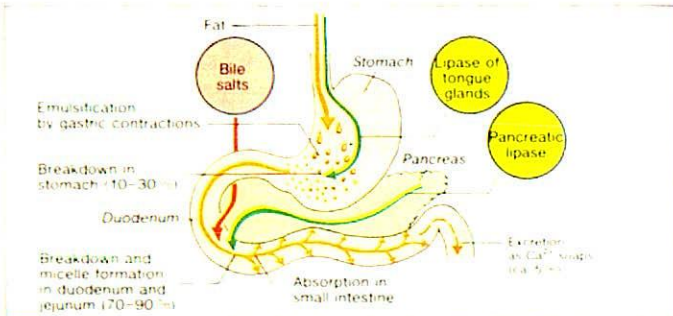


Secondary active vitamin absorption

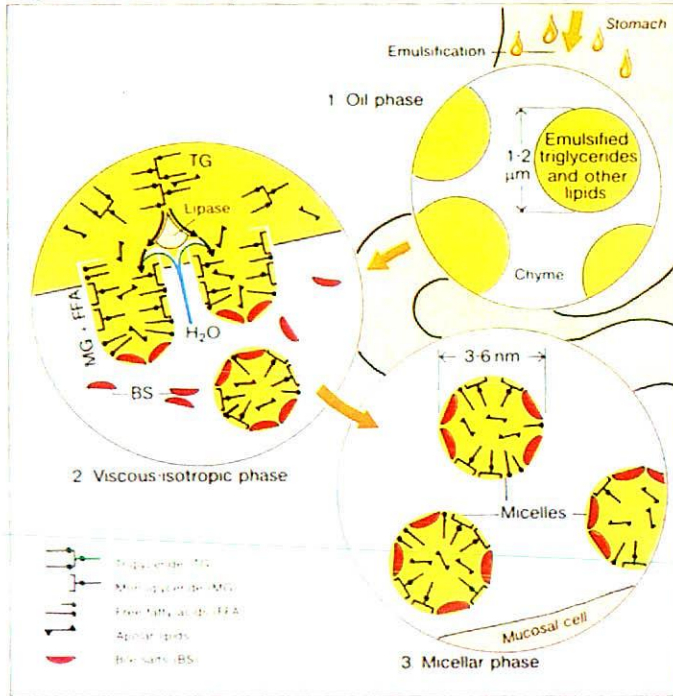


Glucose metabolism (simplified)



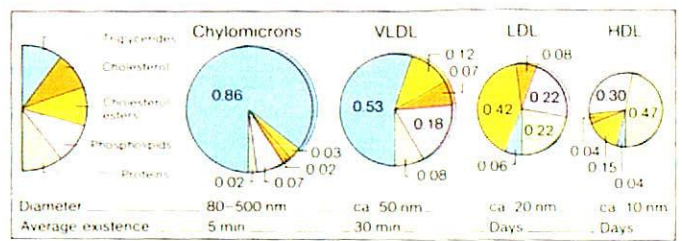


Digestion of fats: Survey

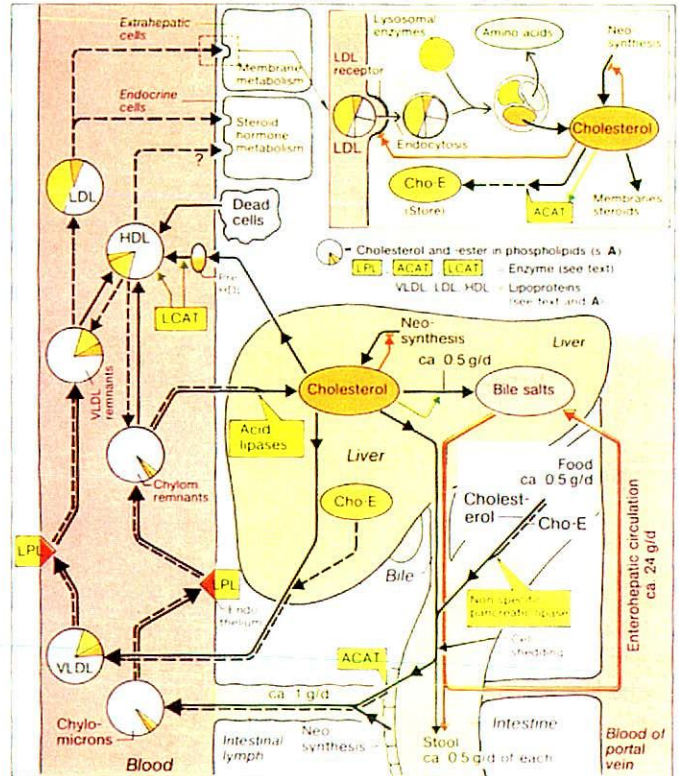


Digestion of fats: Breakdown and micelle formation

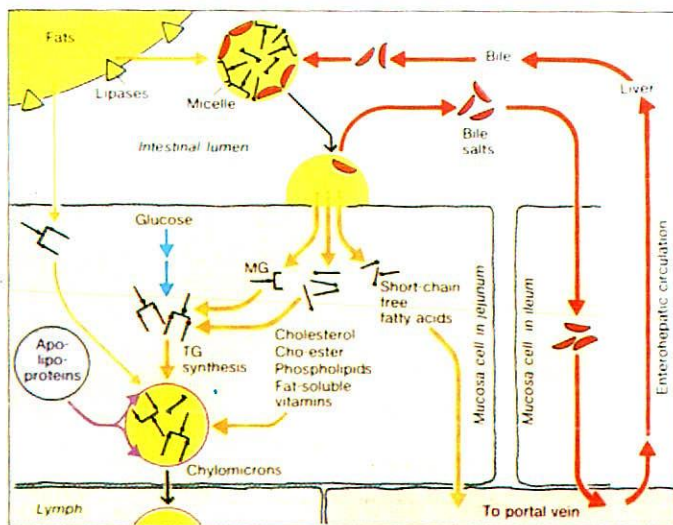
(after Patton)



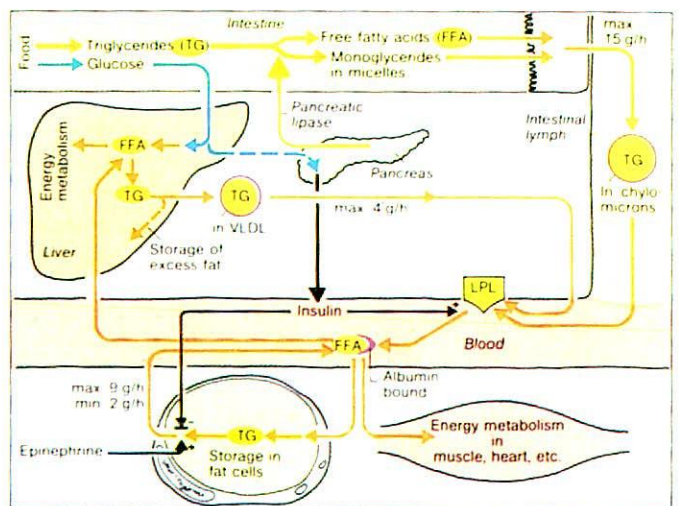
Proportion of lipid and protein (g/g) in the plasma lipoproteins



Sources and fate of cholesterol

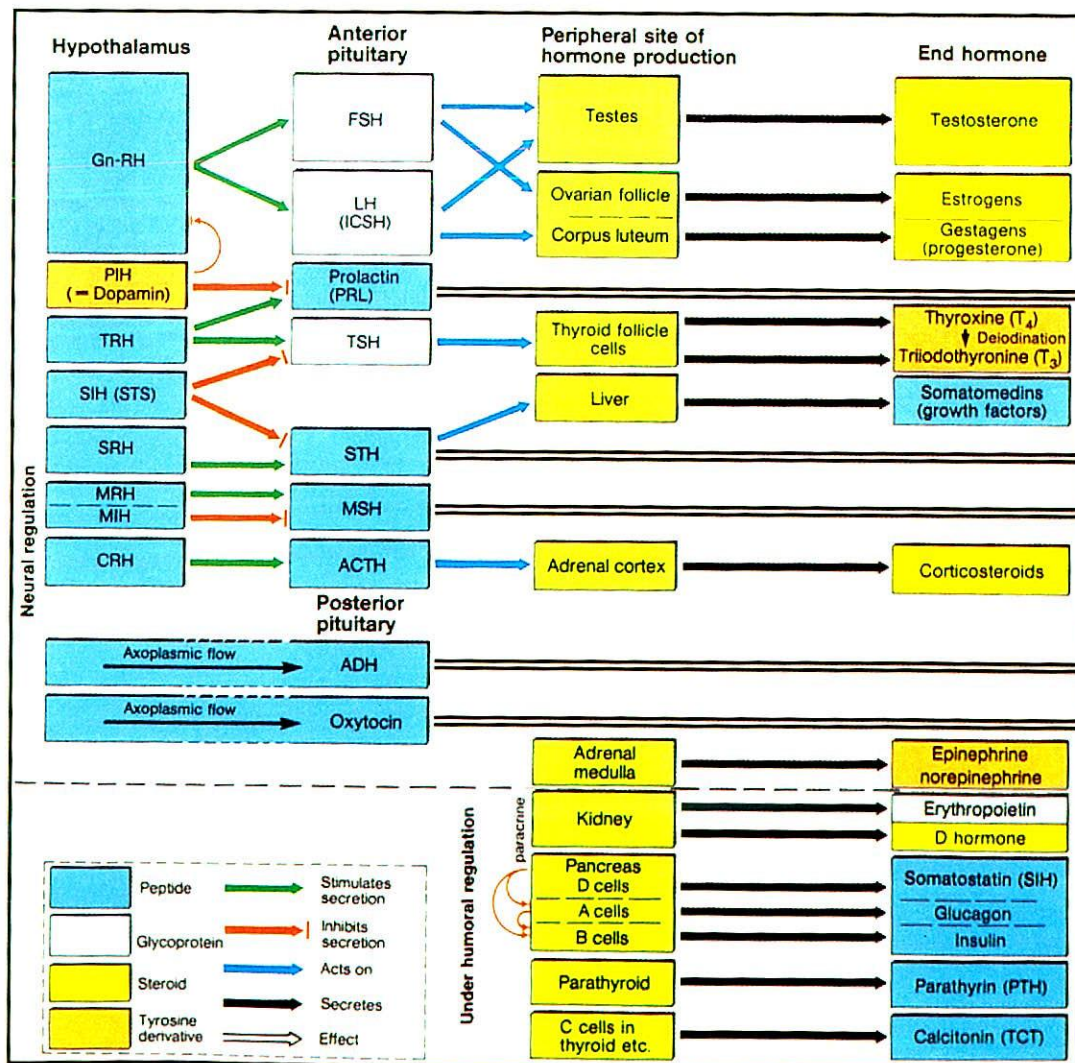
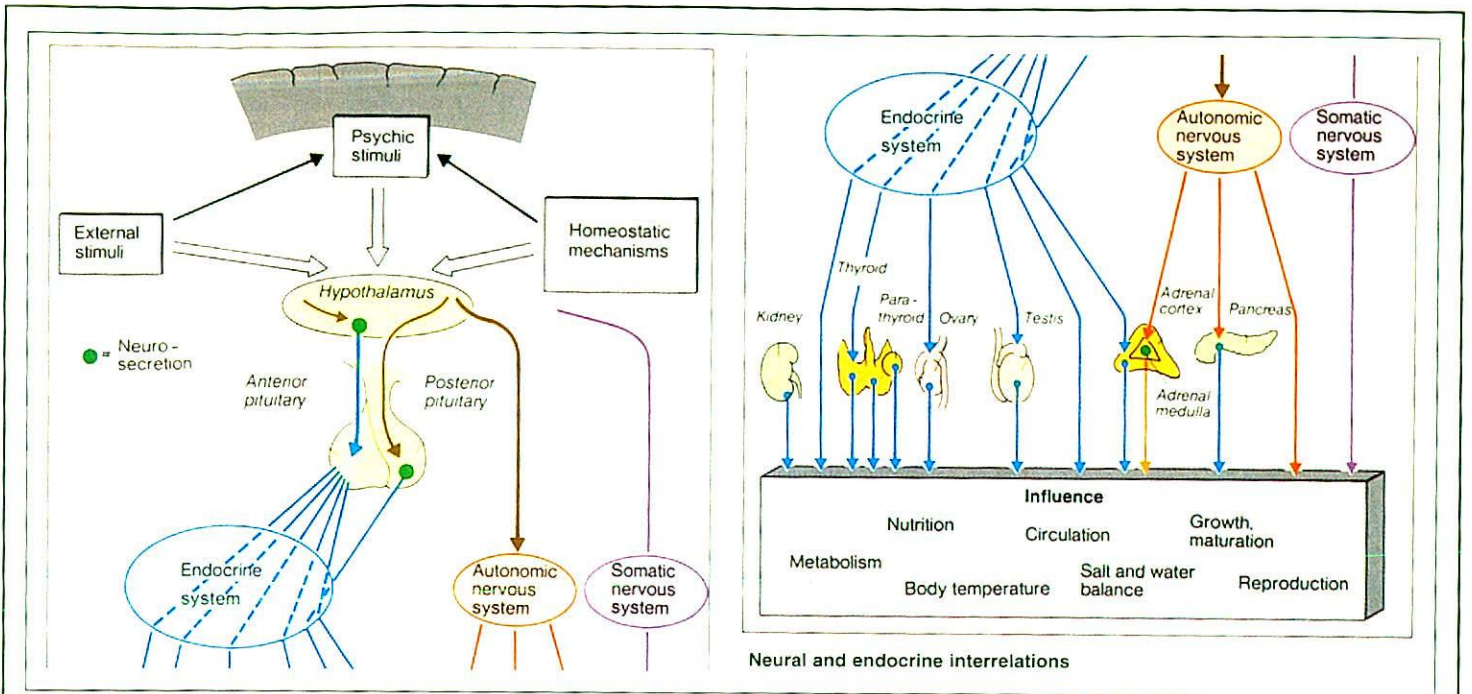


Absorption of fats

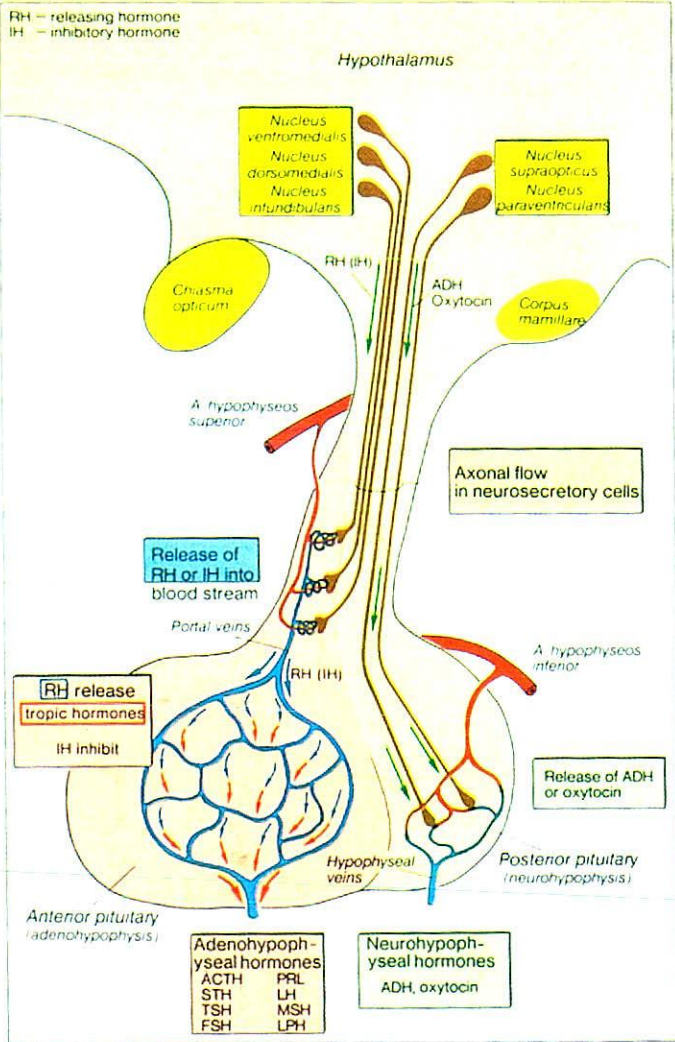


Sources and fate of triglycerides and free fatty acids

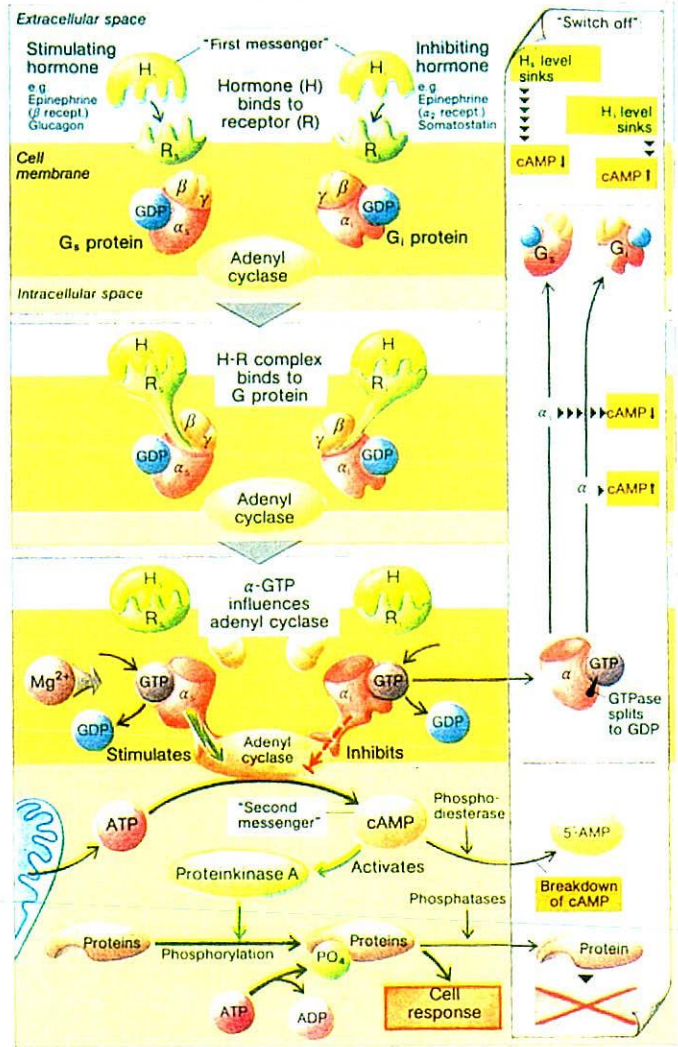




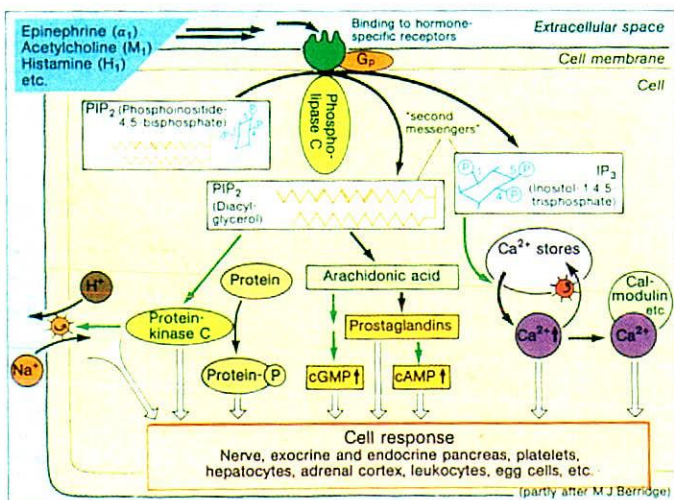




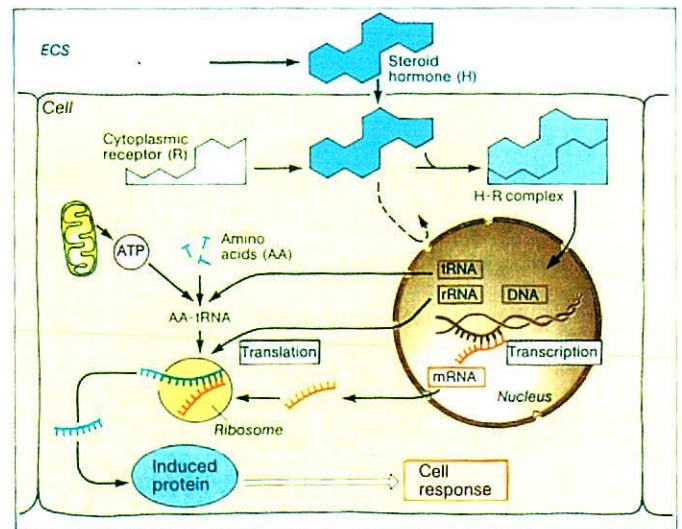
Hypothalamic and pituitary hormones



cAMP as "second messenger"

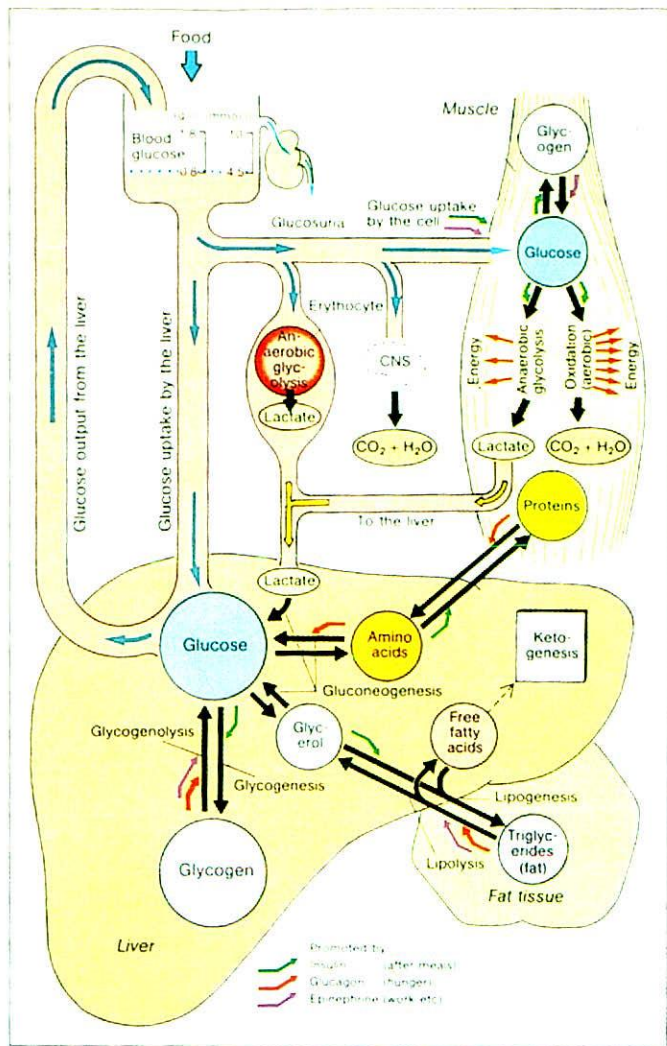


Diacylglycerol and inositol-1,4,5-trisphosphate as "second messengers"

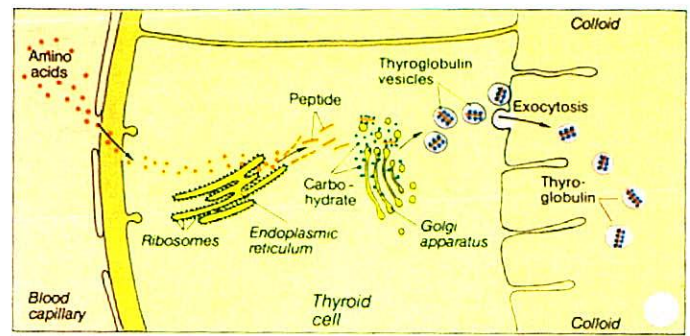


Mechanism of action of steroid hormones

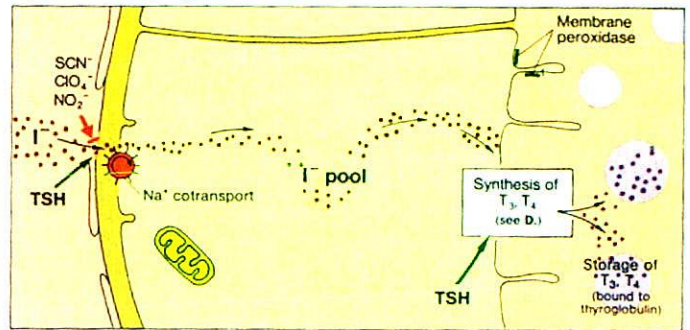




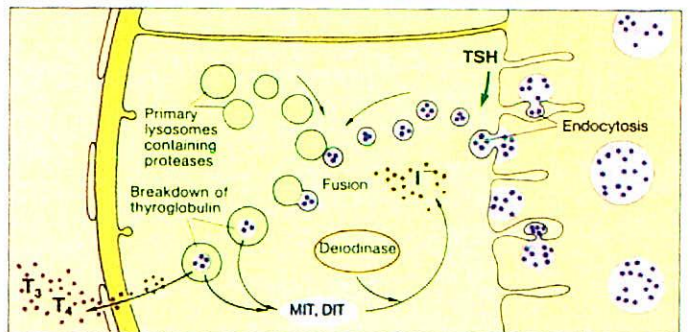
Glucose metabolism (simplified)



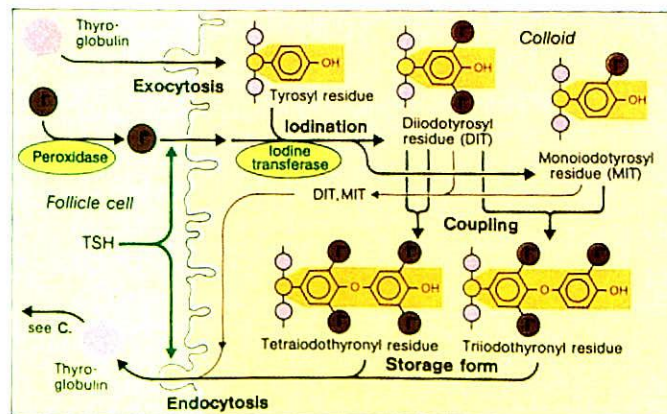
Synthesis of thyroglobulin



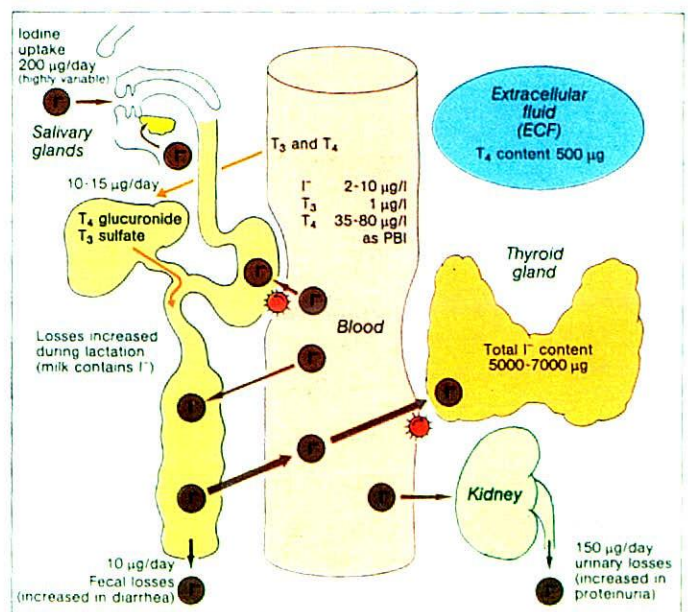
Iodine uptake, synthesis and storage of thyroid hormones



Secretion of thyroid hormones

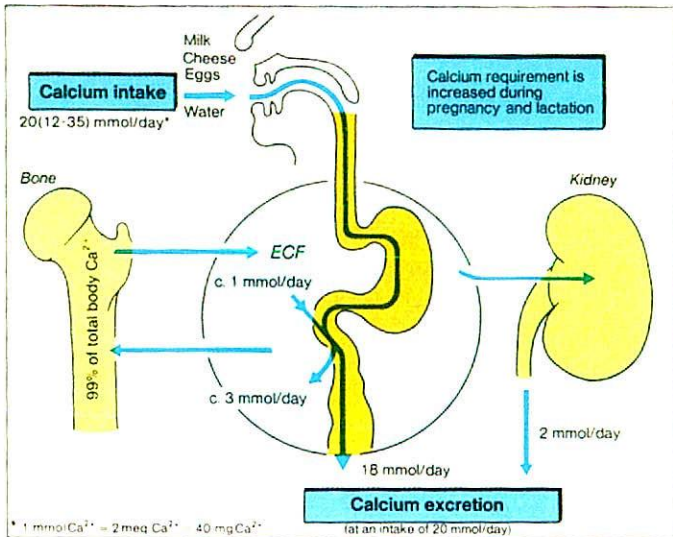


Synthesis, storage and mobilization of the thyroid hormones

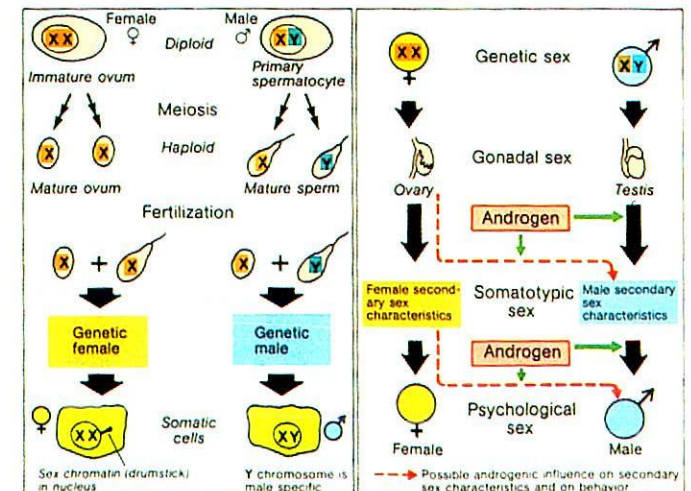
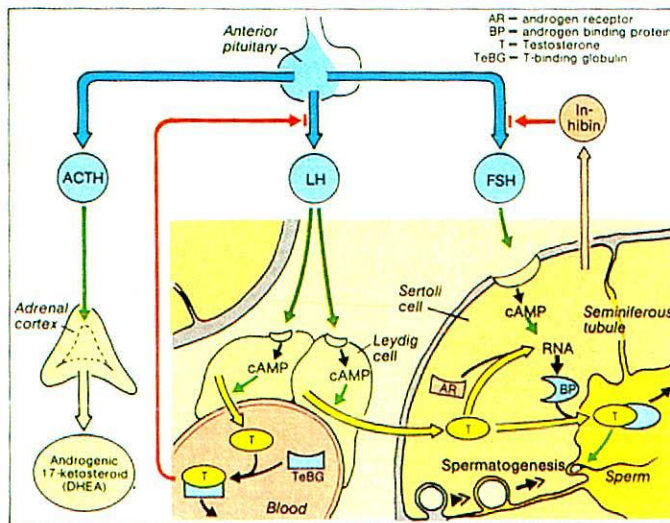
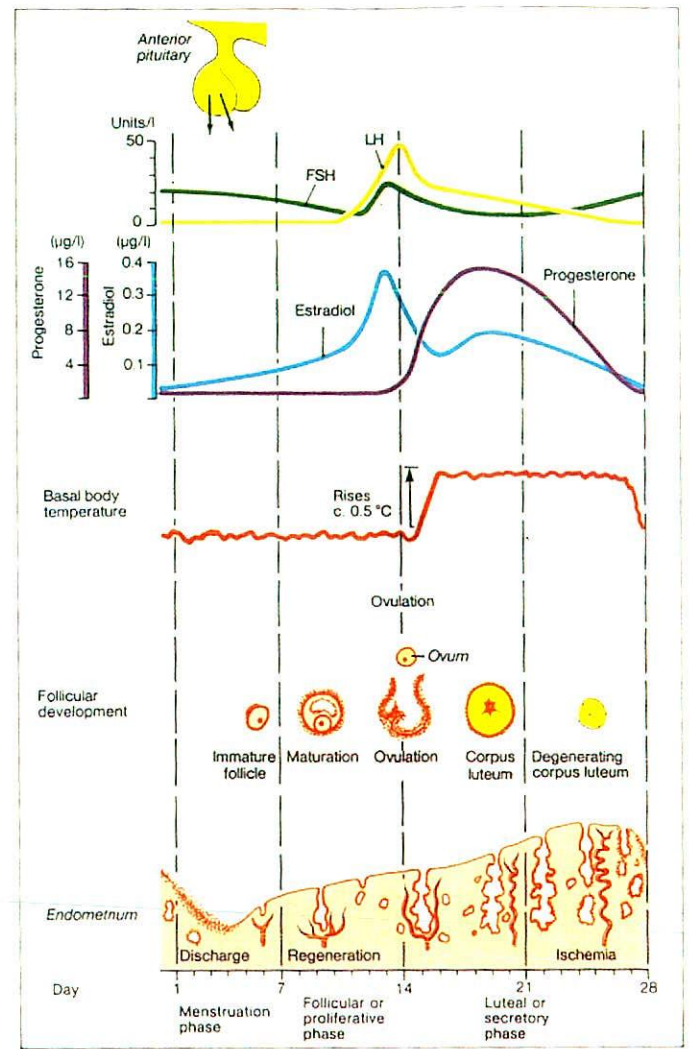
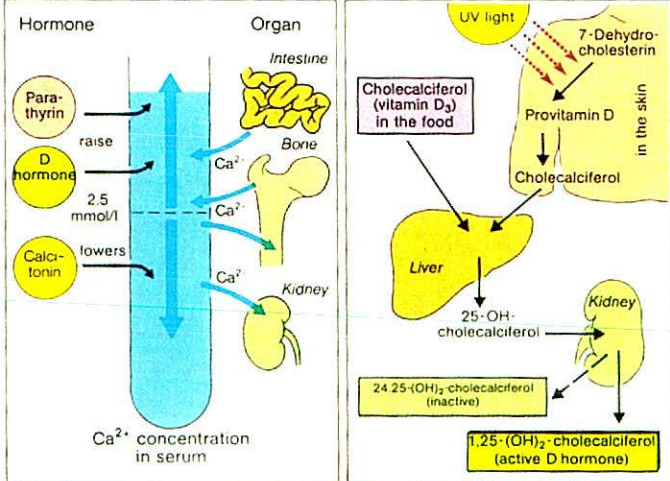


Iodine balance

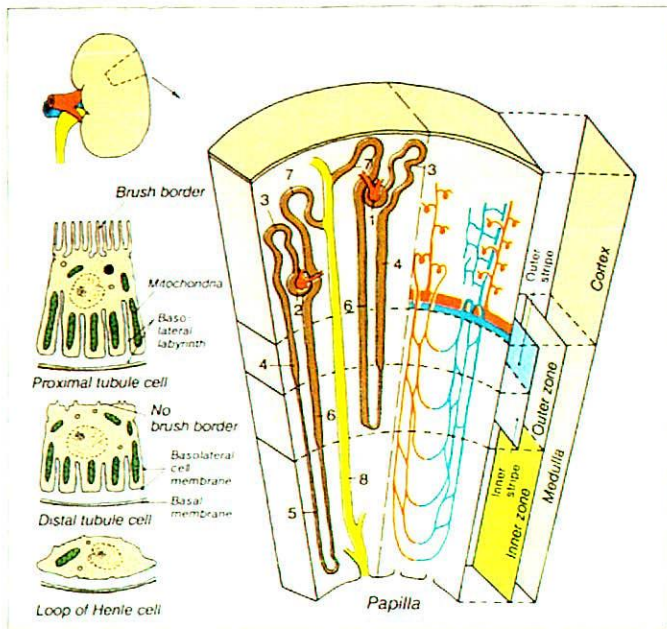




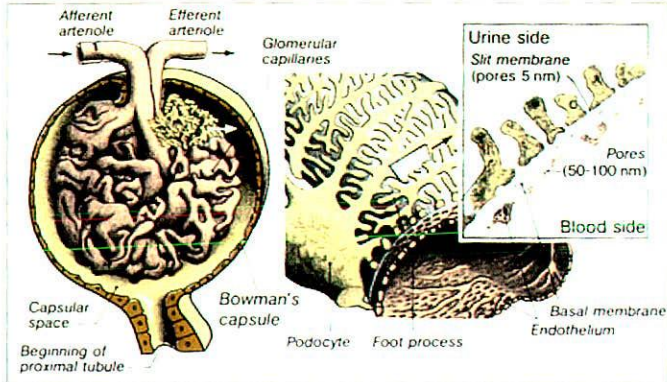
**Calcium balance**



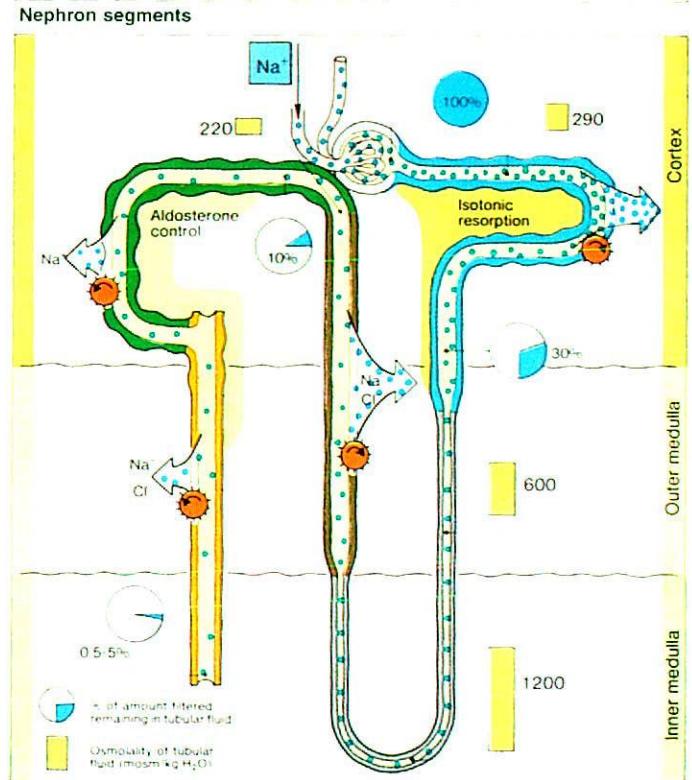
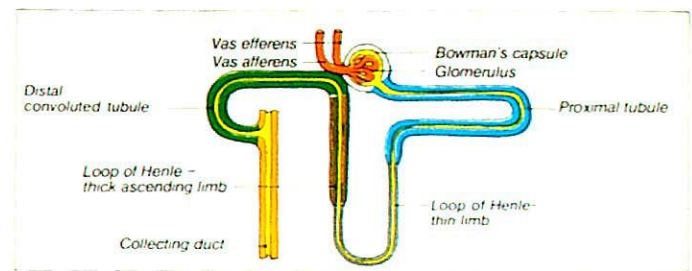




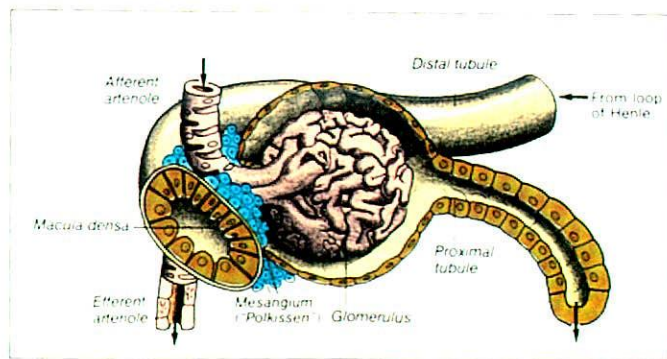
**Functional anatomy of the kidney**



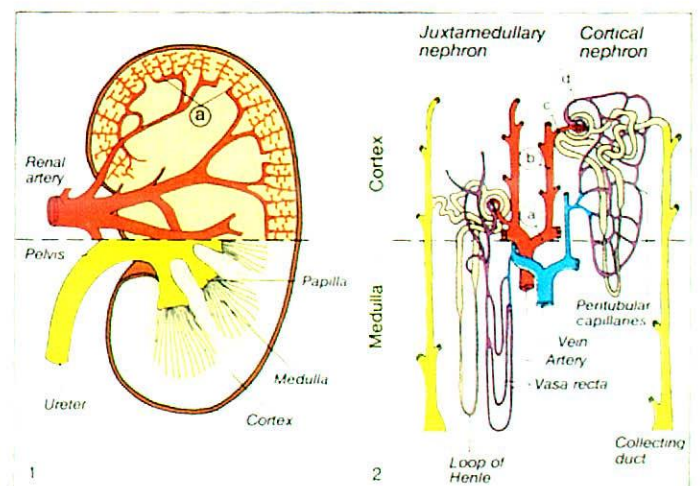
**Glomerulus and Bowman's capsule**



**Na<sup>+</sup> resorption in the nephron**

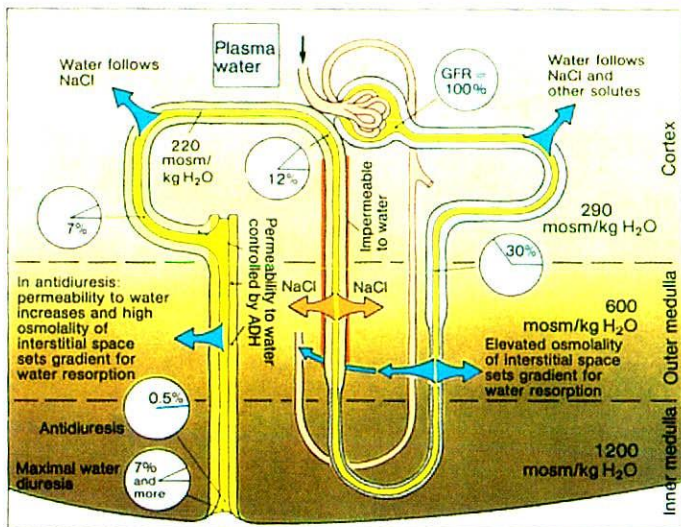


**Juxtaglomerular apparatus**

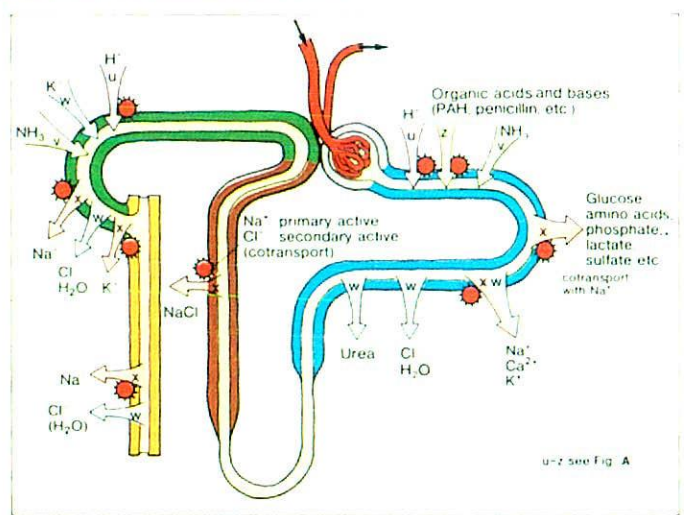


**Vascular arrangement in kidney**

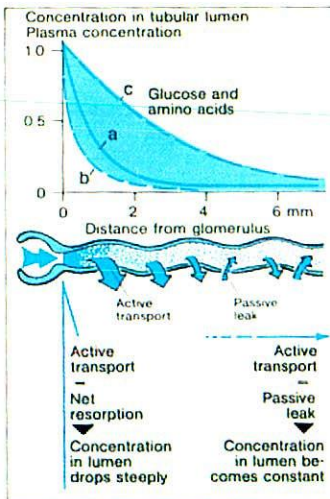




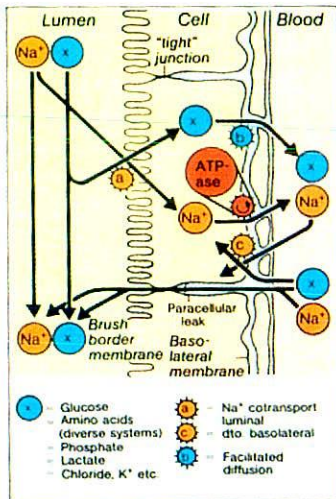
Fluxes of water in the nephron



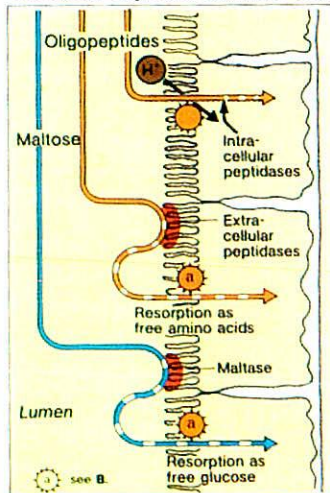
Locus of transport processes in the nephron (simplified)



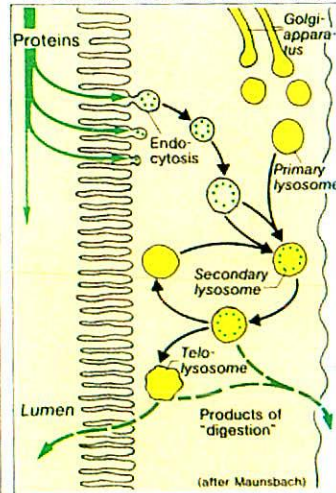
Resorption of glucose and amino acids



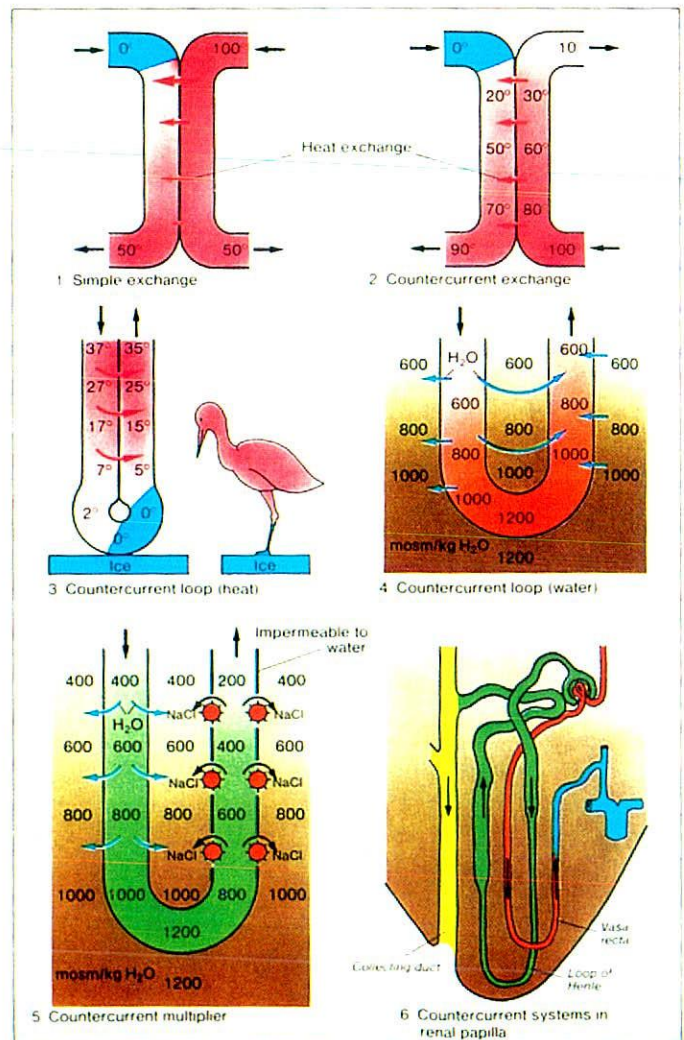
Secondary active Na<sup>+</sup> cotransport



Resorption of oligopeptides and maltose

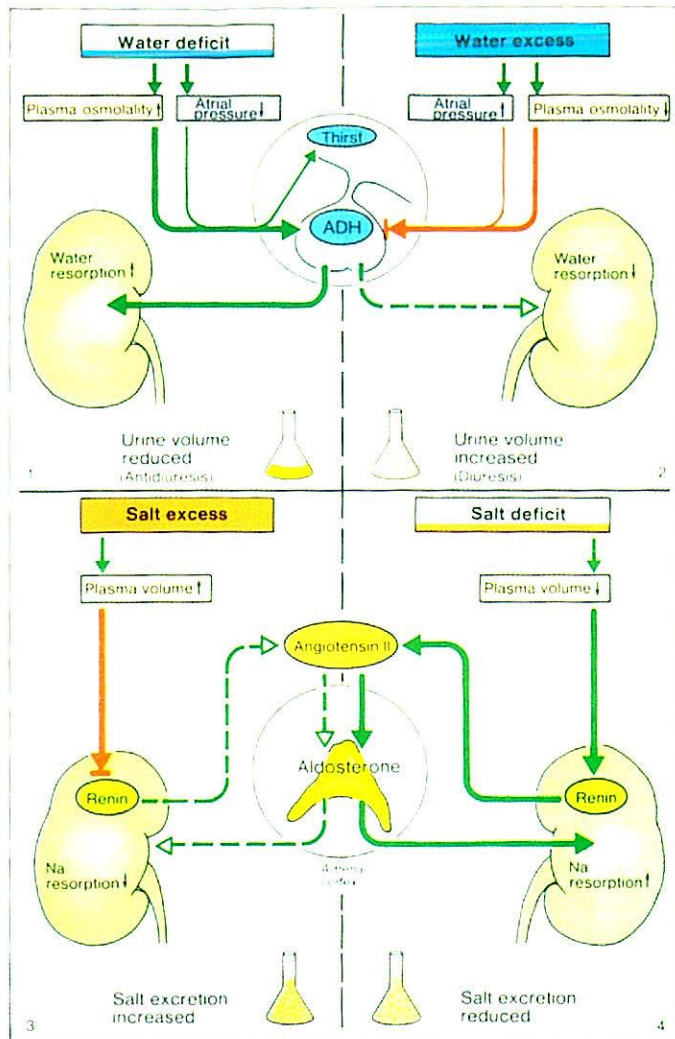


Protein resorption by endocytosis

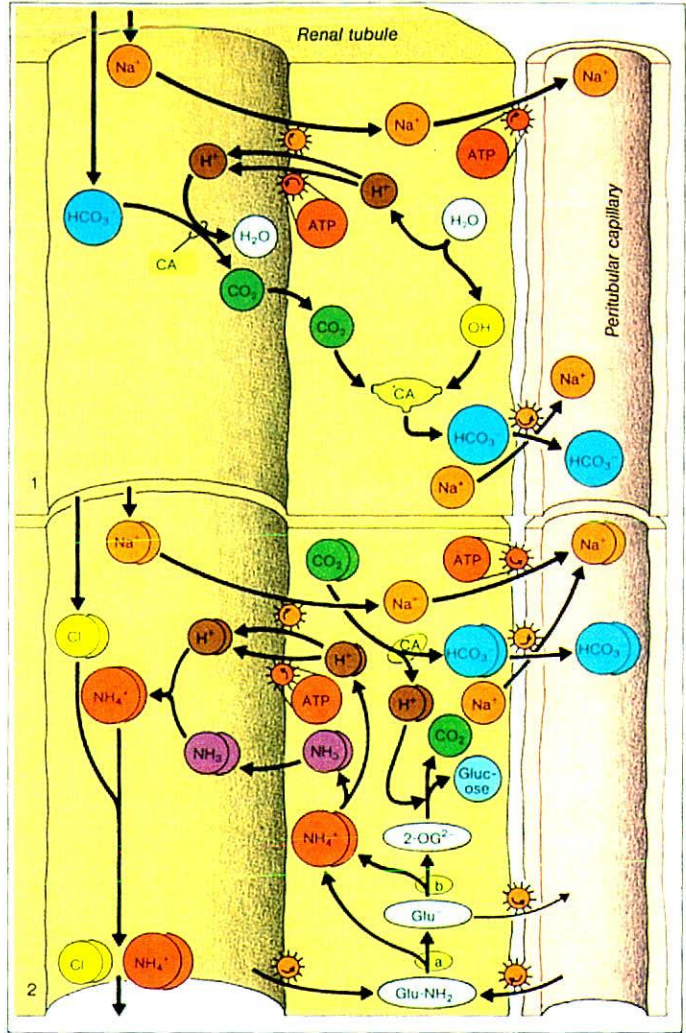


Countercurrent systems

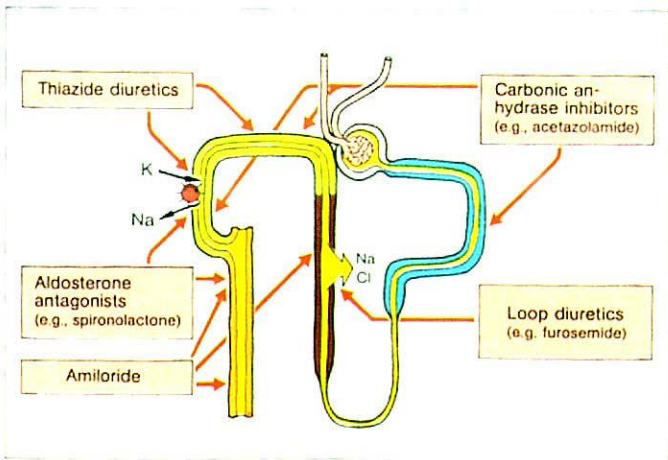




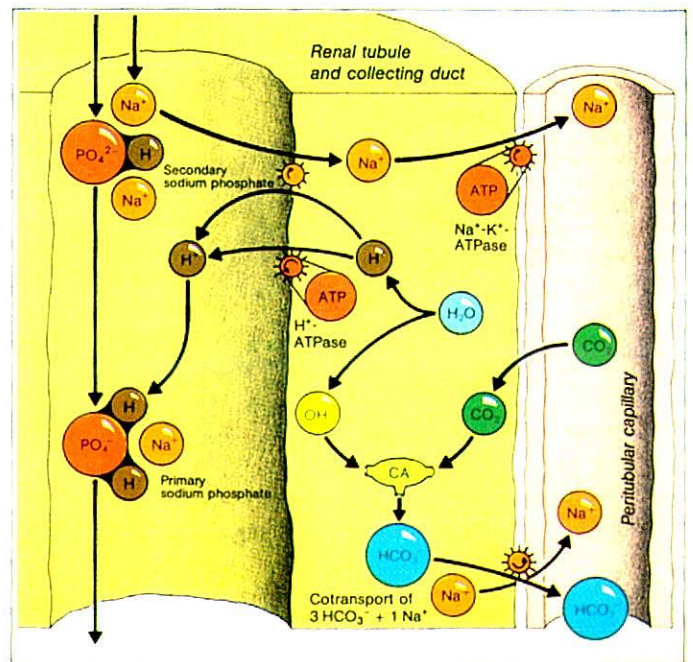
Hormonal control of salt and water balance



Bicarbonate resorption (1) and  $\text{NH}_4^+$  excretion (2)

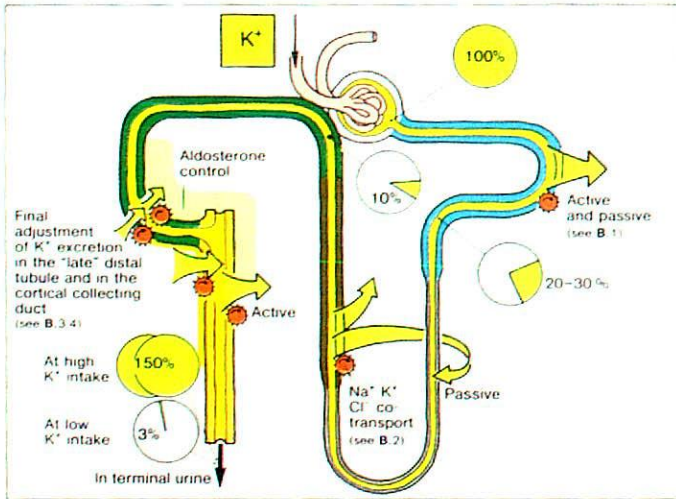


Locus of action of diuretics (simplified)

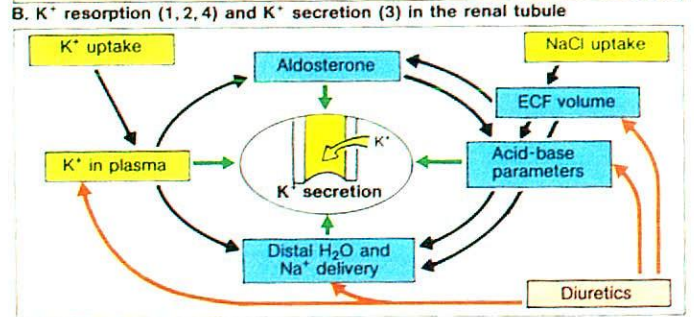
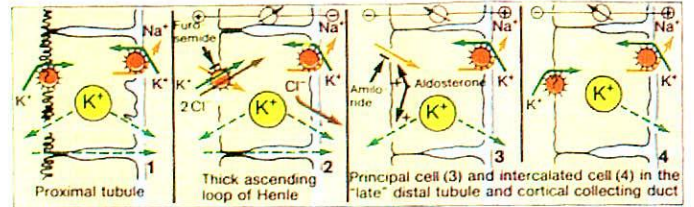


$\text{H}^+$  excretion as  $\text{H}_2\text{PO}_4^-$  (titratable acid)

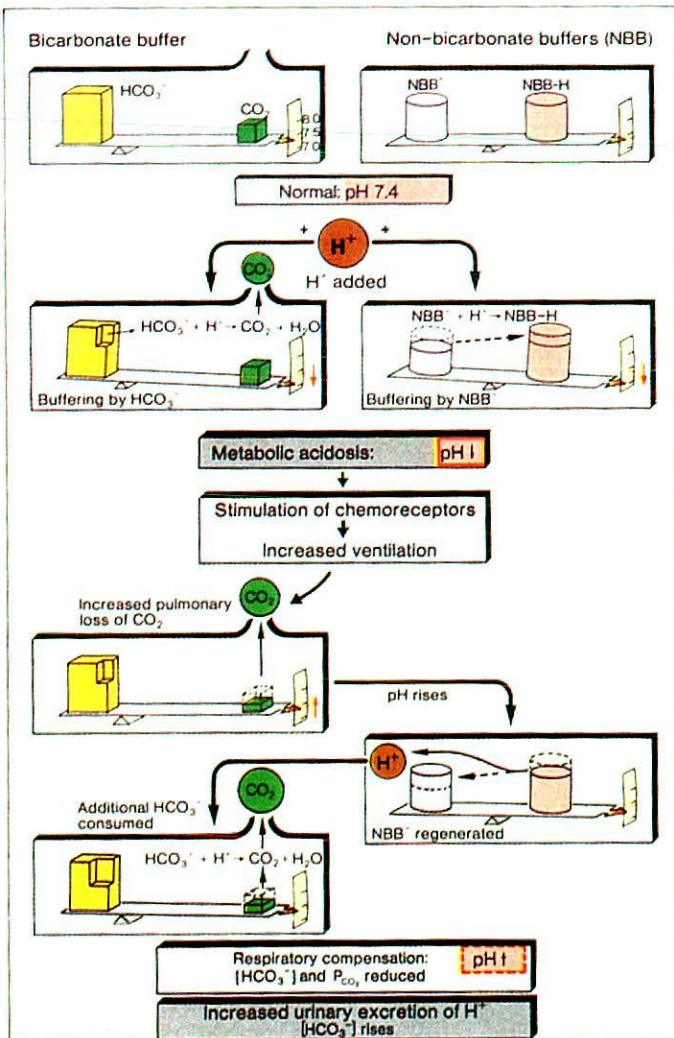




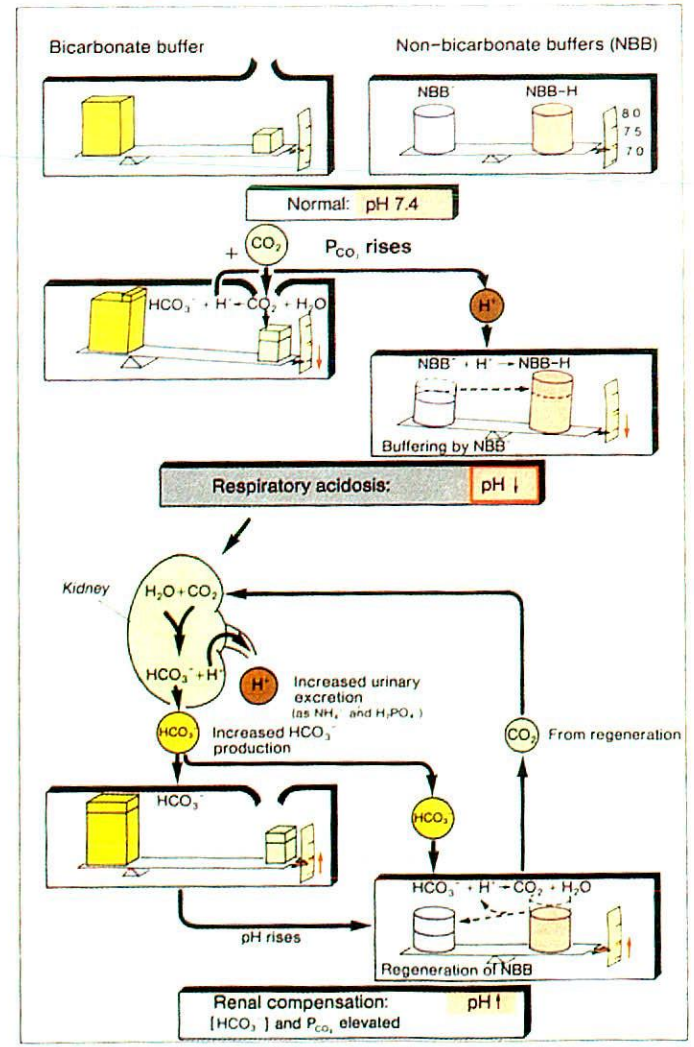
Resorption, secretion and excretion of K<sup>+</sup>



Influences on K<sup>+</sup> secretion and excretion

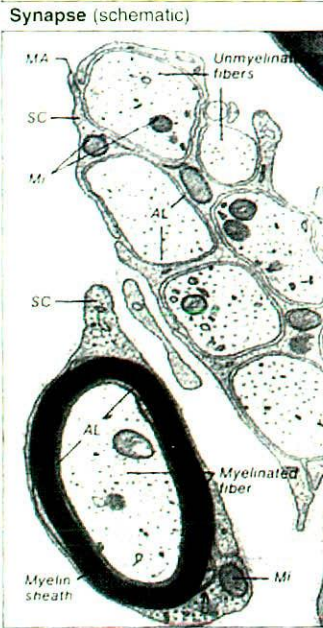
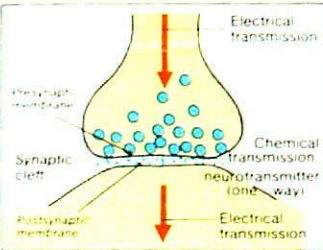
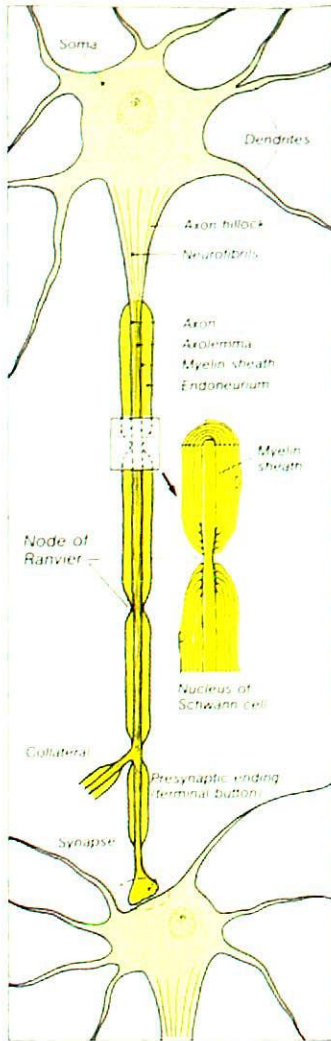


Metabolic acidosis



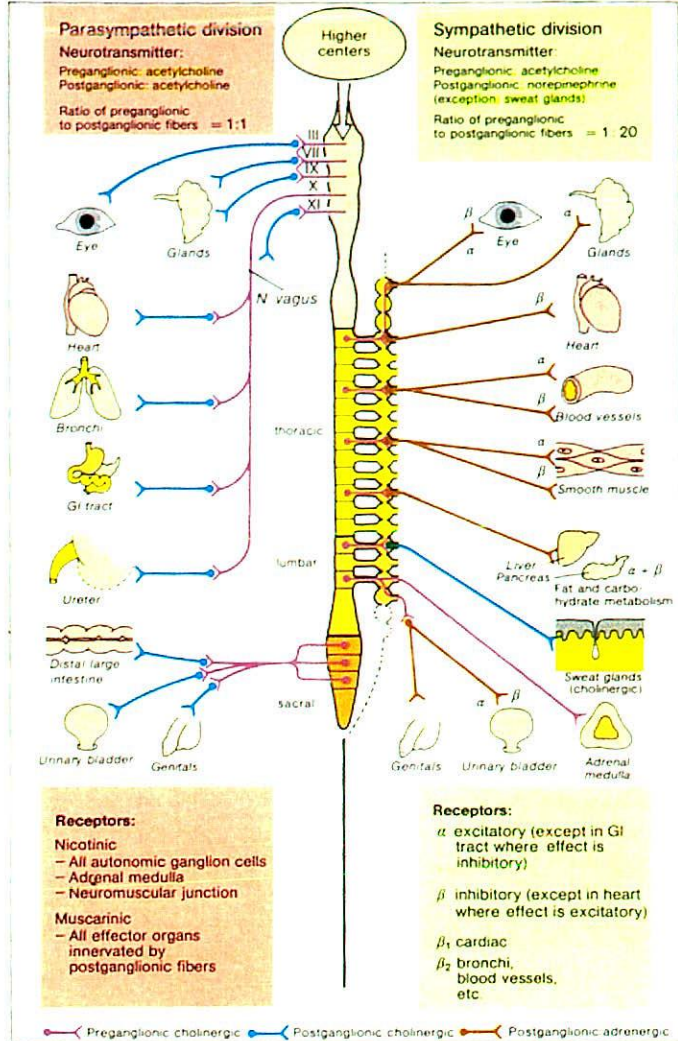
Respiratory



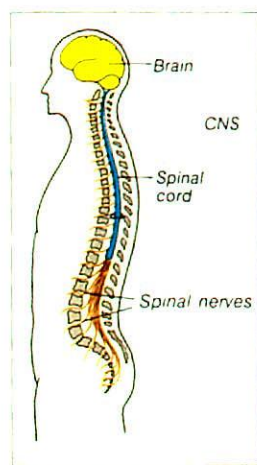


**Myelinated and unmyelinated nerve fibers**  
 Electron microscopic section (Enlargement 122,000). SC - Schwann cell, AL - Axolemma, Mi - Mitochondria, MA - Masaxon (-connection with extracellular space). The photograph was kindly placed at our disposal by Dr. Lauren A. Langford.

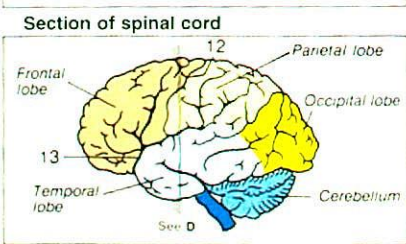
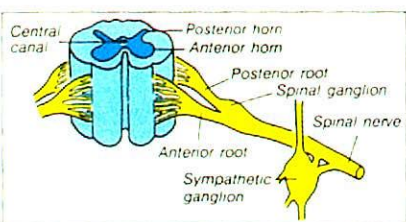
**Neuron and synapse** (schematic)



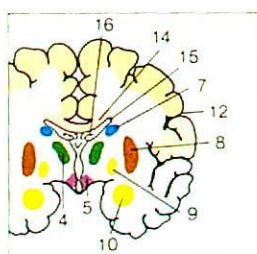
**Survey of autonomic nervous system**



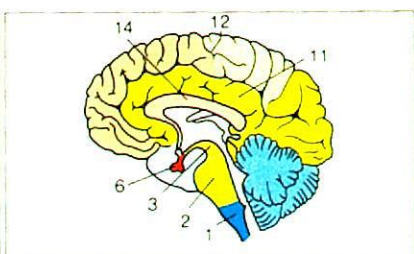
**Central nervous system**



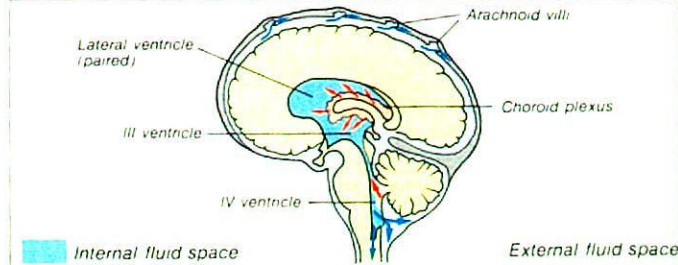
**Brain: lateral surface**



**Brain: transverse section**



**Brain: median sagittal section**

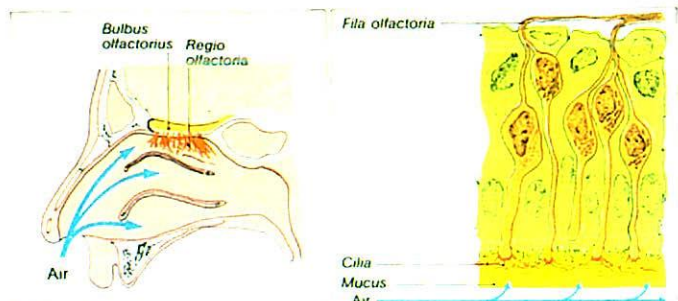


**Brain: fluid spaces**

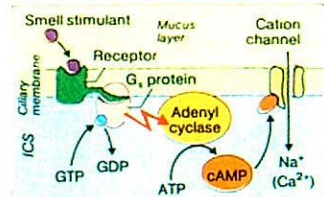




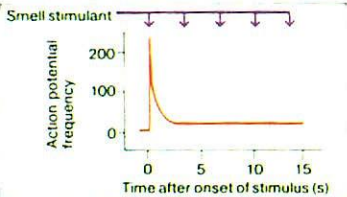




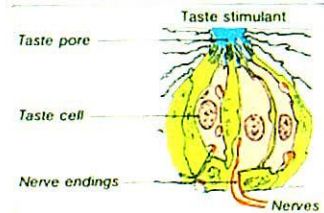
**Nasal cavity: organ of smell**



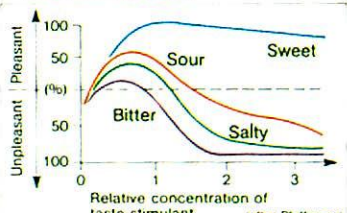
**Olfactory epithelium (after Adres)**



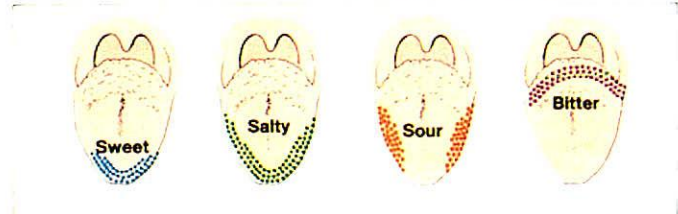
**Transduction of Olfactory stimulus**



**Adaptation to smell**

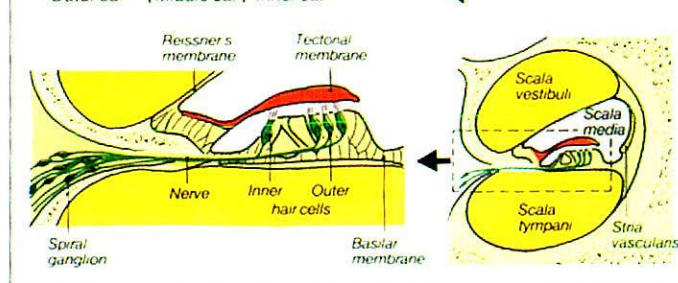
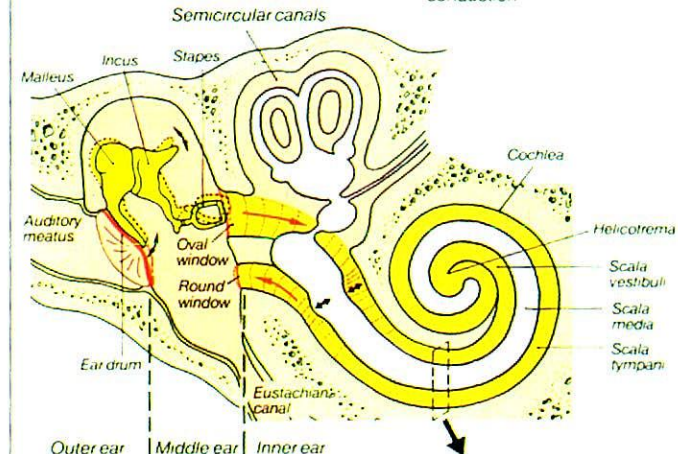
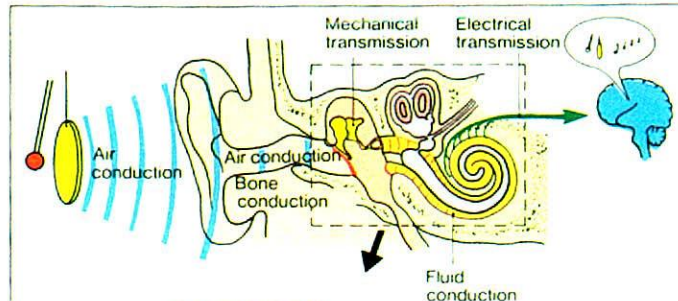


**Taste buds (after Adres)**

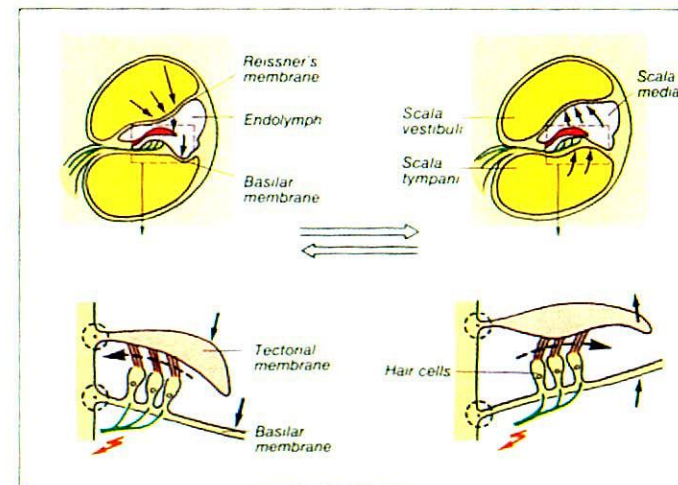


Localization of taste qualities on the tongue

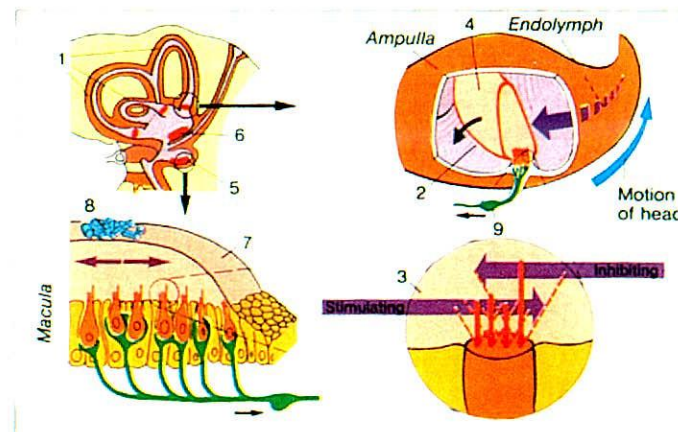
**Evaluation of taste stimuli**



Sound transmission

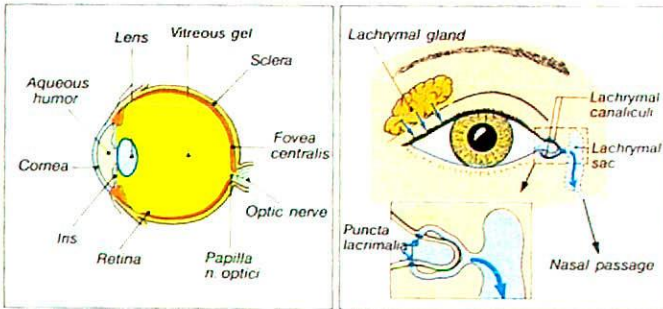


Excitation of hair cells by a shearing action on their hairs



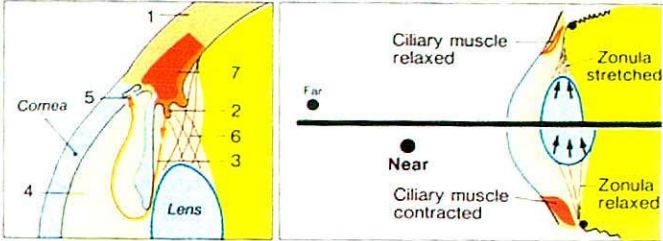
Vestibular organ





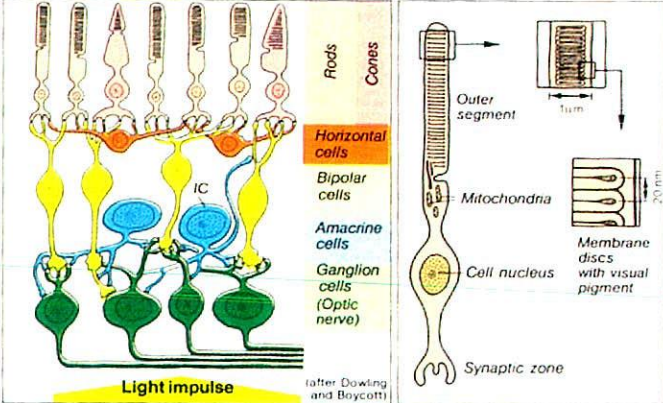
Right eye (horizontal section)

Right eye: tear flow



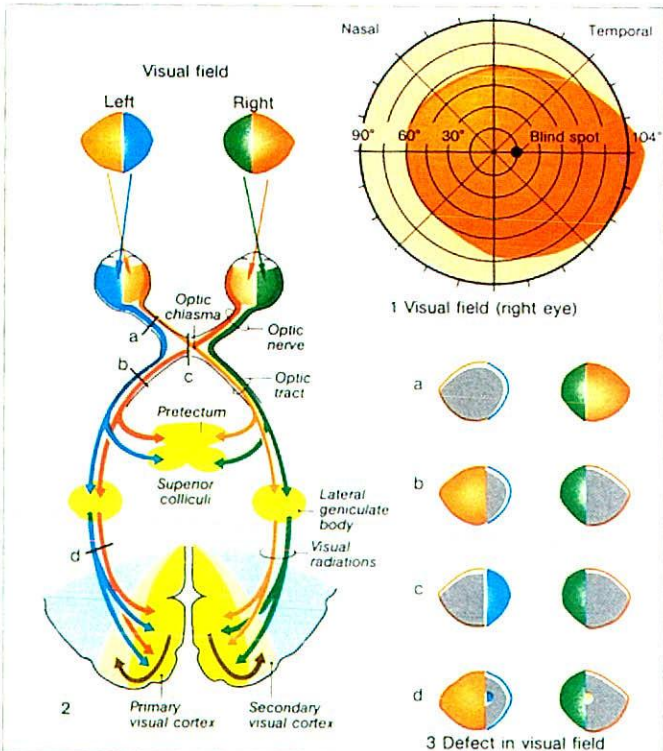
Aqueous humor

Accommodation

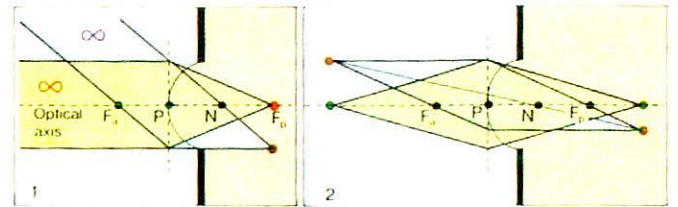


Retina (schematic)

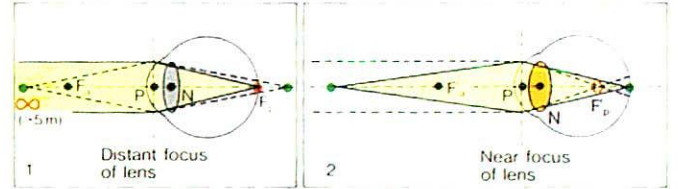
Rods



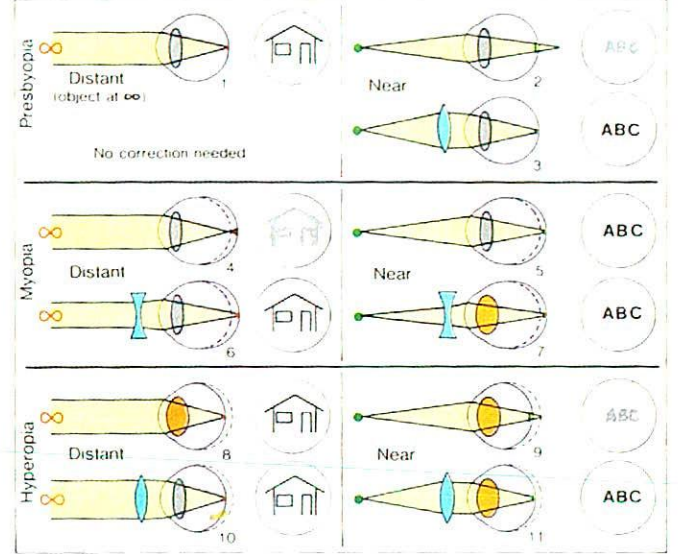
Visual pathway and field



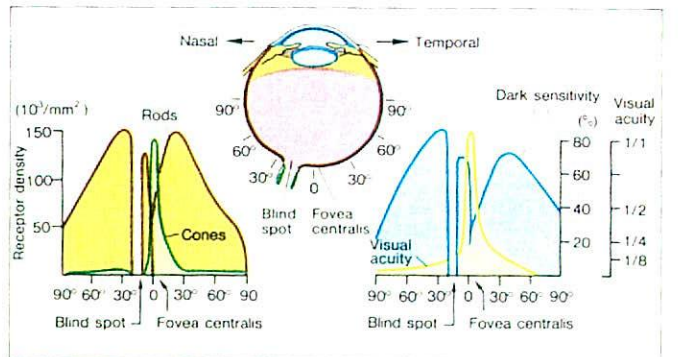
Optics: (1) distant, (2) near light source



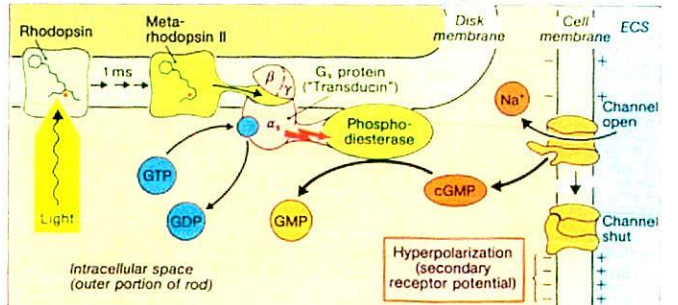
Accommodation in the eye (1) distant, (2) near



Visual defects



Retina: distribution of rods, cones, dark sensitivity and visual acuity



Transduction process in the rods