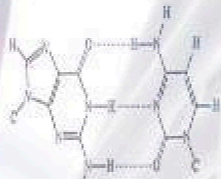
Medical Committee
The University of Jordan

● SLIDE ○ SHEET

SLIDE : 1

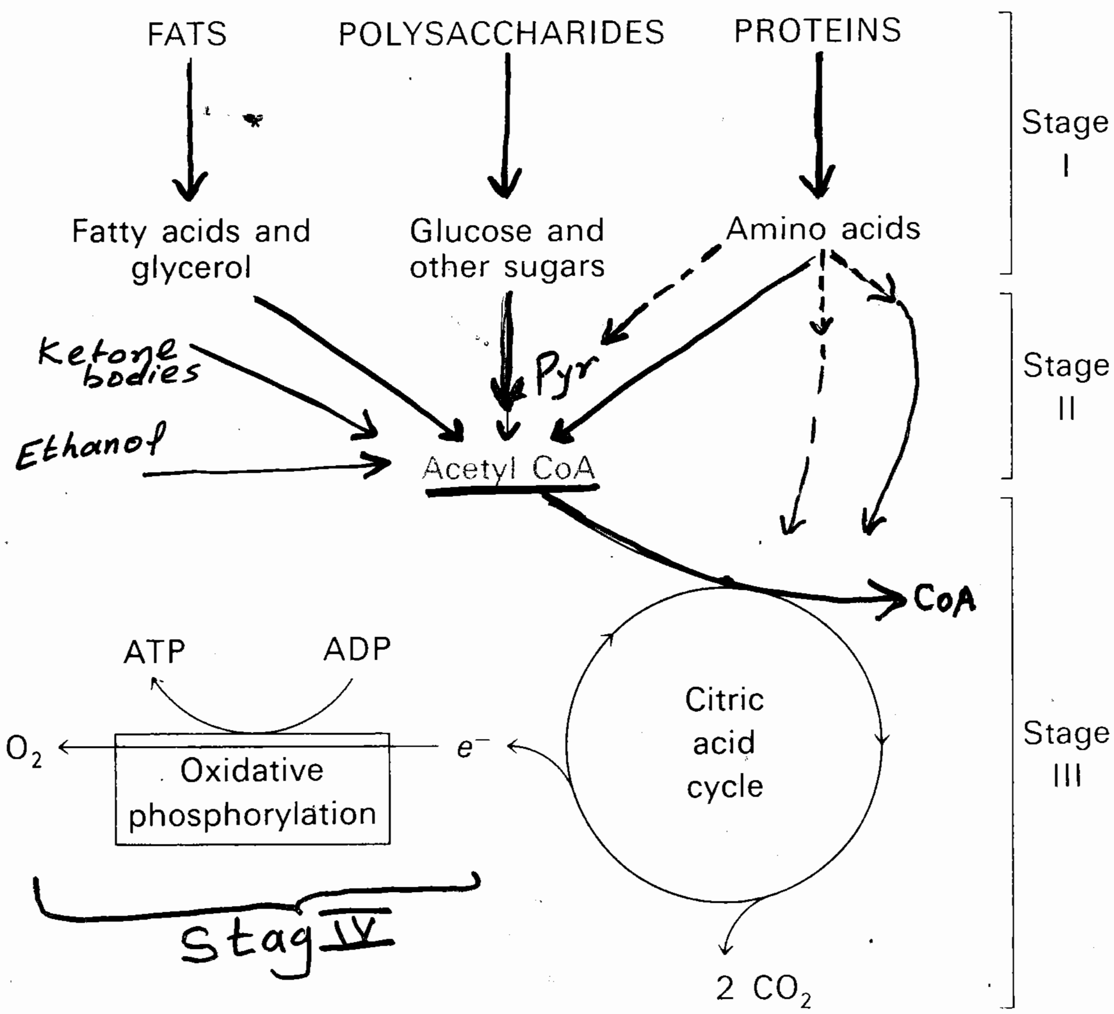
DR.NAME: Nayef Kradsheh

Biochemistry



Majida Al-Foqaraa'

Origin of the Acetyl Group



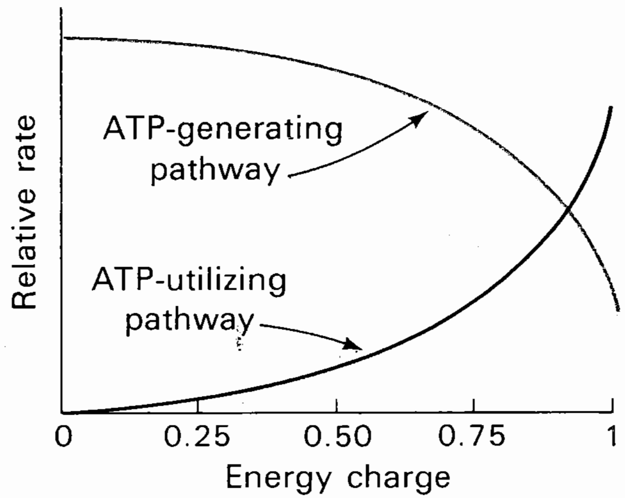


Figure 17-15, page 455; Figure 17-16, page 457

T-50

Stryer: *Biochemistry*, Fourth Edition

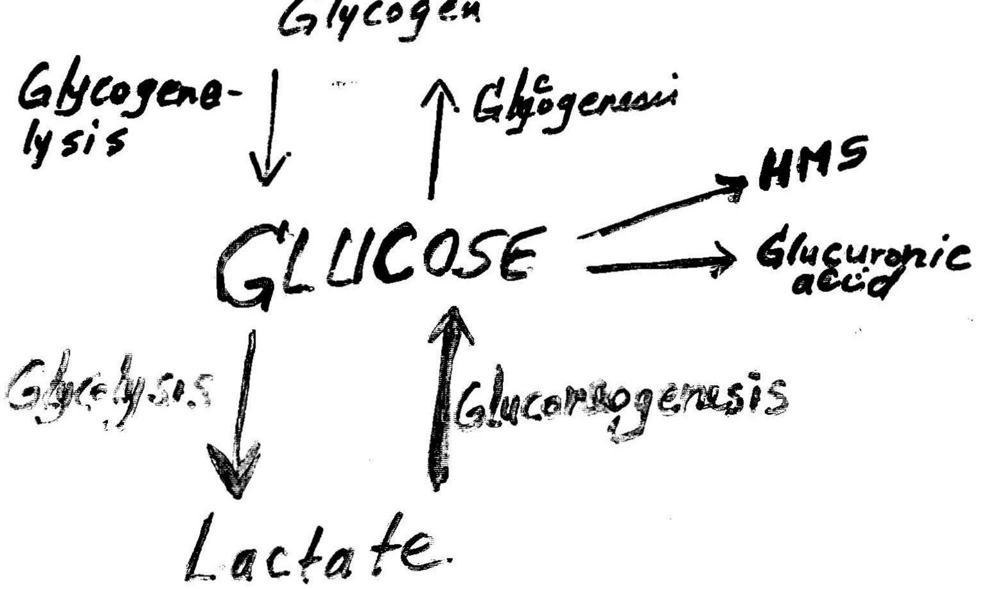
Set I

CARBOHYDRATE METABOLISM

- OBJECTIVE :-

- Utilization of Glu → Energy
- Non-Carbohydrate → Glu
- Storage of Glu → Glycogen
- Release of Glu from Glycogen
- HMS → NADPH → GSH
- Glucuronic acid → Drug metabolism
- Interconversion of Sugar

- Over-all Picture :-



Dietary Carbohydrates :-

→ 40 – 50% of Caloric intake

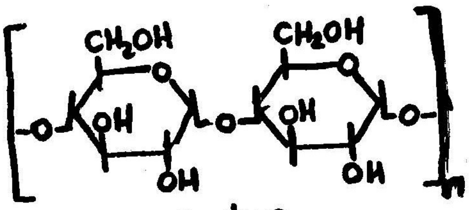
60% of Carbohydrate → STARCH

Sucrose, small amount of Fru, Glu — Fruit, honey, Veg.

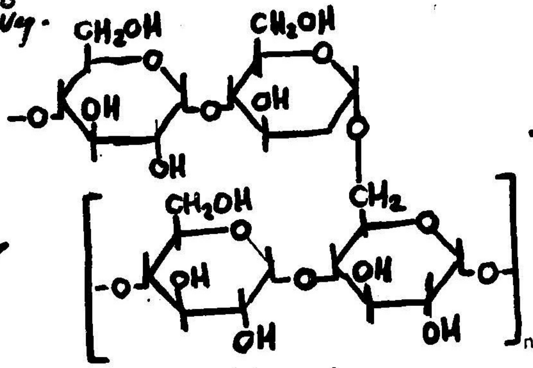
Lactose (animal)

No sp. sugar required

Glu ⟷ all other sugars

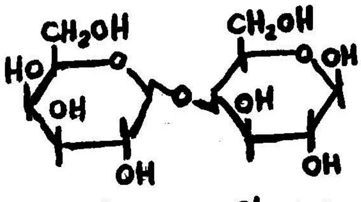


Amylose



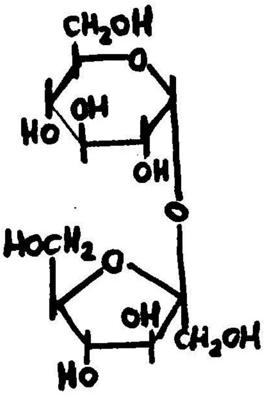
Amylopectin

} STARCH



Galactose Glucose

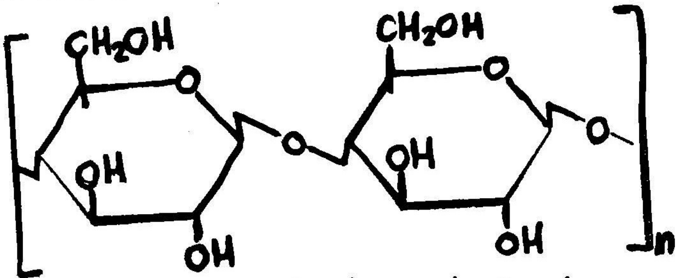
Lactose



Glucose

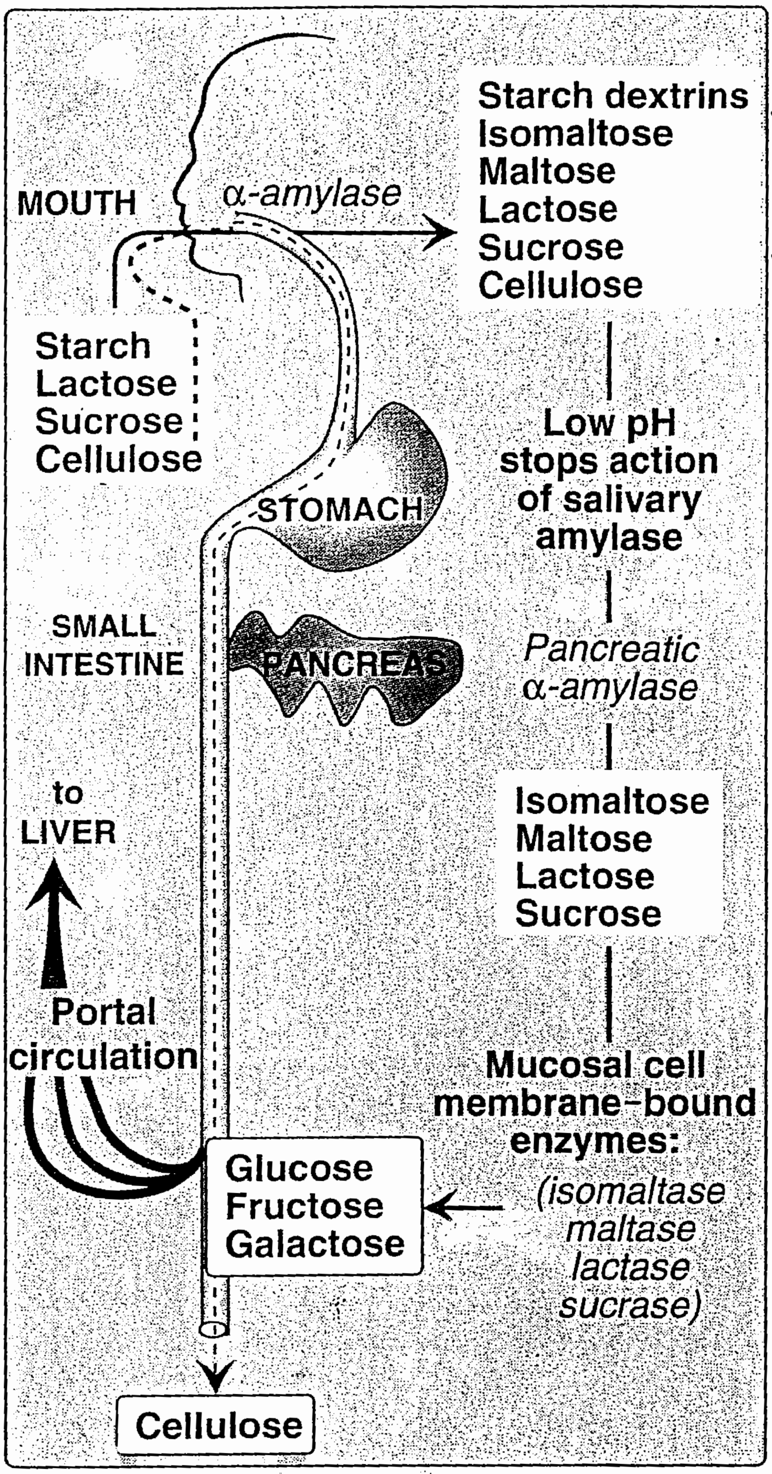
Fructose

Sucrose



β-1,4-glycosidic bond in cellulose

Digestion of Carbohydrate 3a



- Isomaltase:- α-1→6 in Isomaltose
- Maltase α-1→4 in maltose and maltotriose
- Sucrase α-1→2 in sucrose
- Lactase β-1→4 in Lactose
- Trehalase α-1→1 in trehalose in mushroms and other fungi

- Sucrase + Isomaltase — single protein —split→ two associated subunits complexed
- maltase + exoglucosidase (glucoamylase) —no split→ similar complex; α-1,4 in limit dextrins

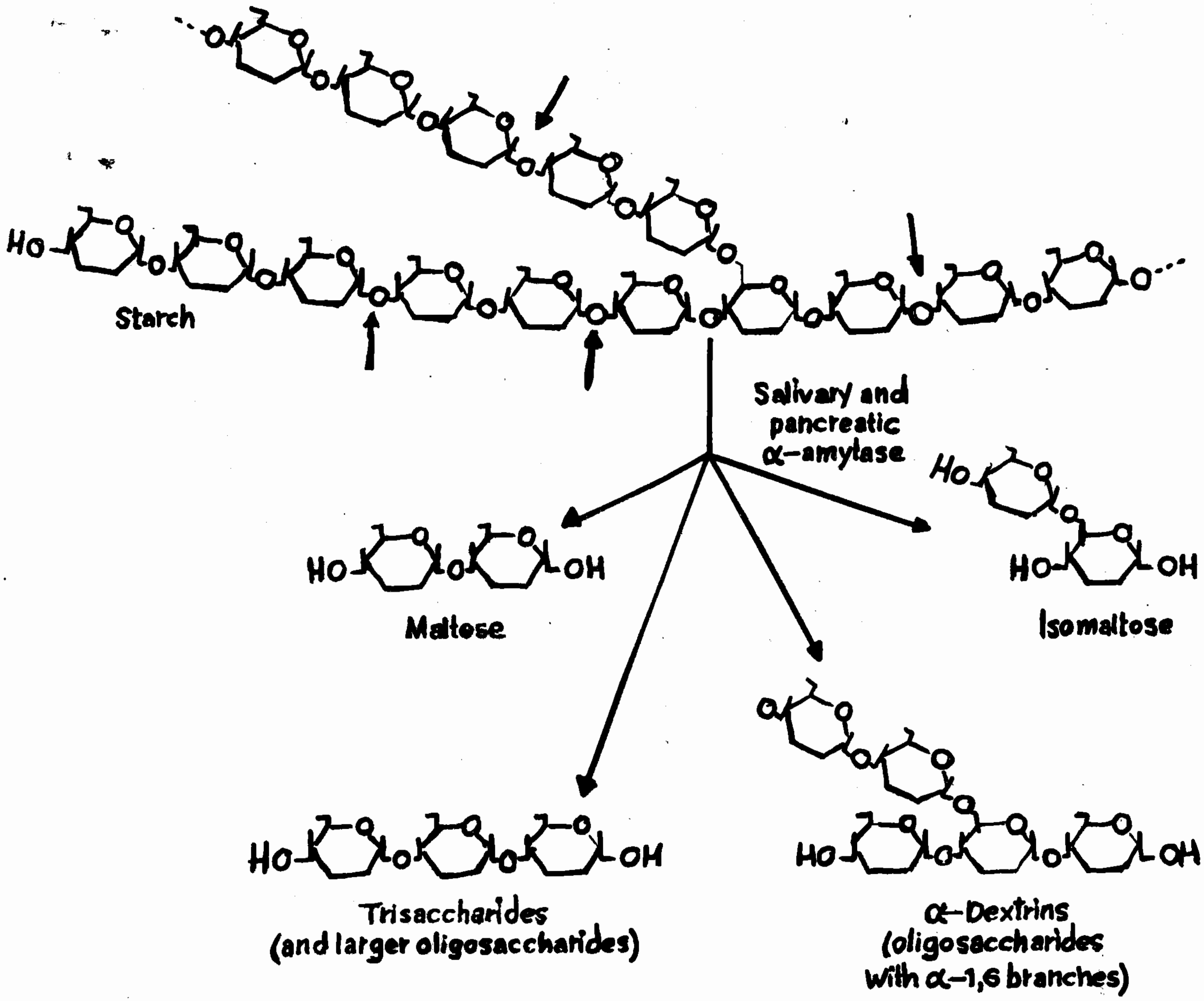
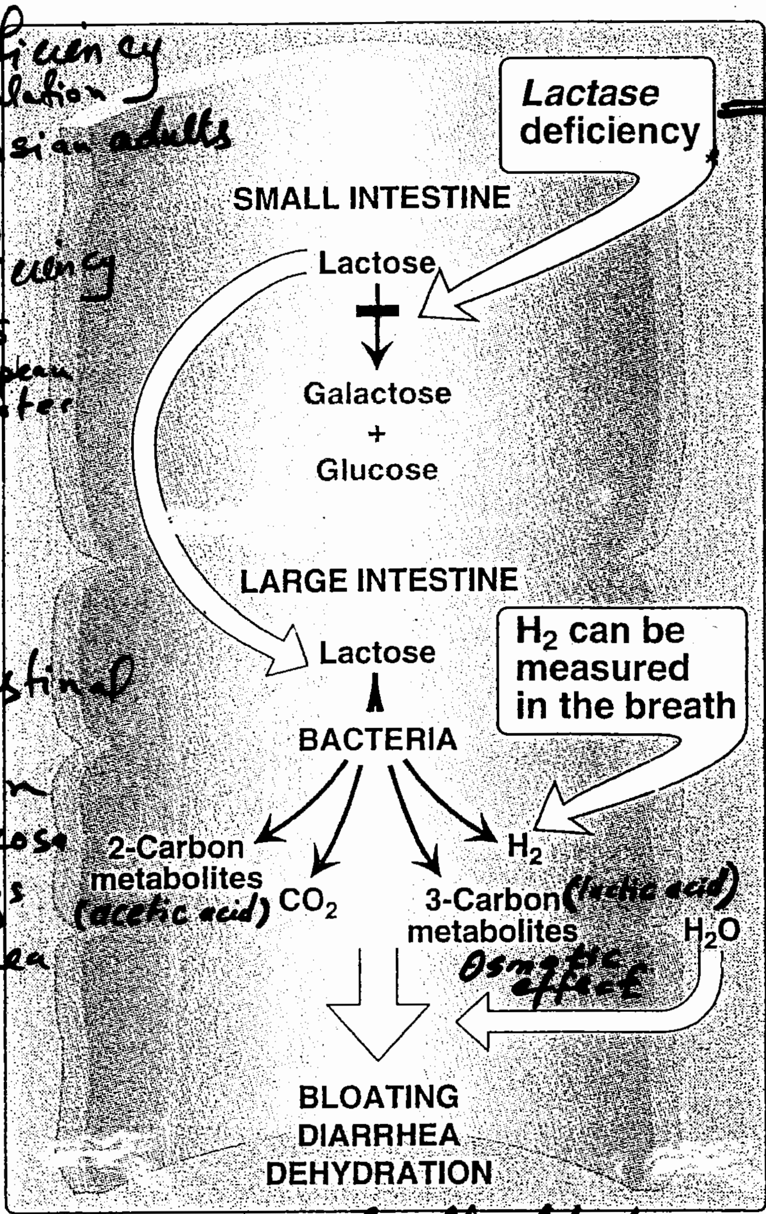


Fig. 25.12. Action of salivary and pancreatic α-amylase, on STARCH

Abnormal Degradation of Disaccharides

- Lactase deficiency
  - > ½ World's population
  - 90% African & Asian adults
- (isomaltase) Sucrase deficiency
  - 10% Askimos
  - 2% North European are heterozygotes



→ ADULT HYPOLACTASIA

1L of extracellular fluid lost per 9 gr of lactose in 1 glass of milk.

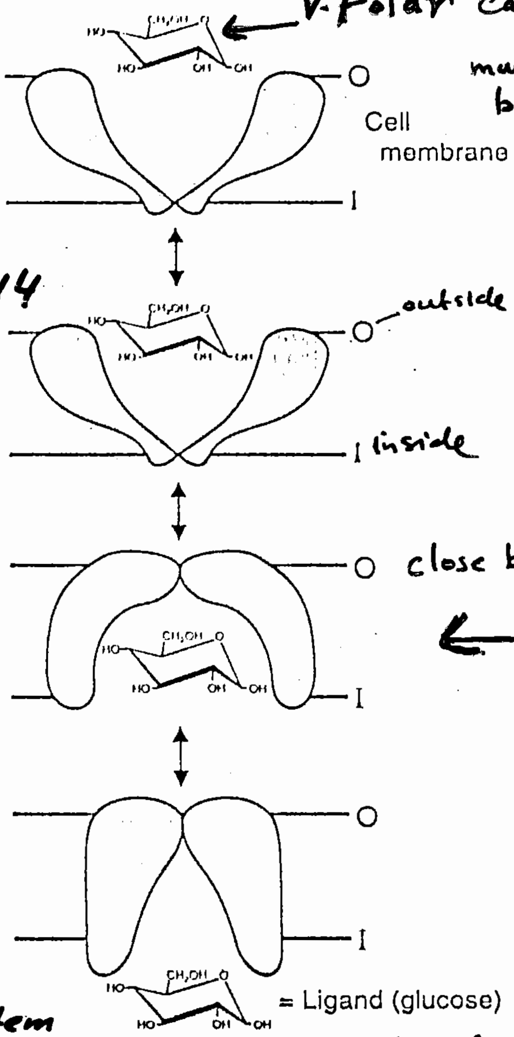
Causes:-
- Genetics
- Variety of Intestinal diseases
- Malnutrition
- Injury of mucosa e.g. by drugs
- severe diarrhea

Maximal activity → 1 month of age
declines → adult level at 5 to 7 yr. age (10% of Infant level)

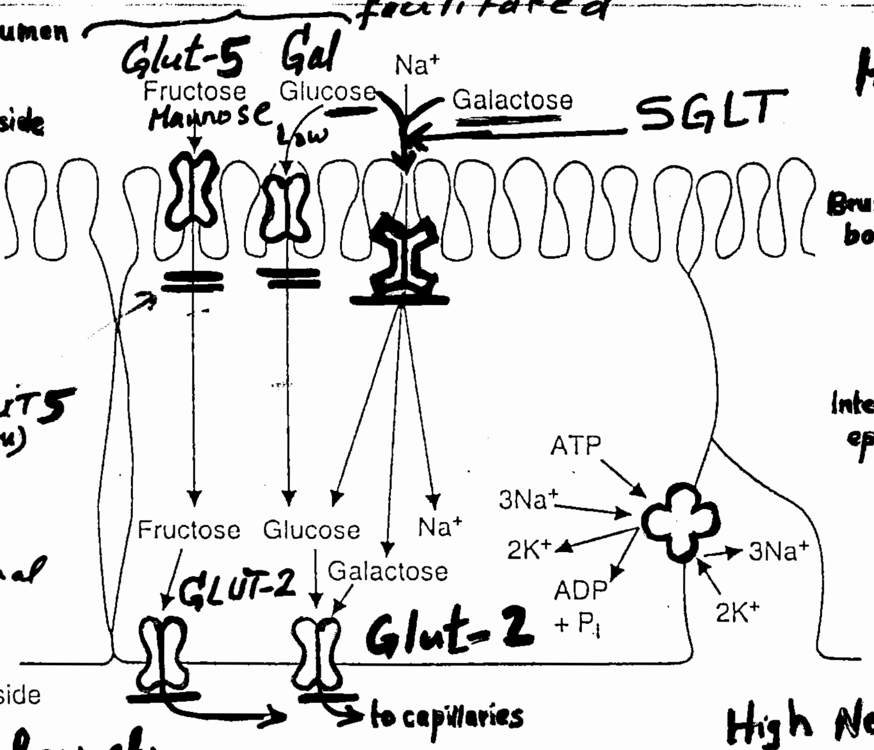
Absorption of Sugars

A- Na^+-independant facilitated diffusion transport

- Glut-1 → Glut-14
- Glu movements follow conc. gradient
- two conformational states



B- Na^+-monosaccharide cotransporter system (SGLT)



SGLT:-
- Energy requiring process
- occurs in intestinal & renal tubules epithelial cells

GLUT5 (fru)

= Na^+- glucose cotransporters — SGLT

= Facilitated glucose transporters — GLUT

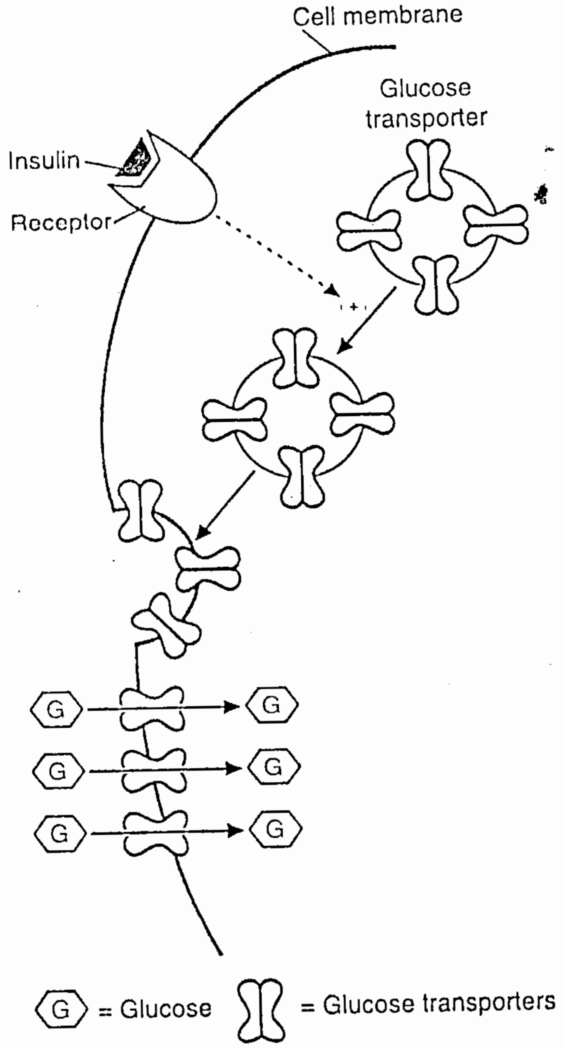
= Na^+,K^+- ATPase

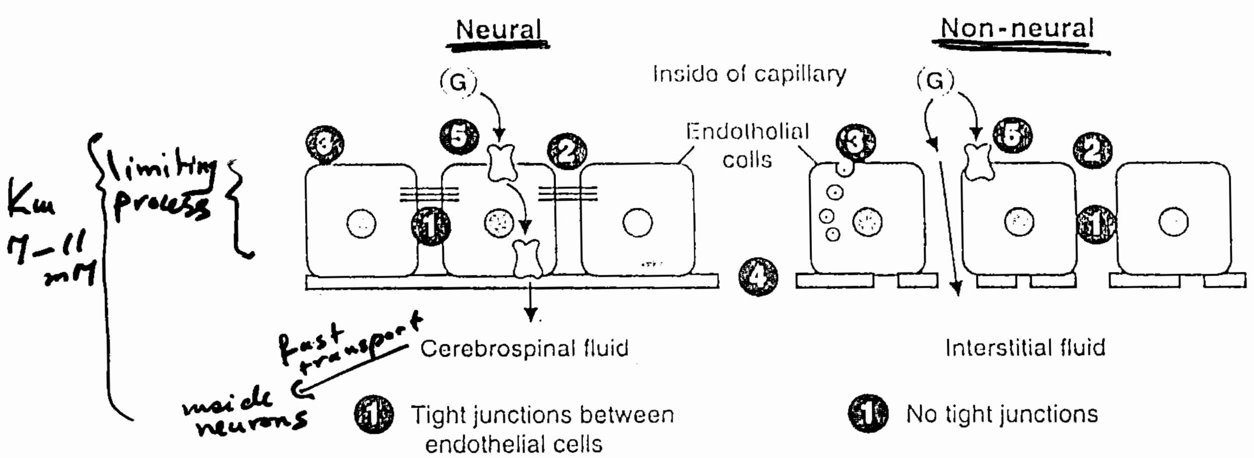
Transporter	Occurrence	Function
I Sodium dependent-Transporter:-SGLT	Small intestine and kidney	Active uptake from lumen of intestine, reabsorption of glu in proximal tubule of kidney against conc. gradient

II Facilitative Bidirection Transporters

GLUT-1	Erythrocyte + Blood-brain barrier, also retinal, placental, testis-barriers	uptake of Glu Km=1mM
GLUT-2	Liver, Pancreatic β-cell small Intestine, kidney (Serosal surface)	Rapid uptake and release of Glu • Km = ~15mM • High Vmax • Glucose sensor
GLUT-3	brain, kidney, placenta (Major transporter in CNS)	uptake of Glu Km = ~1mM (High affinity)
GLUT-4	Heart and skeletal muscle, adipose tissue	Insulin stimulated uptake of glu Km = ~5mM
GLUT-5	Small intestine + spermatozoa	absorption of fru
GLUT-7	at endoplasmic reticulum membrane of glucogenic tissue (liver and kidney)	

stimulation by Insulin of Glucose transport into muscle and adipose Tissues





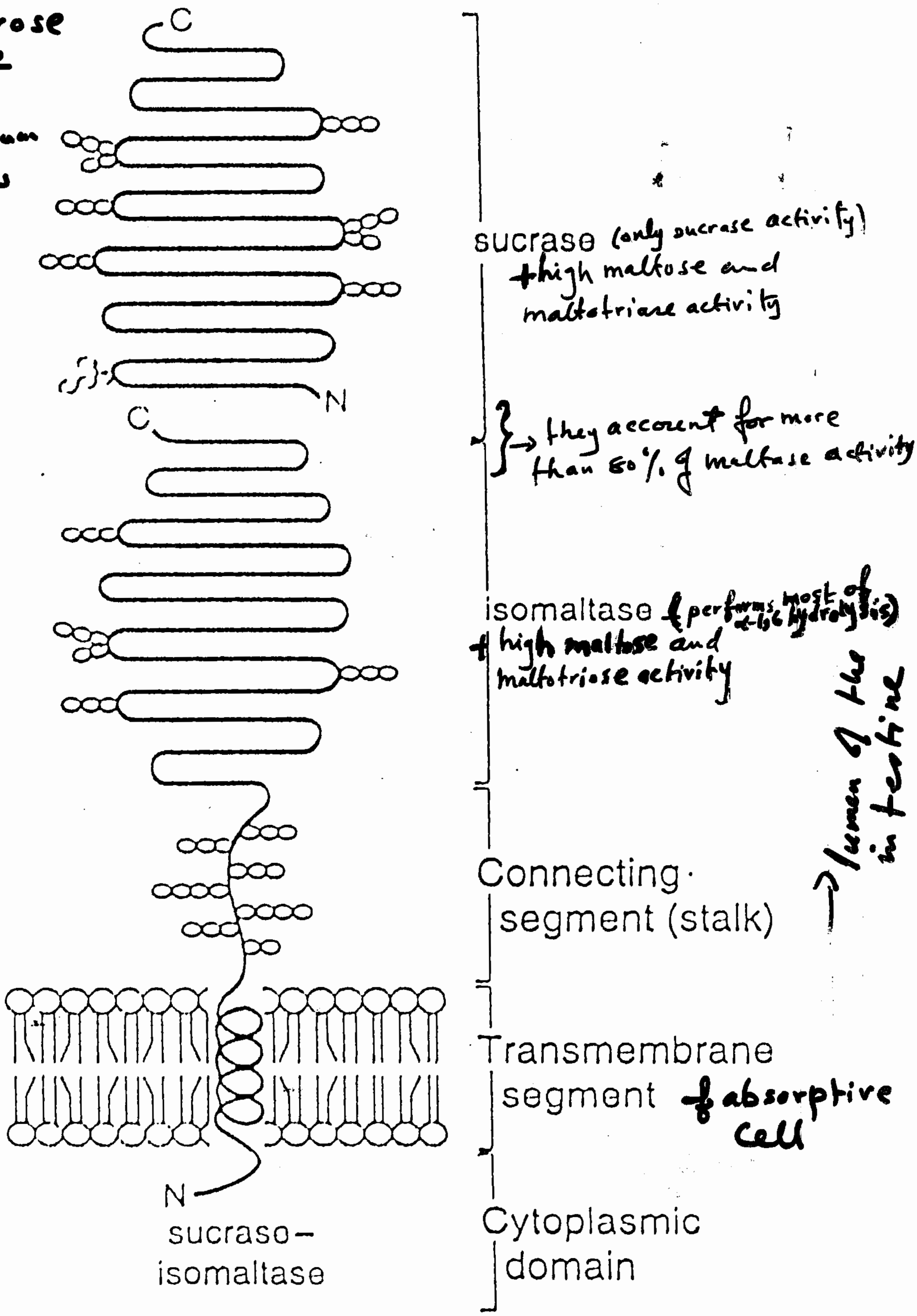
Neural	Non-neural
1 Tight junctions between endothelial cells	1 No tight junctions
2 Narrow intercellular space	2 Sometimes wide intercellular gaps
3 Lack of pinocytosis	3 Pinocytosis
4 Continuous basement membrane	4 Discontinuous basement membrane

Glucose transport through the Capillary Endothelium

Sucrase-Isomaltase Complex

Specificity:-
maltose, sucrose and Isomaltose

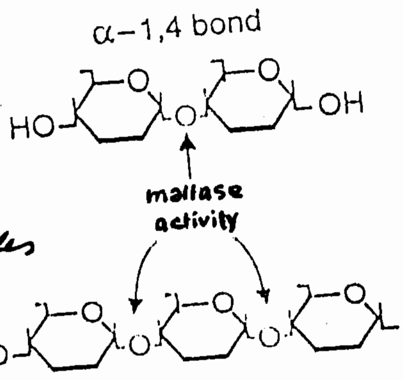
Location:-
rich in jejunum and lower below



IV Glucoamylase Complex

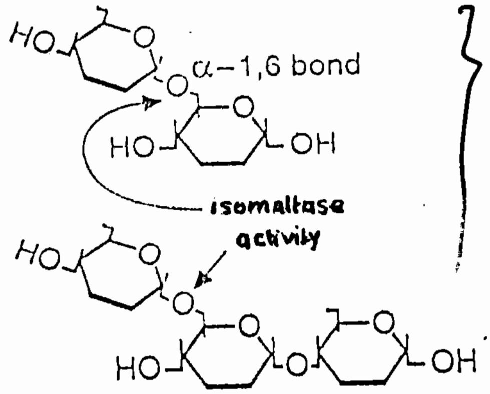
- two different subunits
  - small difference in specificity
- Exoglucosidase activities → hydrolysis of α-1,4 bonds in oligosaccharides
- Also maltase activity
- Location: Jejunum

Maltose



Maltotriose

Complex II both subunits

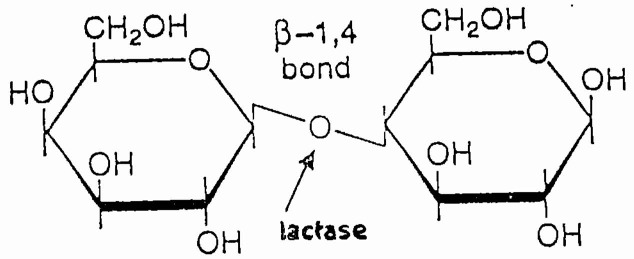


Complex I Isomaltase subunit

III β-Glycosidase (Lactase)

- Location – as for sucrase
- Activity – low and rate limiting for lactose absorption
- Highest upto 5-7yr.
- Secondary lactase deficiency

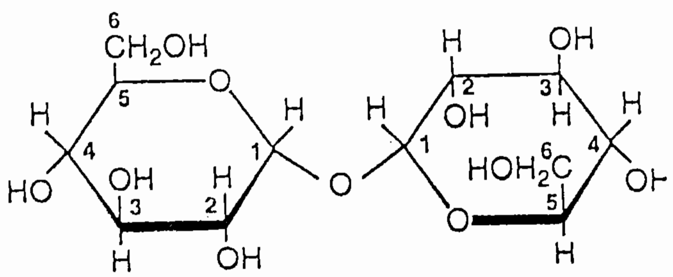
Lactose



Galactose Glucose

IV Trehalase

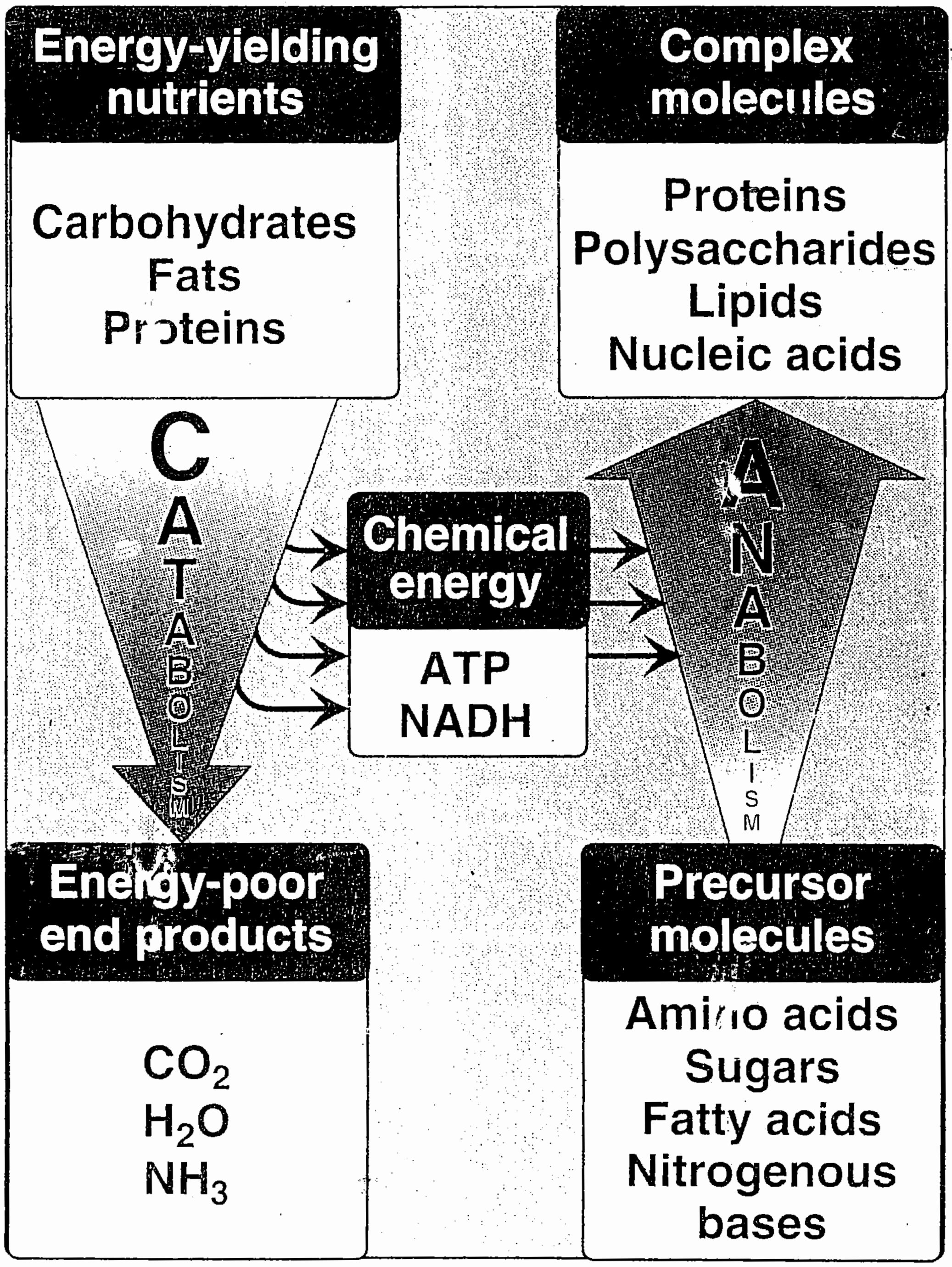
Trehalose (sugar in insects, algae, mushroom ...)



Glucose Glucose

GLYCOLYSIS

- INTRODUCTION



Regulation of Metabolism:-

- Signals from within the cell
- Communication between cells (Intercellular)
- SECOND MESSENGER SYSTEMS
  - Ca^{2+}/phosphatidylinositol system
  - Adenylcyclase system

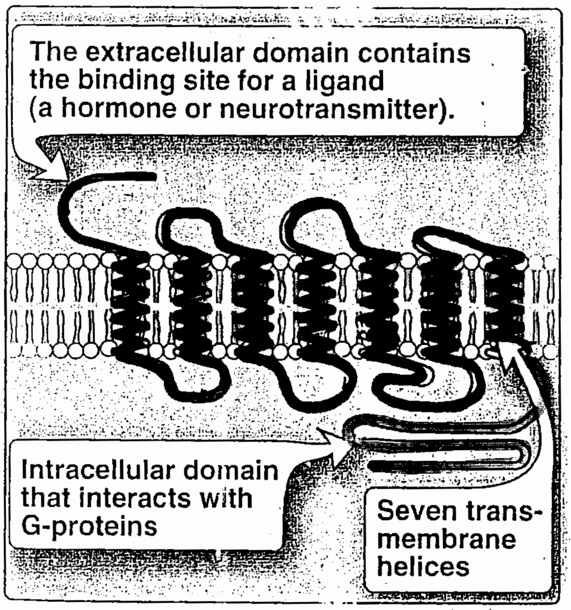


Figure 8.6
Structure of a typical membrane receptor.

. Adenyl Cyclase .

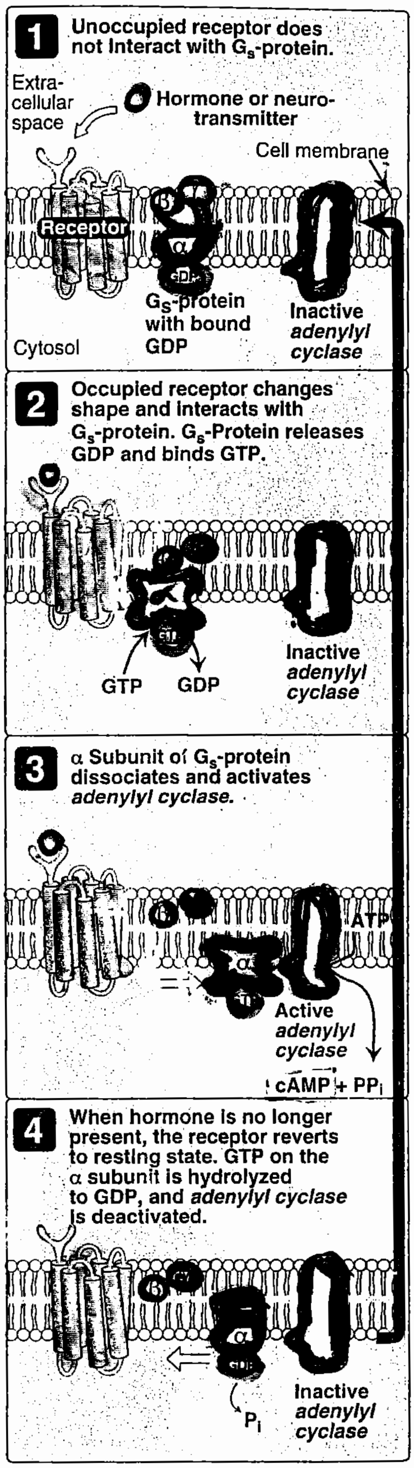
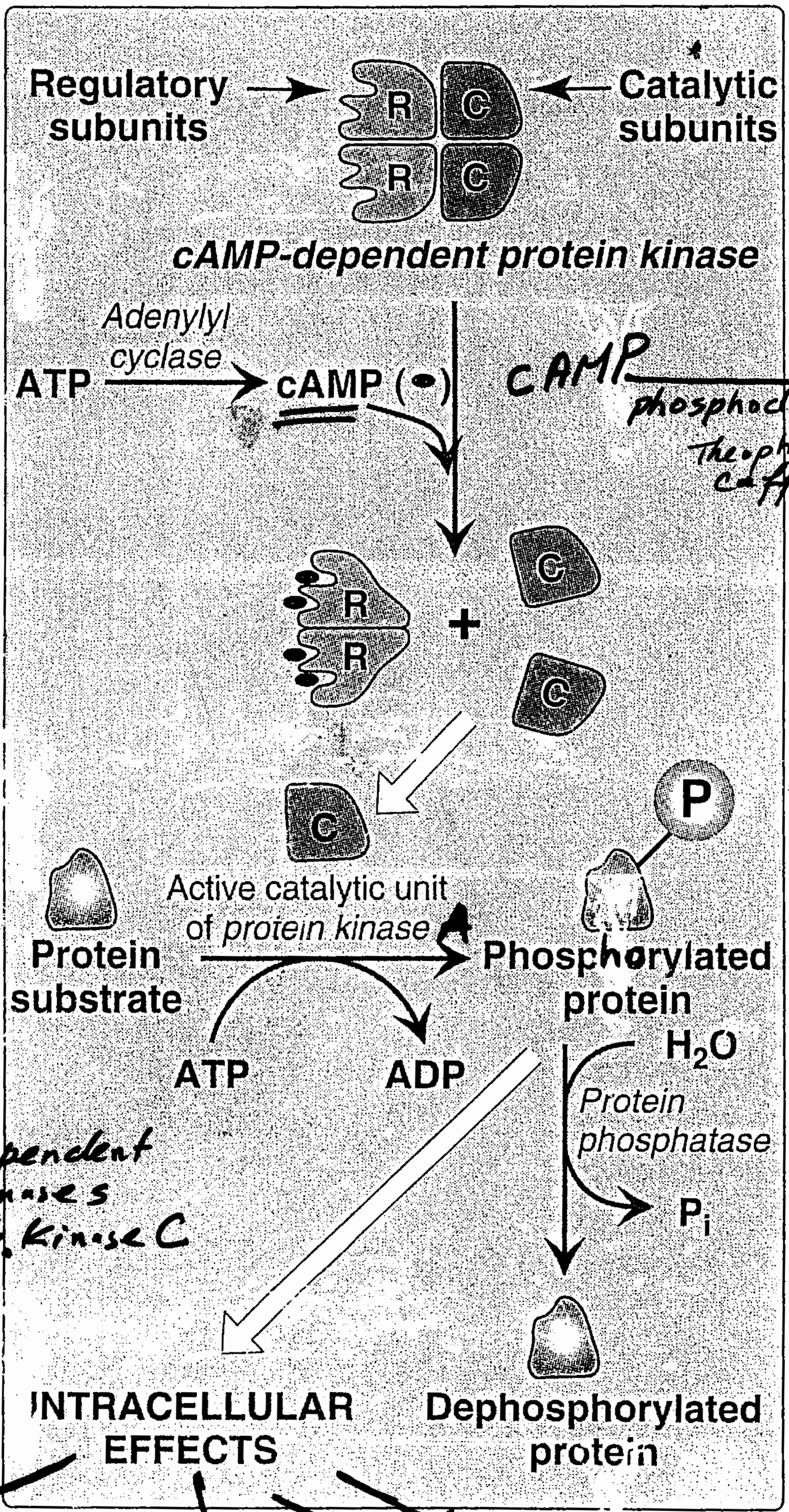


Figure 8.7
The recognition of chemical signals by certain membrane receptors triggers an increase (or, less often, a decrease) in the activity of *adenylyl cyclase*.

Actions of cAMP



cAMP → 5'-AMP phosphodiesterase

Theophylline (−)
caffeine (−)

- cAMP-independent protein kinases e.g. Prot. Kinase C

bind to promotor regions of DNA

Cells ion channels

Inhibited enzymes

Activated enzymes