Introduction to Medical Biochemistry

What is Keto Diet?

What is Sugar Craving?

Why food and weight do not have strict correlation?

SMPatel

Introduction to Medical Biochemistry

you know how to operate mobile phone.

If U have GPS, You can travel the world without studying Geography

Introduction to Medical Biochemistry

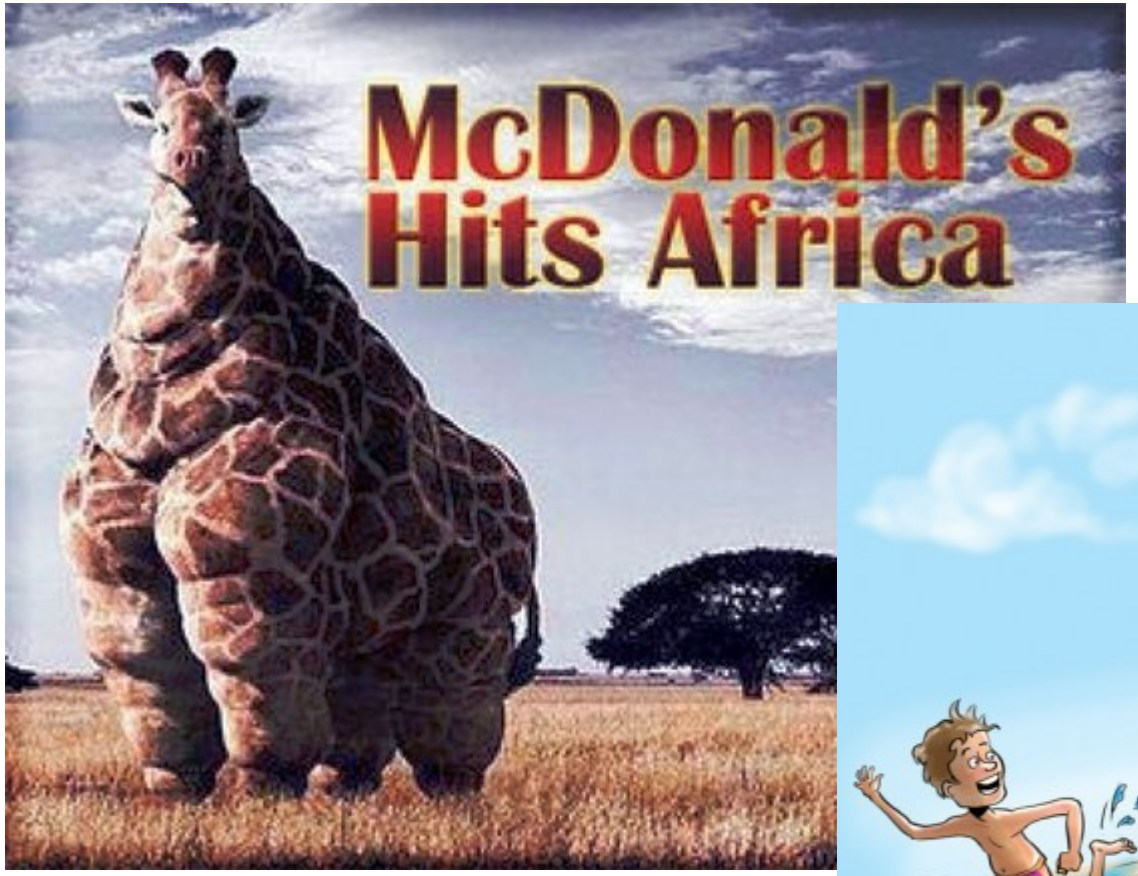
you know **how to** read and study

If U can question, You can study anything

Let us try, and jump to your questions

What is Keto Diet?

Yes, good question. Why?

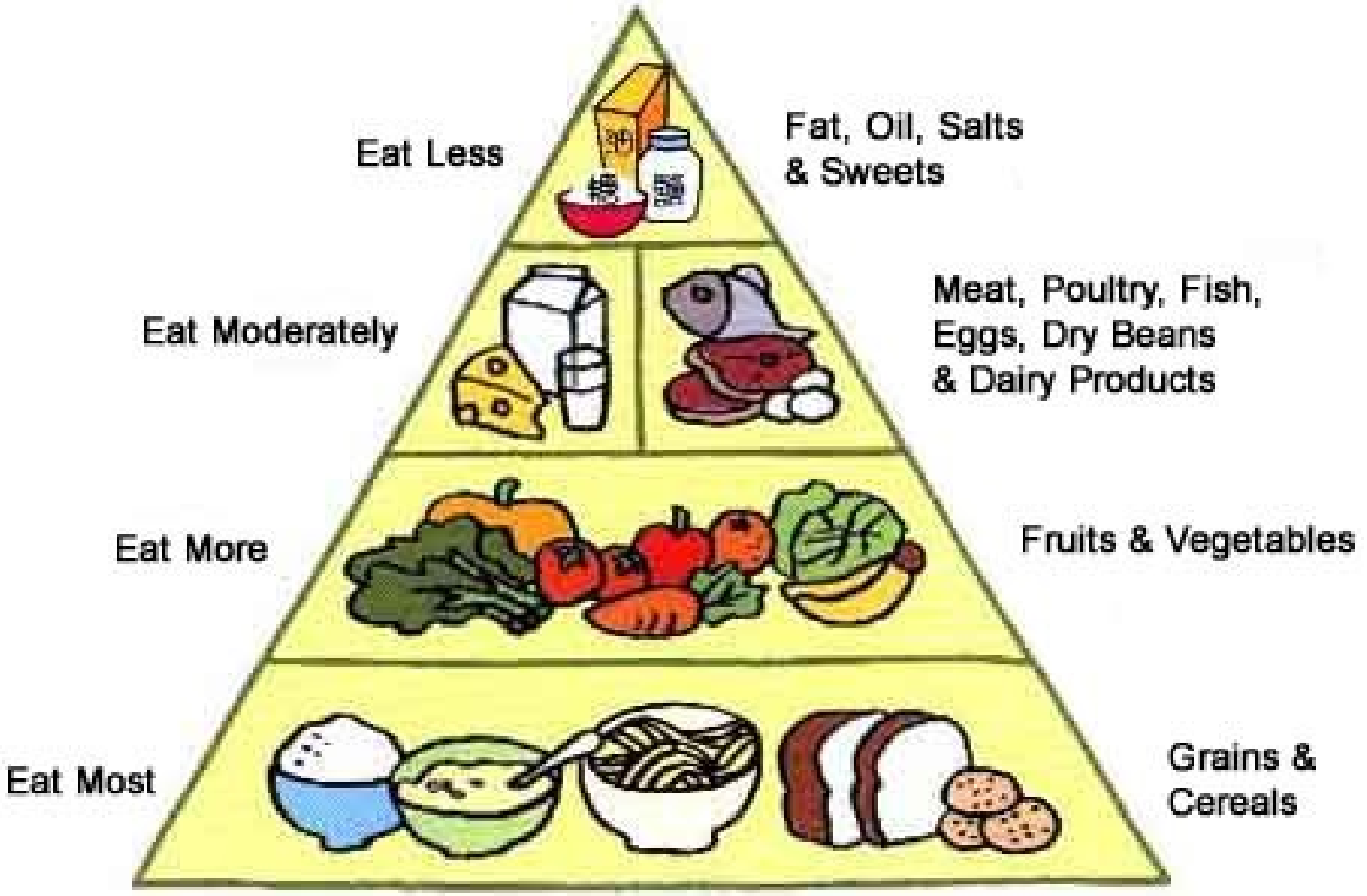


Obesity is epidemic

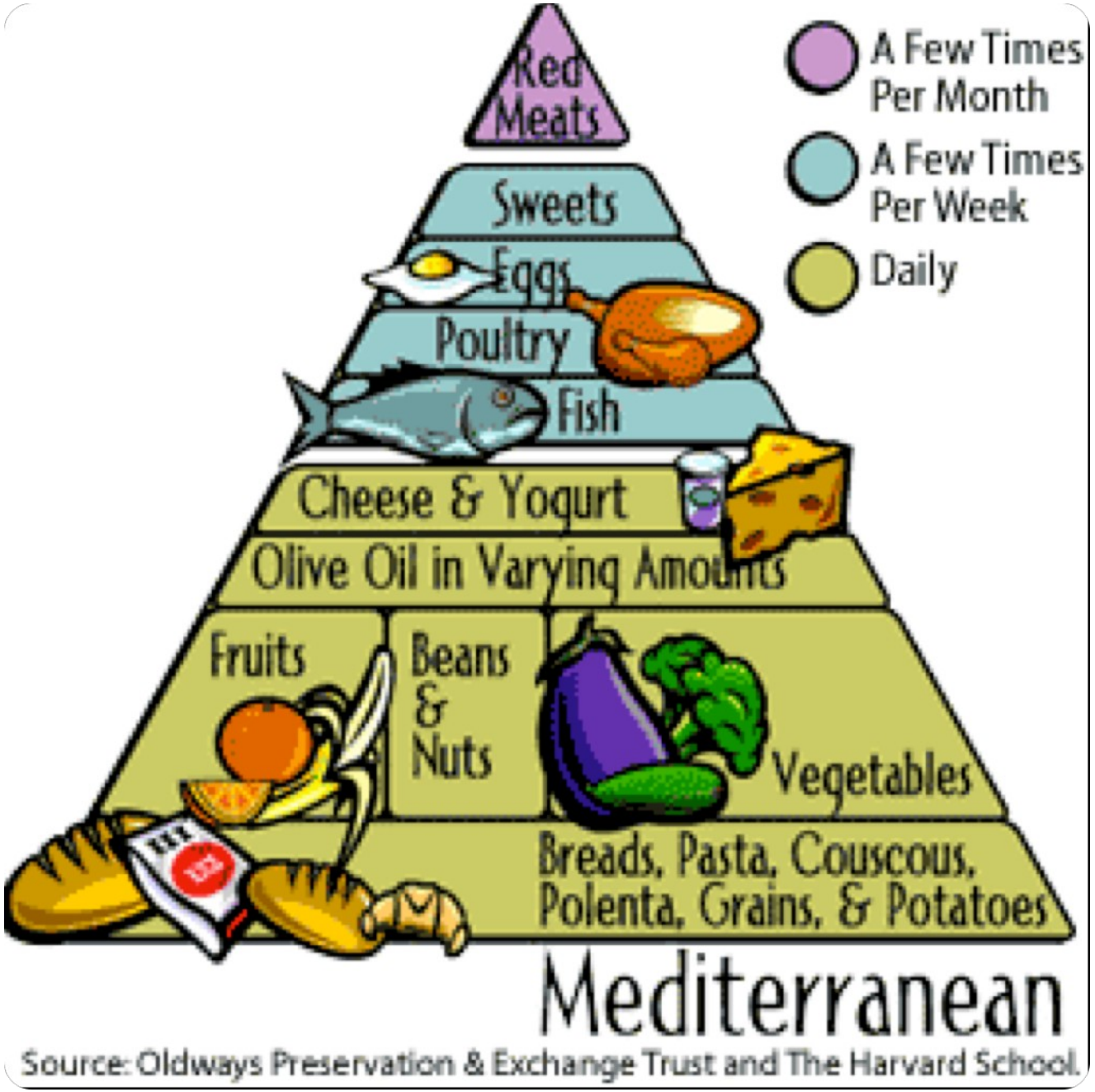
We need to something about it

Keto Diet, why controversy?

Food pyramid we studied

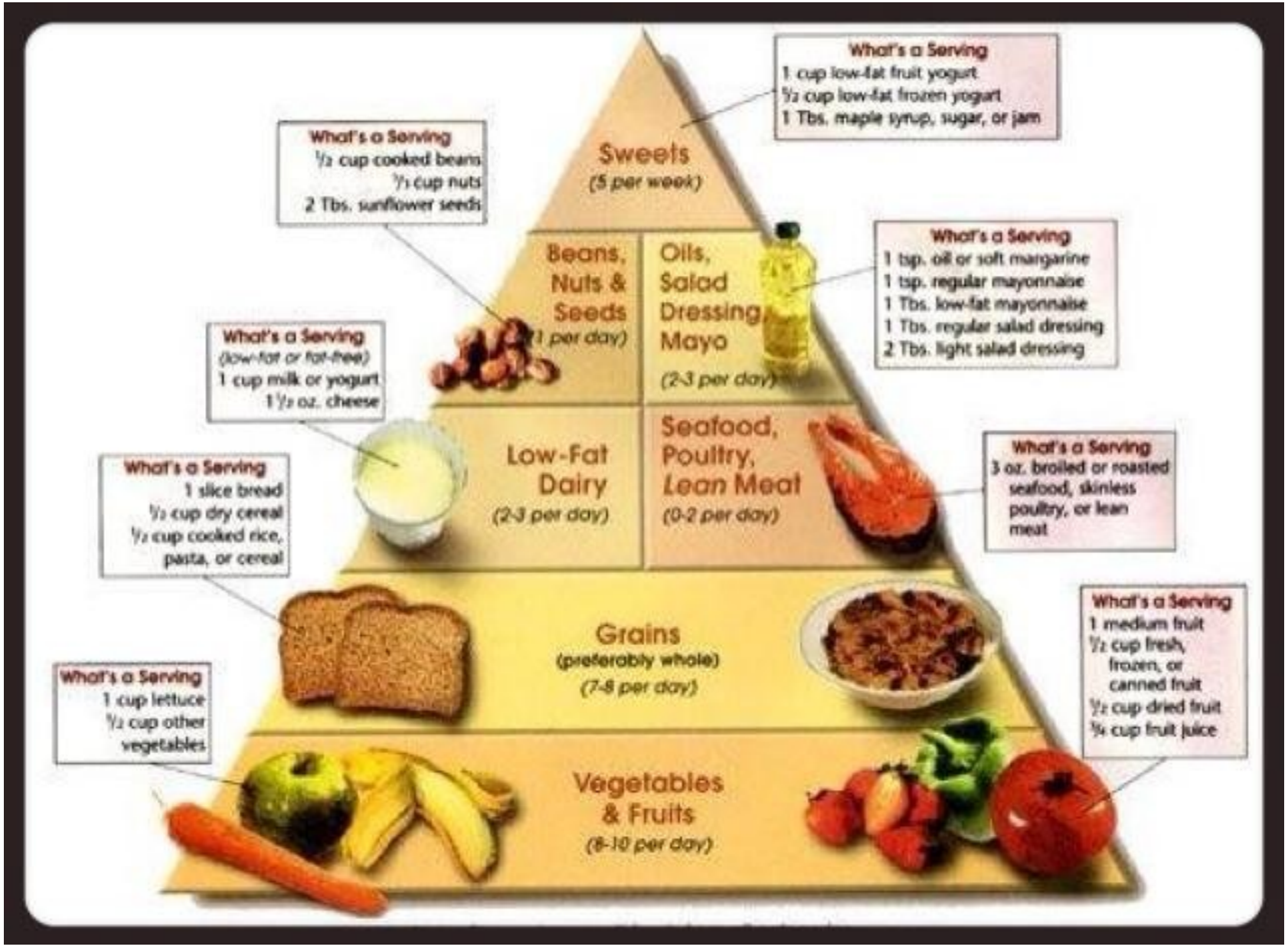


Mediterranean Pyramid



Mediterranean Sea

DASH diet


What's a Serving
1 cup low-fat fruit yogurt
½ cup low-fat frozen yogurt
1 Tbs. maple syrup, sugar, or jam
Sweets
(5 per week)
What's a Serving
½ cup cooked beans
⅓ cup nuts
2 Tbs. sunflower seeds
Beans, Nuts & Seeds
(1 per day)
Oils, Salad Dressing, Mayo
(2-3 per day)
What's a Serving
1 tsp. oil or soft margarine
1 tsp. regular mayonnaise
1 Tbs. low-fat mayonnaise
1 Tbs. regular salad dressing
2 Tbs. light salad dressing
What's a Serving
(low-fat or fat-free)
1 cup milk or yogurt
1½ oz. cheese
Low-Fat Dairy
(2-3 per day)
Seafood, Poultry, Lean Meat
(0-2 per day)
What's a Serving
3 oz. broiled or roasted seafood, skinless poultry, or lean meat
What's a Serving
1 slice bread
½ cup dry cereal
½ cup cooked rice, pasta, or cereal
Grains
(preferably whole)
(7-8 per day)
What's a Serving
1 medium fruit
½ cup fresh, frozen, or canned fruit
¼ cup dried fruit
¾ cup fruit juice
What's a Serving
1 cup lettuce
½ cup other vegetables
Vegetables & Fruits
(8-10 per day)

Egypt Pyramid
Keto Pyramid
Mediterennian Pyramid

DASH pyramid
Falana pyramid
Dhikana pyramid

But, basic Q is
What why when where and how ?

What is food?

Why we need it?

What food must have?

Which are good for health?

Which are not?

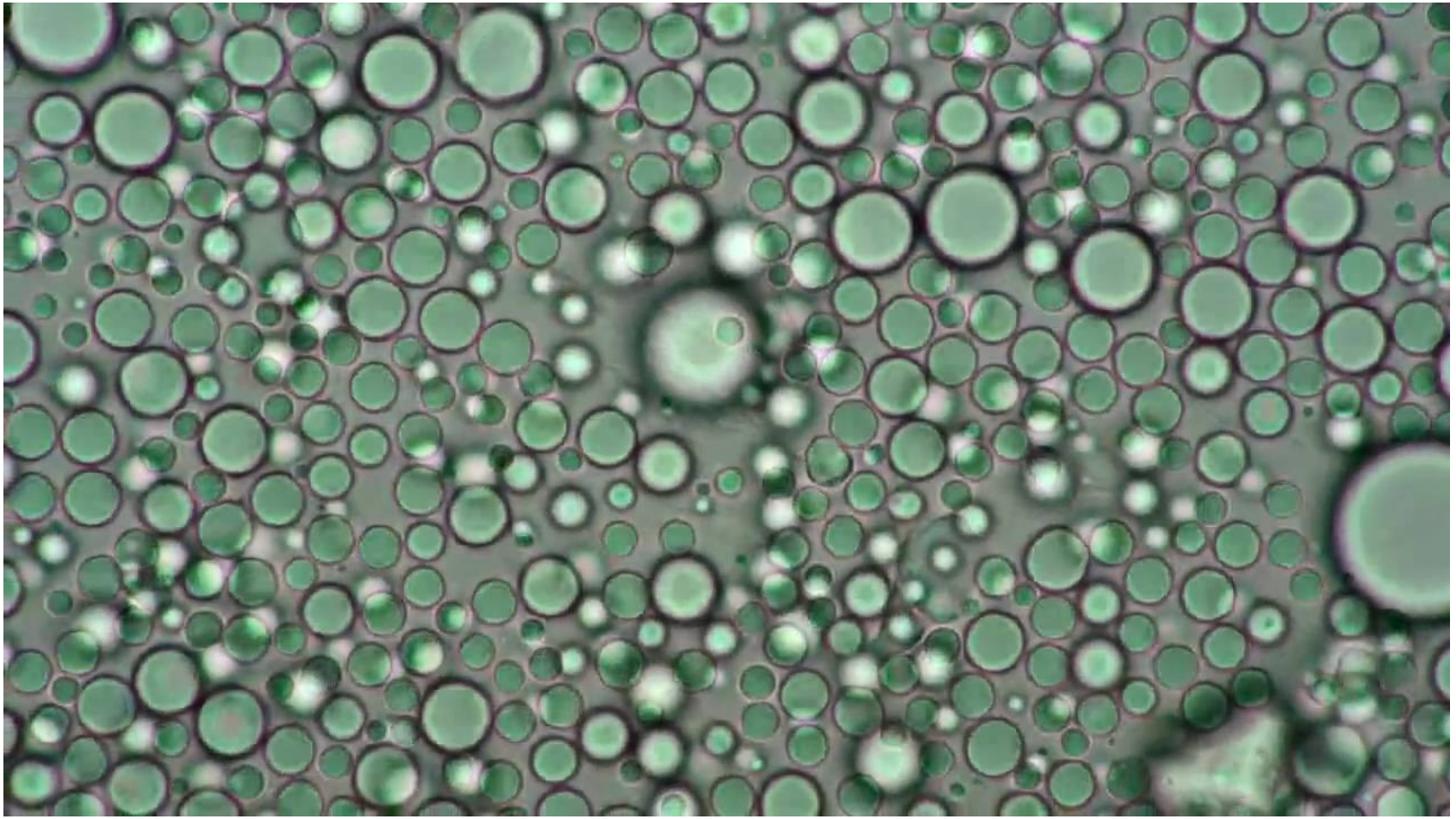
What is food?

SOP for making RoSogulla?

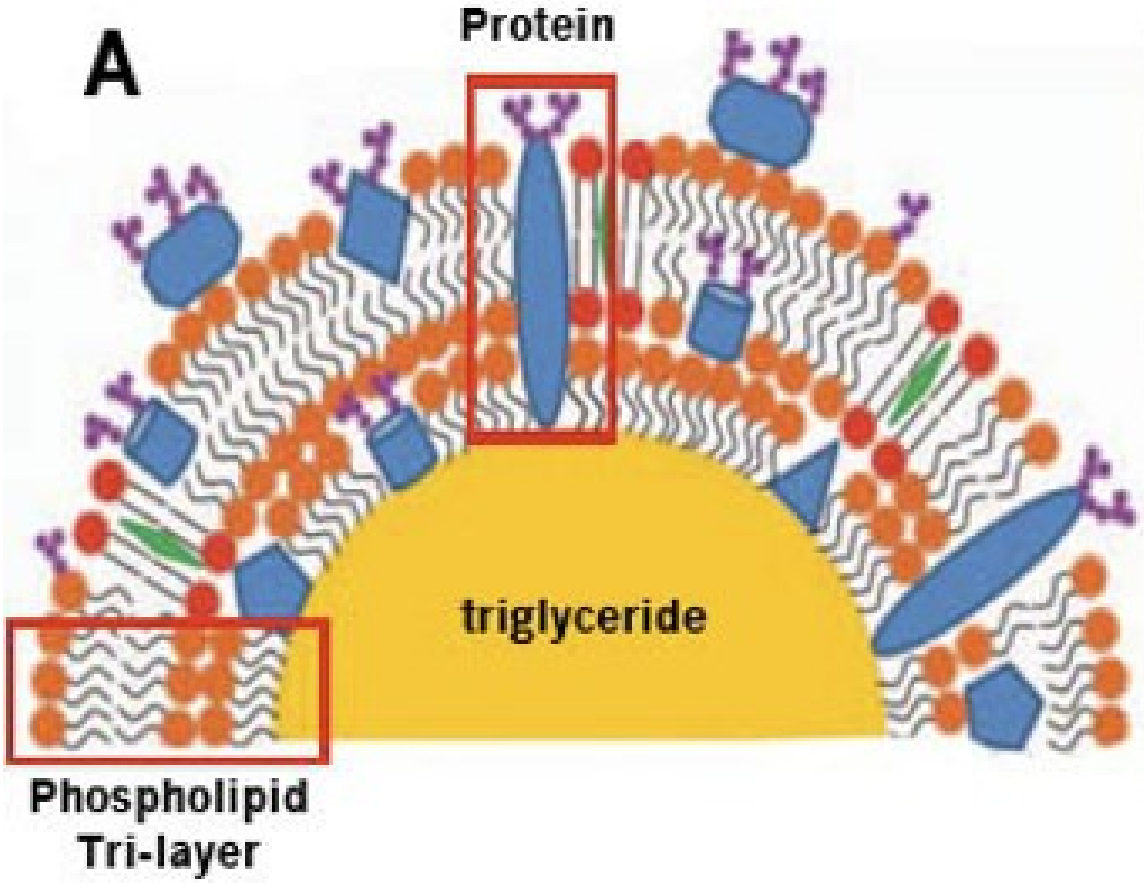
rOSoguLLa is made up of milk

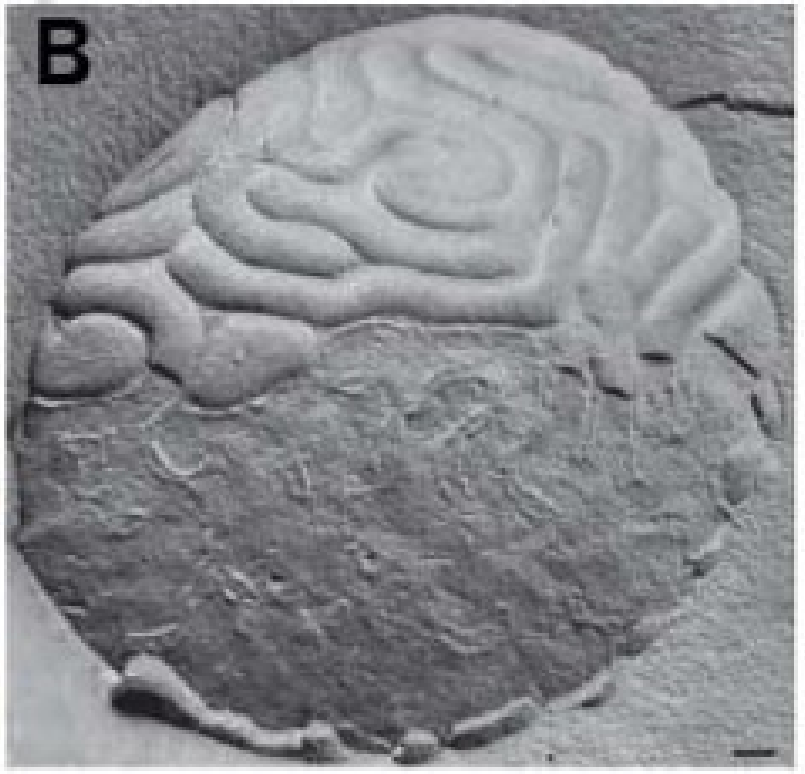
What is milk?

Milk Under Microscope

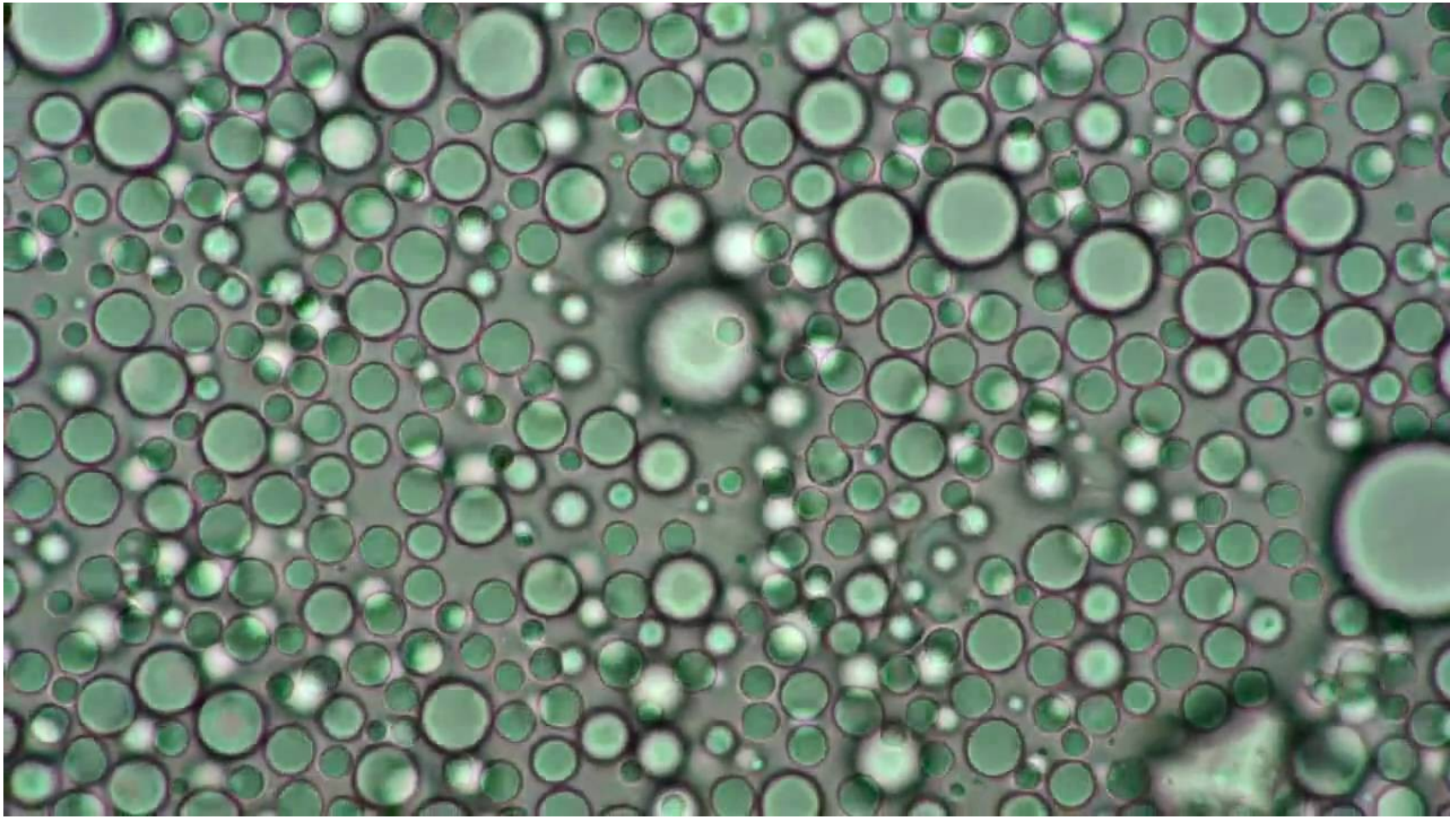


Milk – structure of microscopic roSoGulla





Milk Under Microscope



What is food?

Food is collection of molecules

So simple.

You NEED teacher
to make it sooooo difficult

What is food?

Why we need it?

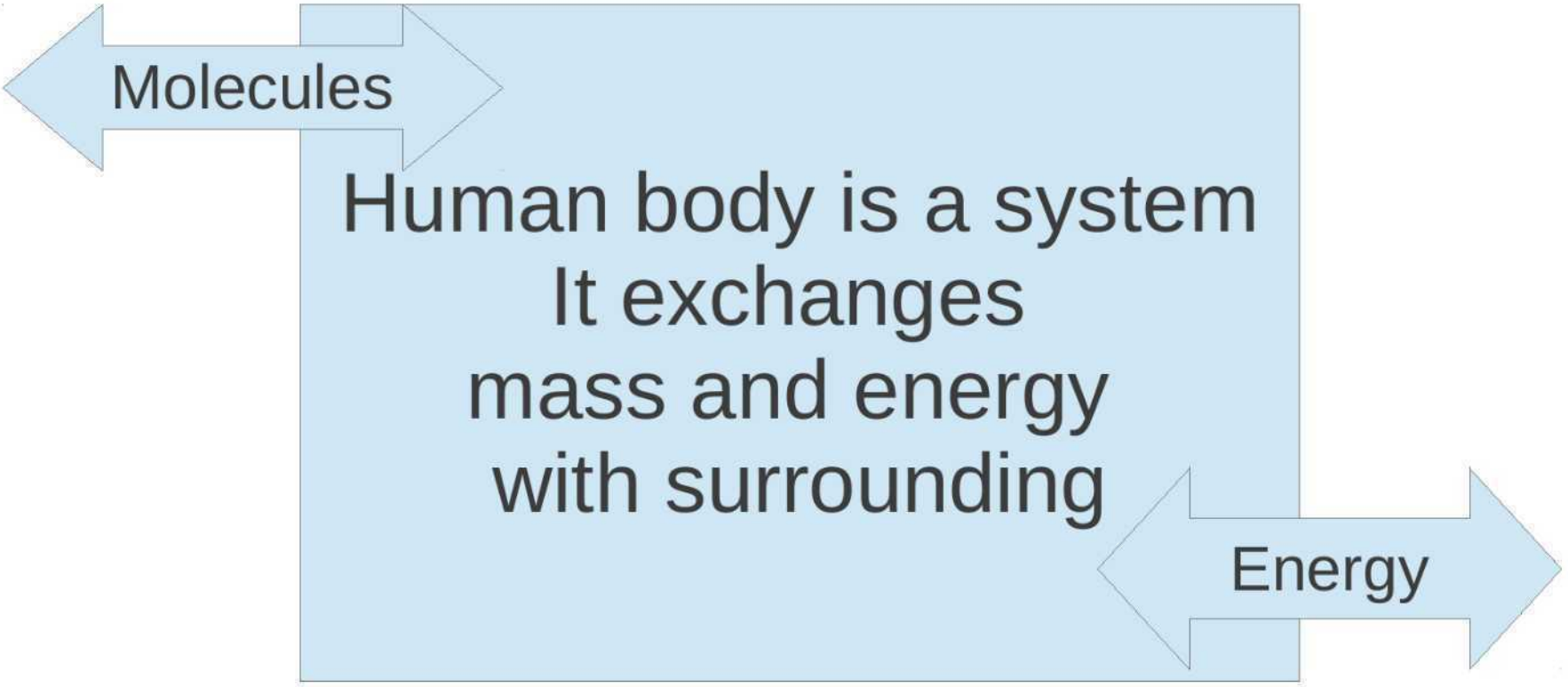
What food must have?

Which are good for health?

Which are not?

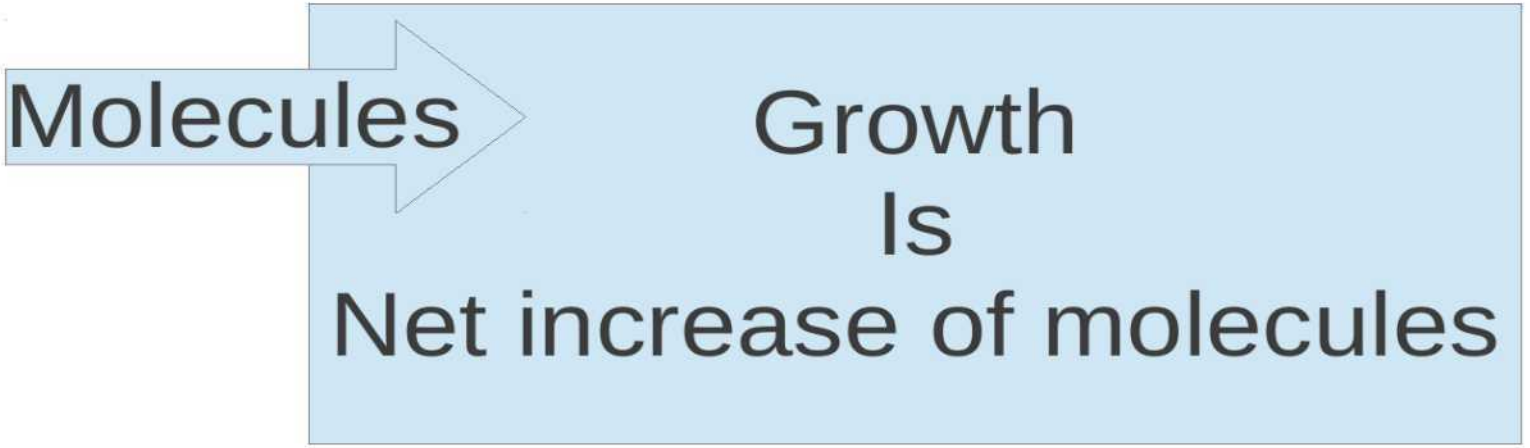
What is a system?

Body is a system



When does the system mass increases?

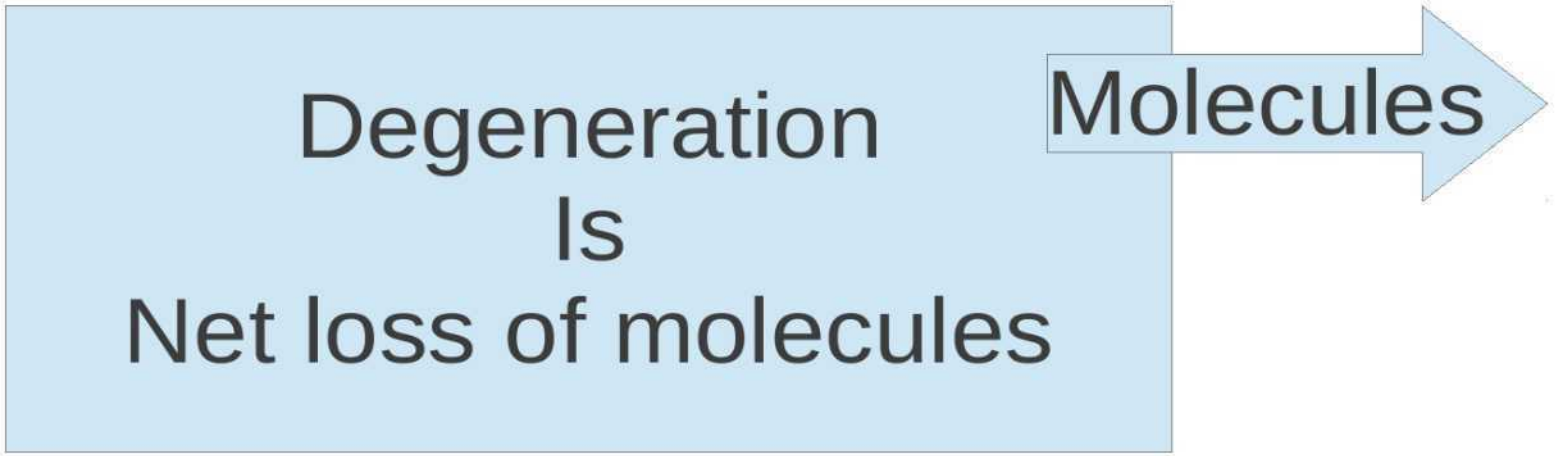
Growth



Embryo, Growing Child,
Body Building,
recovery from illness

When does the system mass decreases?

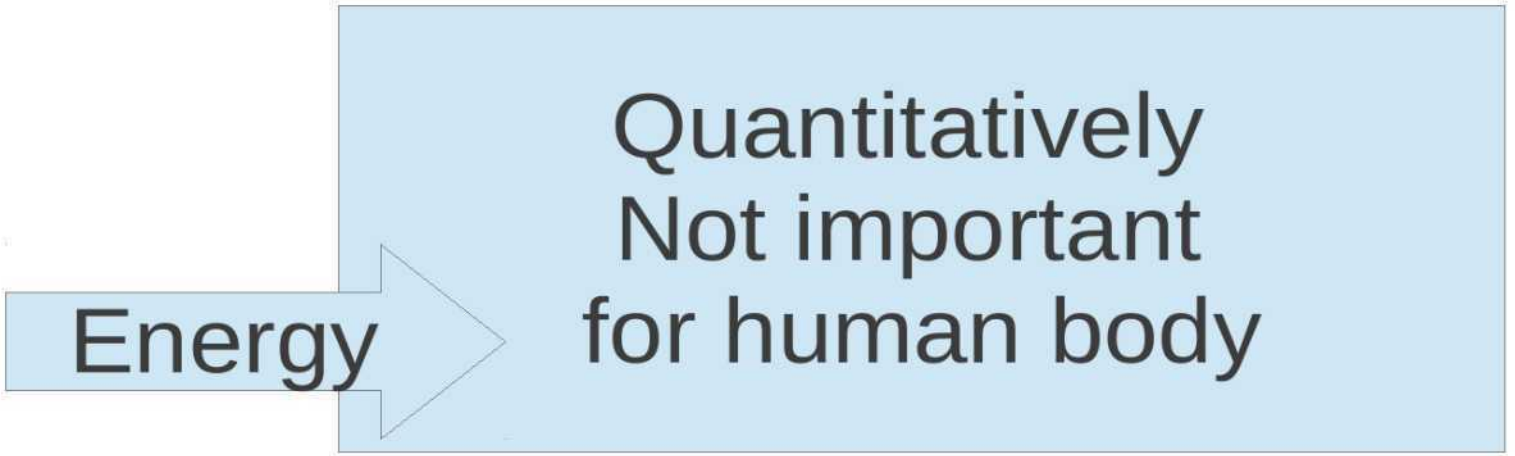
Degeneration



Aging
Illness

When does the system energy increases?

Photons are used by human body



Synthesis of Vitamin D
Retina absorbing light
Plant uses energy to form Glucose

When does the system energy decreases?

Body makes net energy output

Heat energy
Kinetic energy

Heat

energy output we can not do

Electric fish

Firefly

Why we need it?

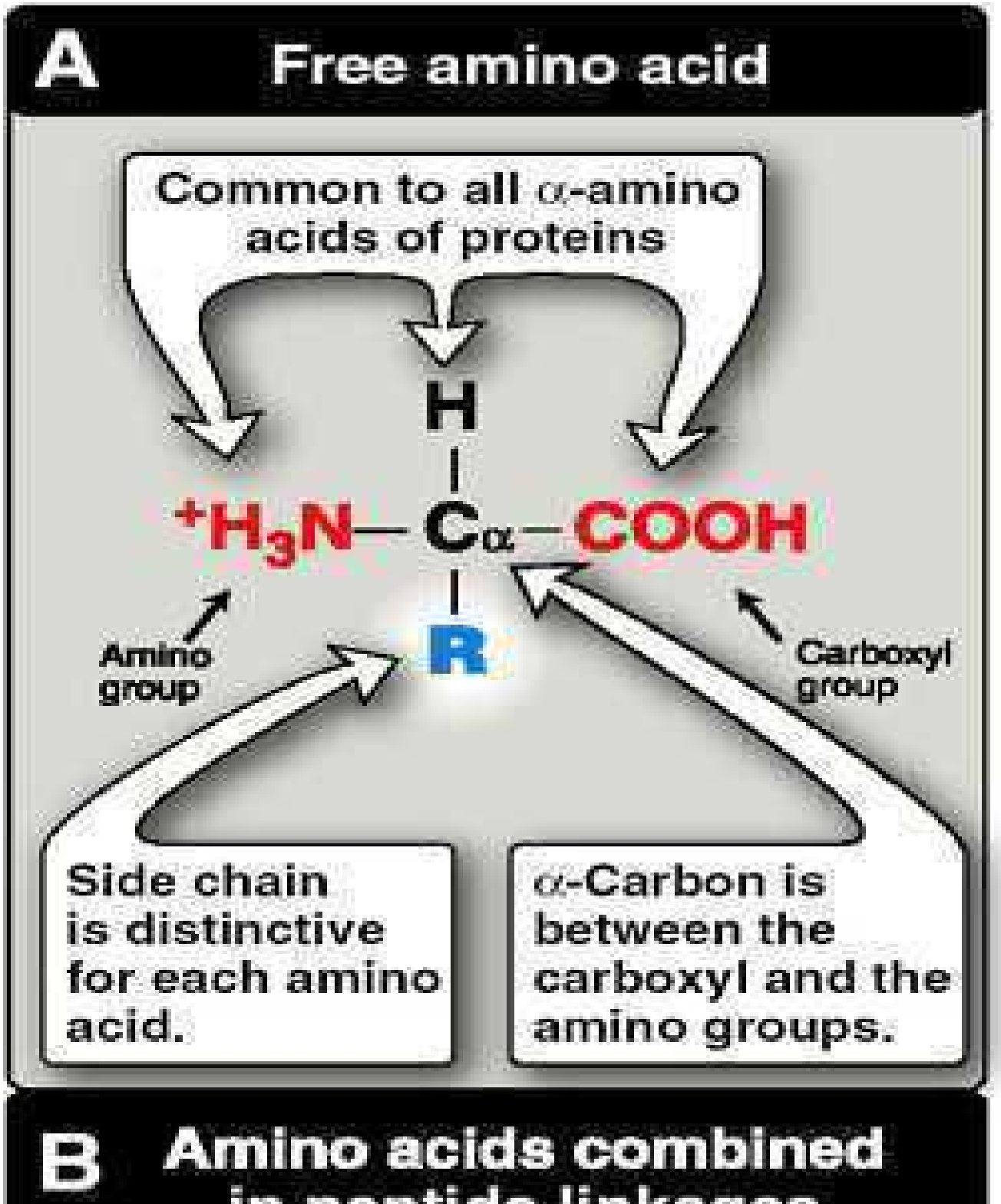
We need food molecules to

1)Increase number of **body molecules**

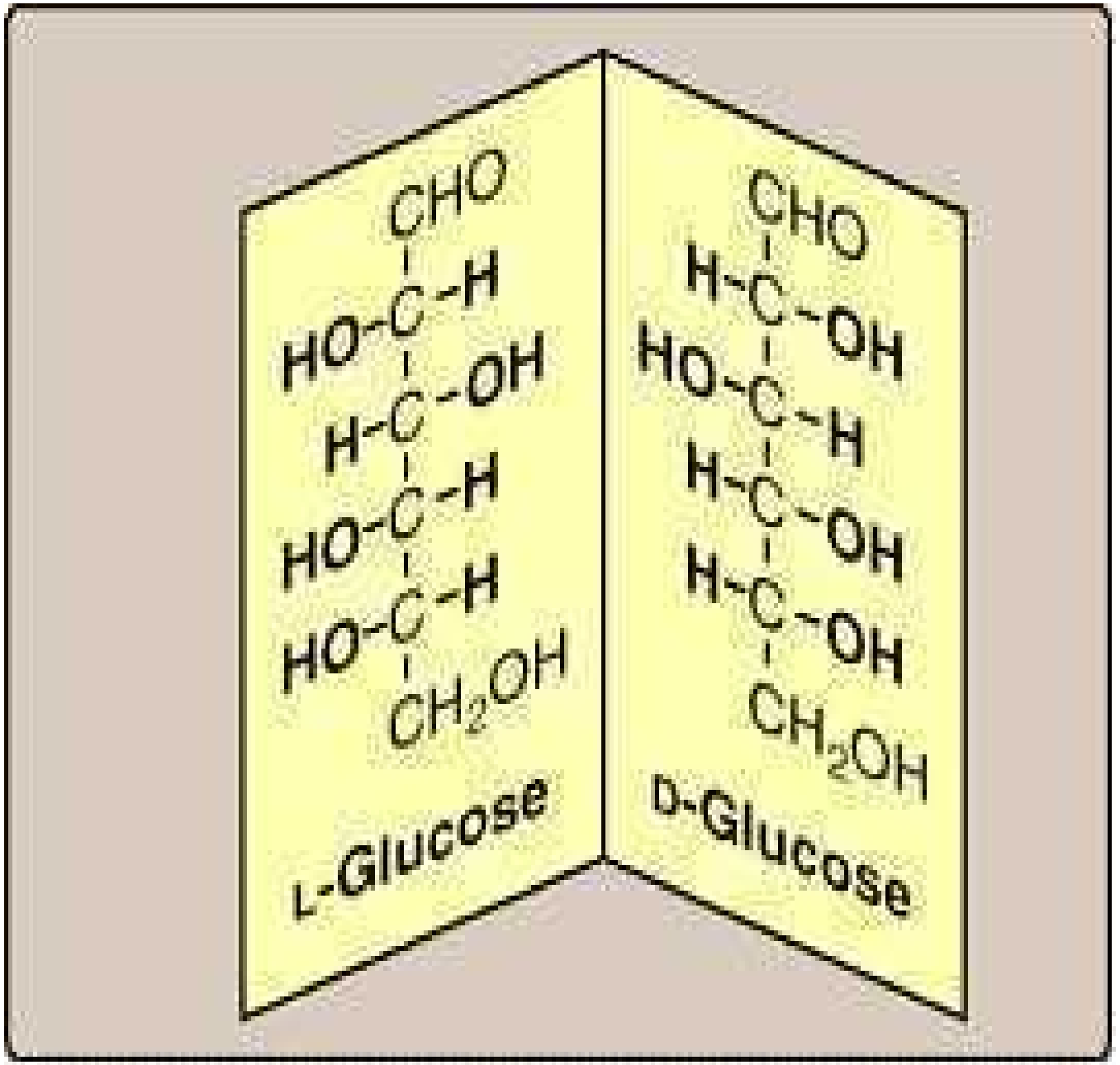
2)To replace **body molecules** going out body

3) To get energy (why we need energy?)

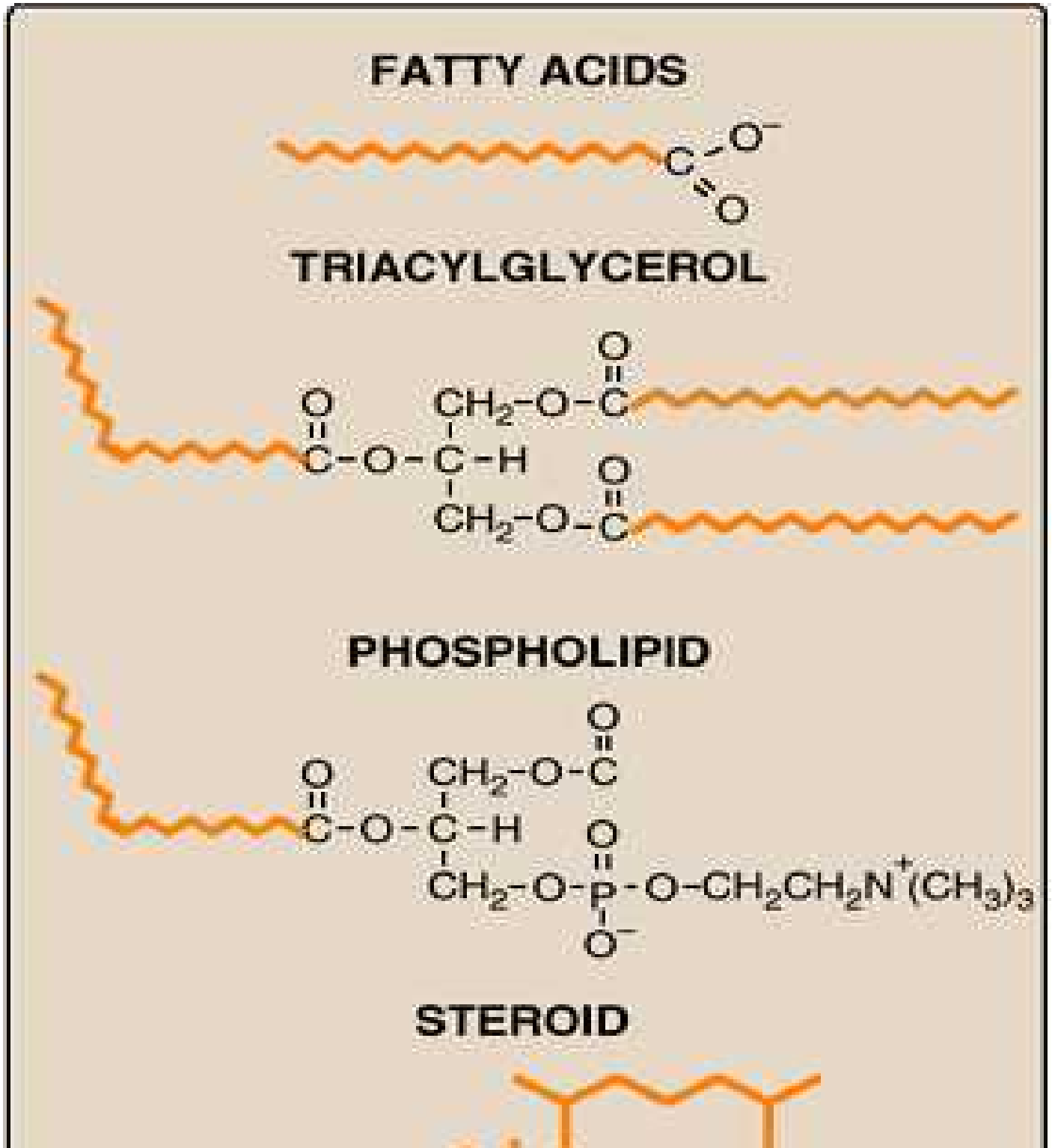
Body molecules


A
Free amino acid
Common to all α-amino acids of proteins
H
+H3N— Cα —COOH
R
Amino group
Carboxyl group
Side chain is distinctive for each amino acid.
α-Carbon is between the carboxyl and the amino groups.
B
Amino acids combined

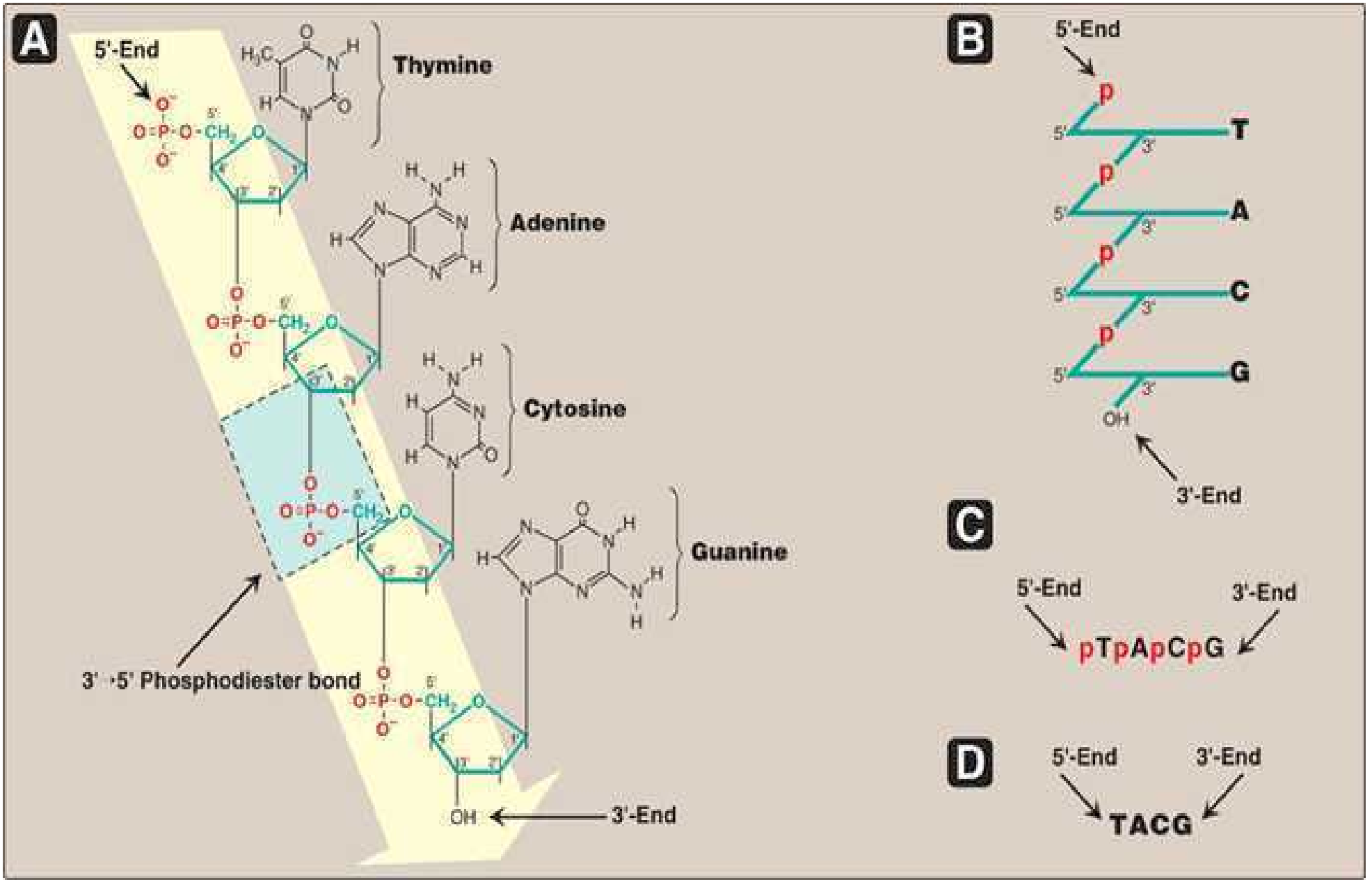
1

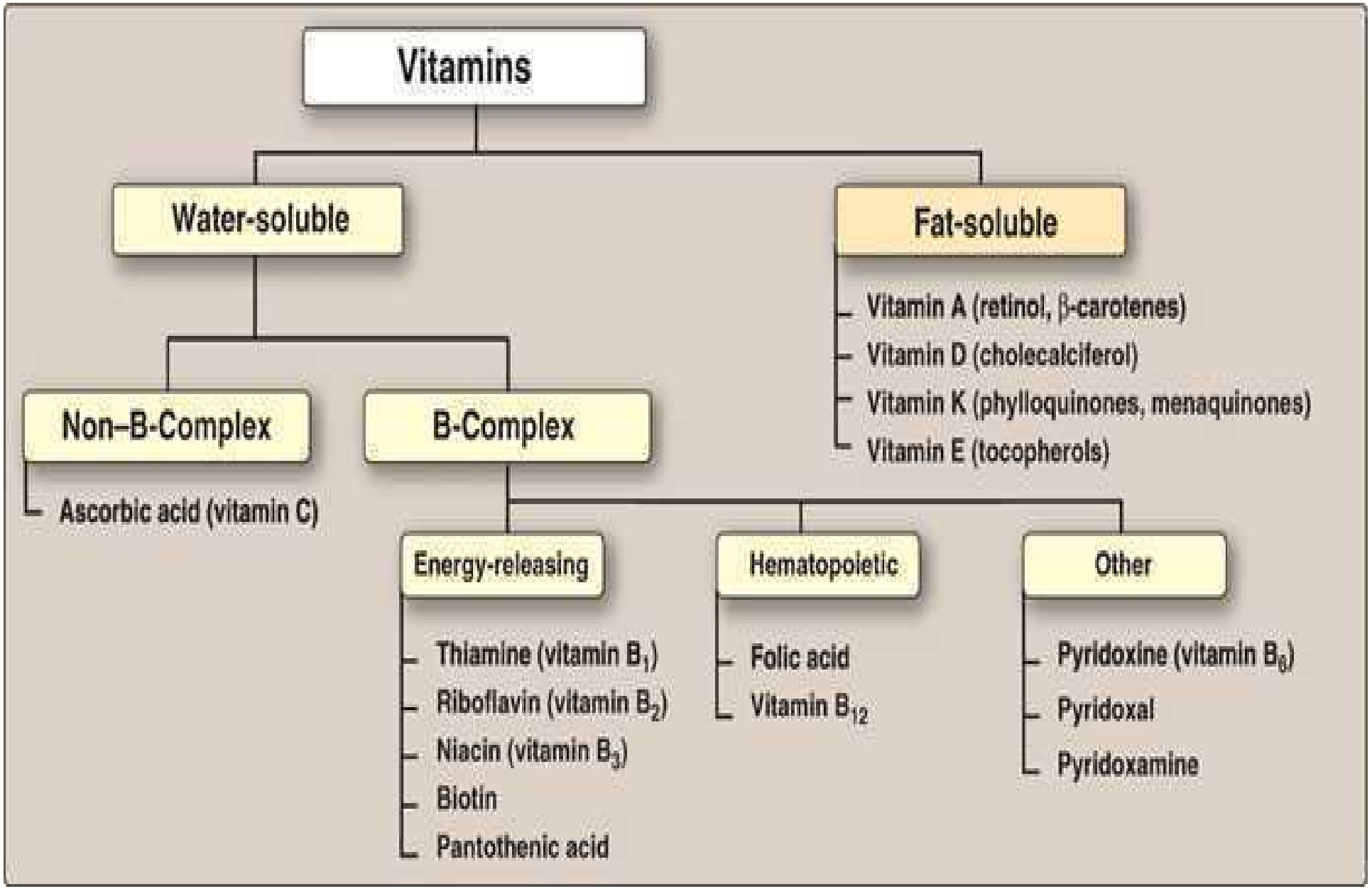

CHO
H-C-OH
HO-C-H
H-C-OH
H-C-OH
CH2OH
D-Glucose
CHO
H-C-OH
HO-C-H
H-C-OH
H-C-OH
CH2OH
L-Glucose

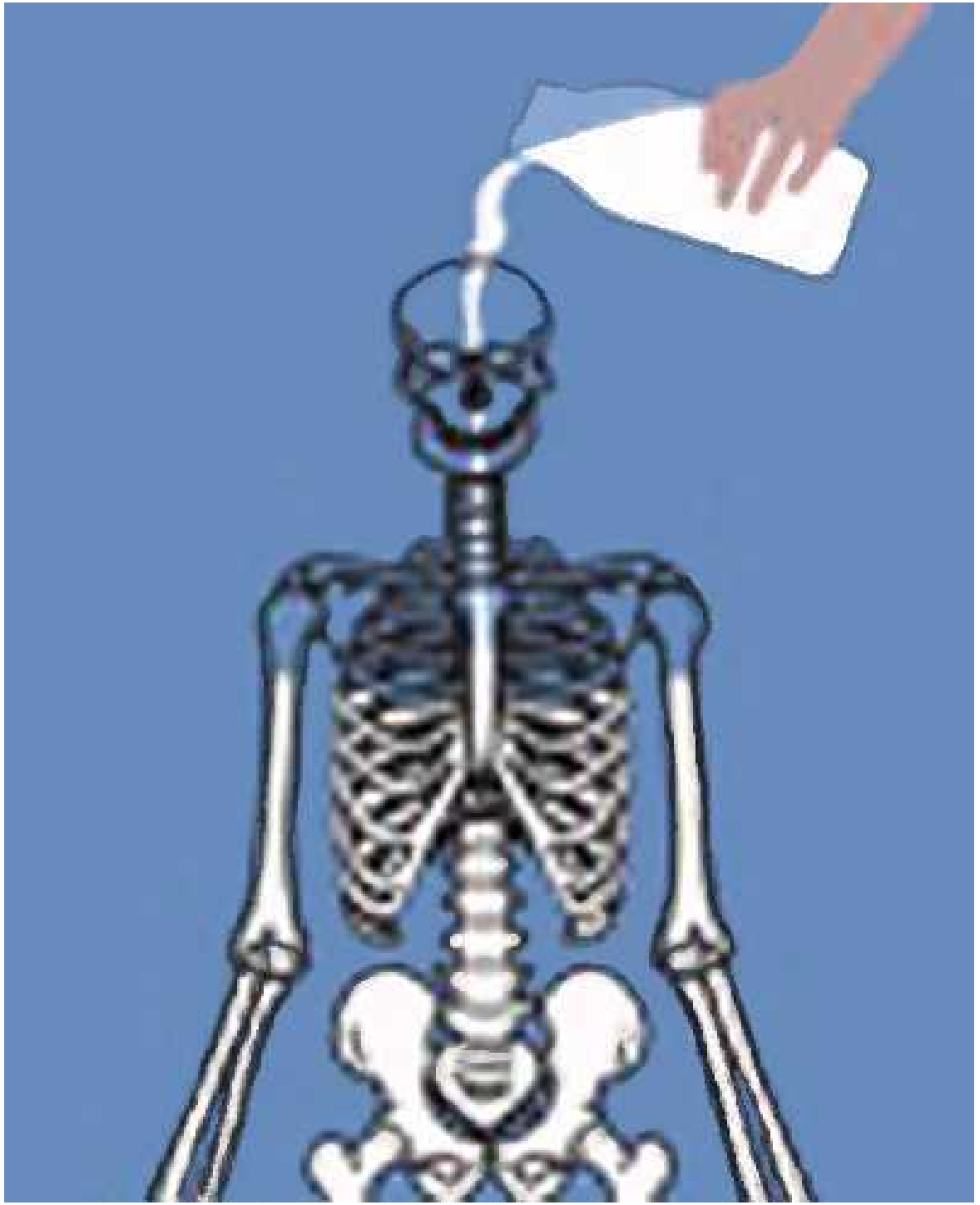
2



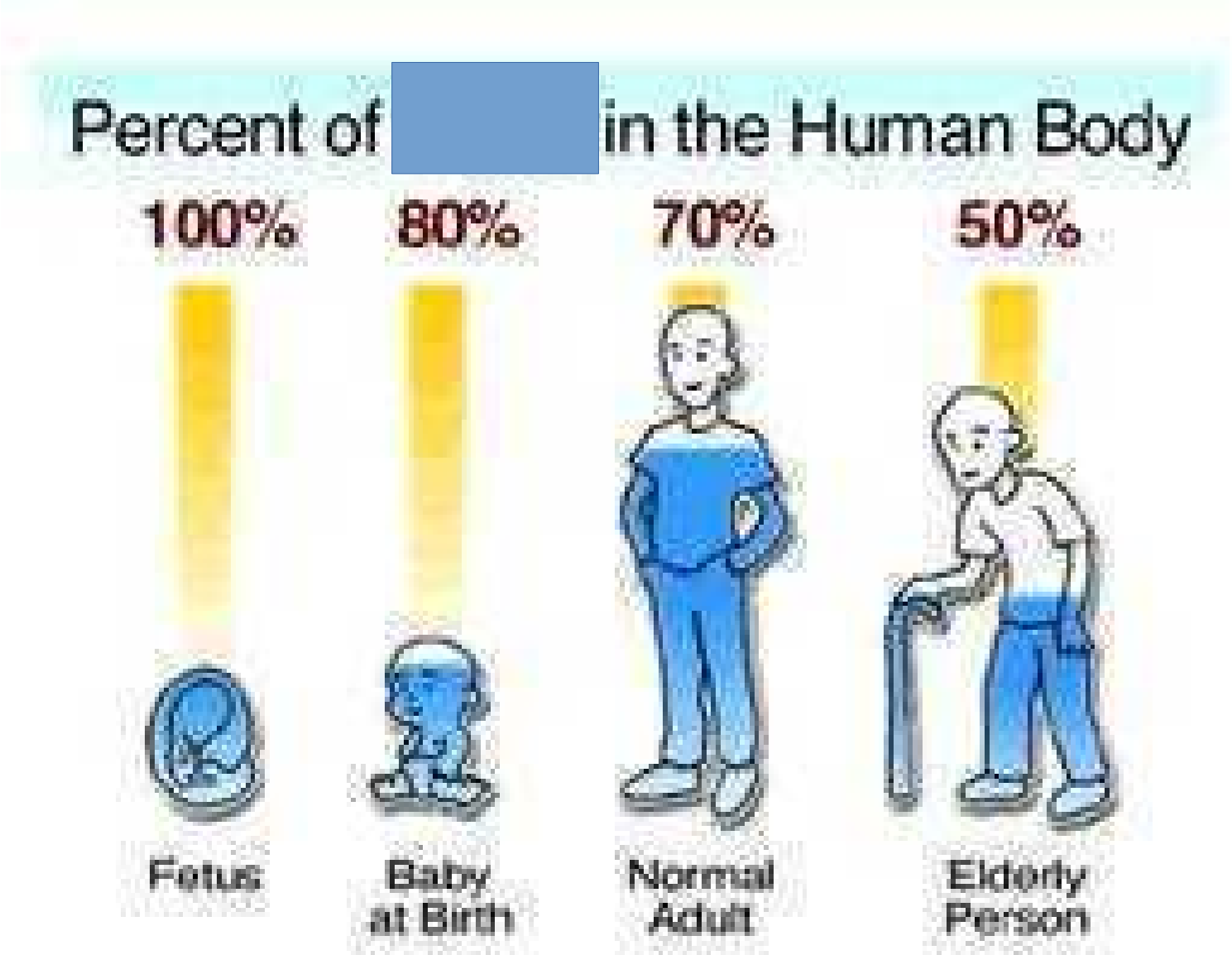
3


A
5'-End
Thymine
Adenine
Cytosine
Guanine
3' ›5' Phosphodiester bond
OH
3'-End
B
5'-End
T
A
C
G
OH
3'-End
C
5'-End
3'-End
pTpApCpG
D
5'-End
3'-End
TACG

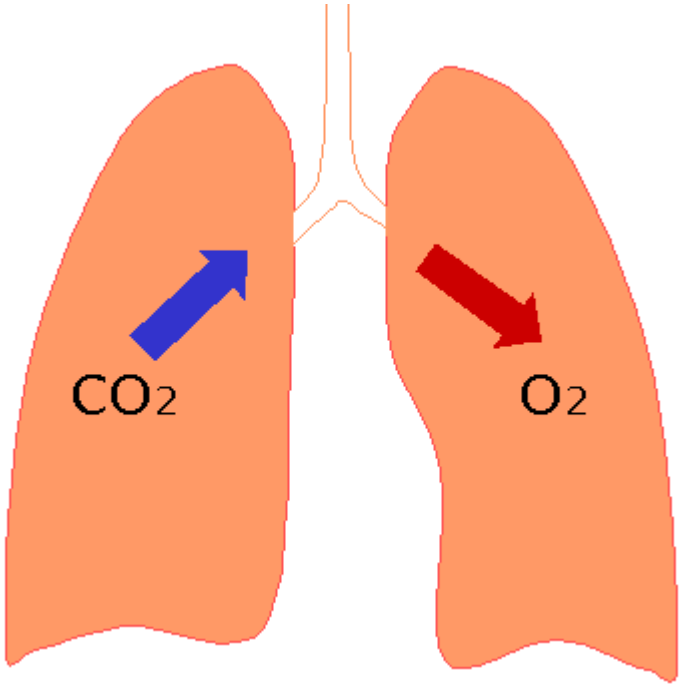

Vitamins
Water-soluble
Fat-soluble
Non–B-Complex
B-Complex
Ascorbic acid (vitamin C)
Vitamin A (retinol, β-carotenes)
Vitamin D (cholecalciferol)
Vitamin K (phylloquinones, menaquinones)
Vitamin E (tocopherols)
Energy-releasing
Hematopoietic
Other
Thiamine (vitamin B_1)
Riboflavin (vitamin B_2)
Niacin (vitamin B_3)
Biotin
Pantothenic acid
Folic acid
Vitamin B_{12}
Pyridoxine (vitamin B_6)
Pyridoxal
Pyridoxamine



6


Percent of [redacted] in the Human Body
100%
80%
70%
50%
Fetus
Baby at Birth
Normal Adult
Elderly Person

7



8

9

What is food?

Why we need it?

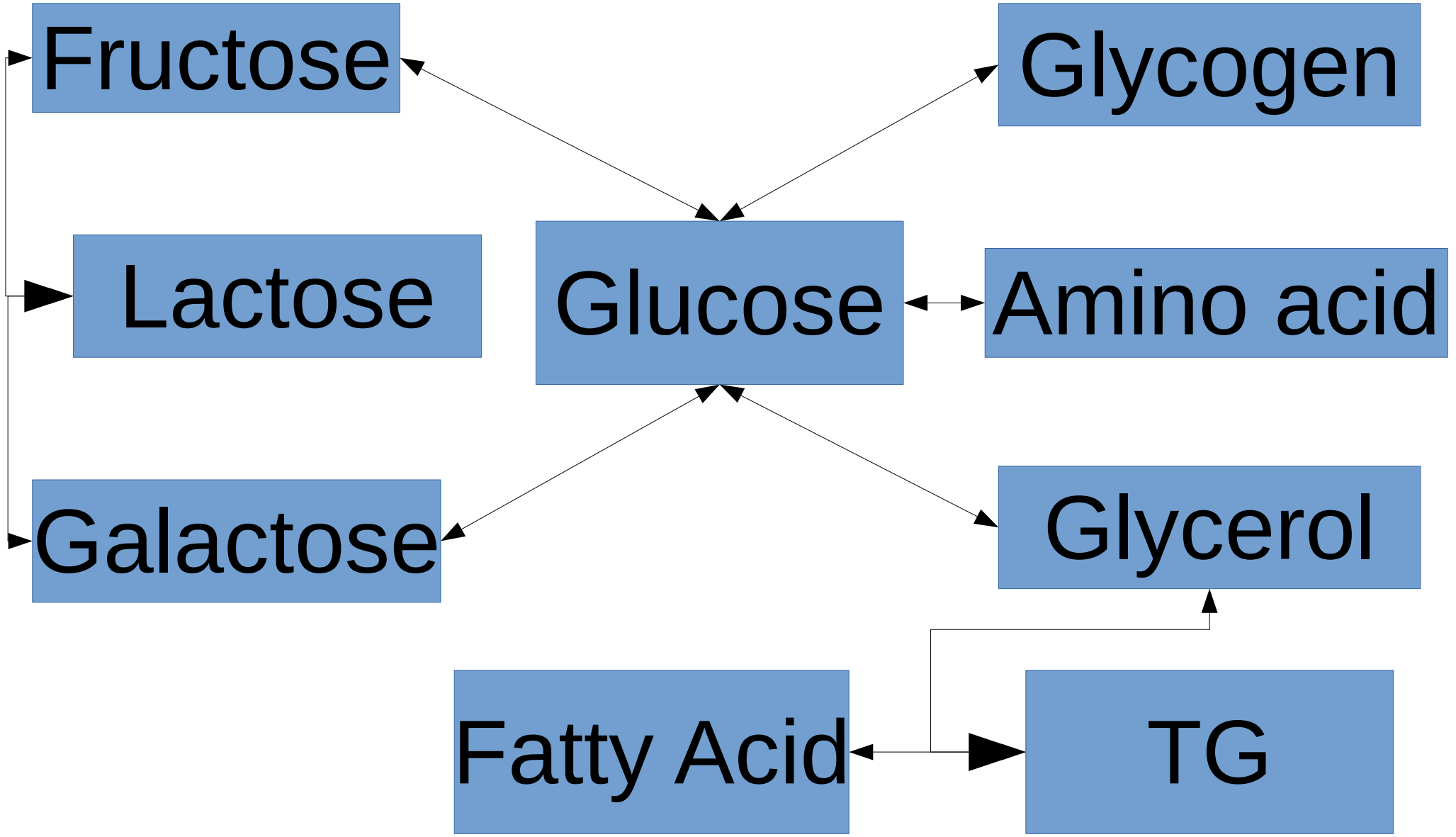
What food must have?

Which are good for health?

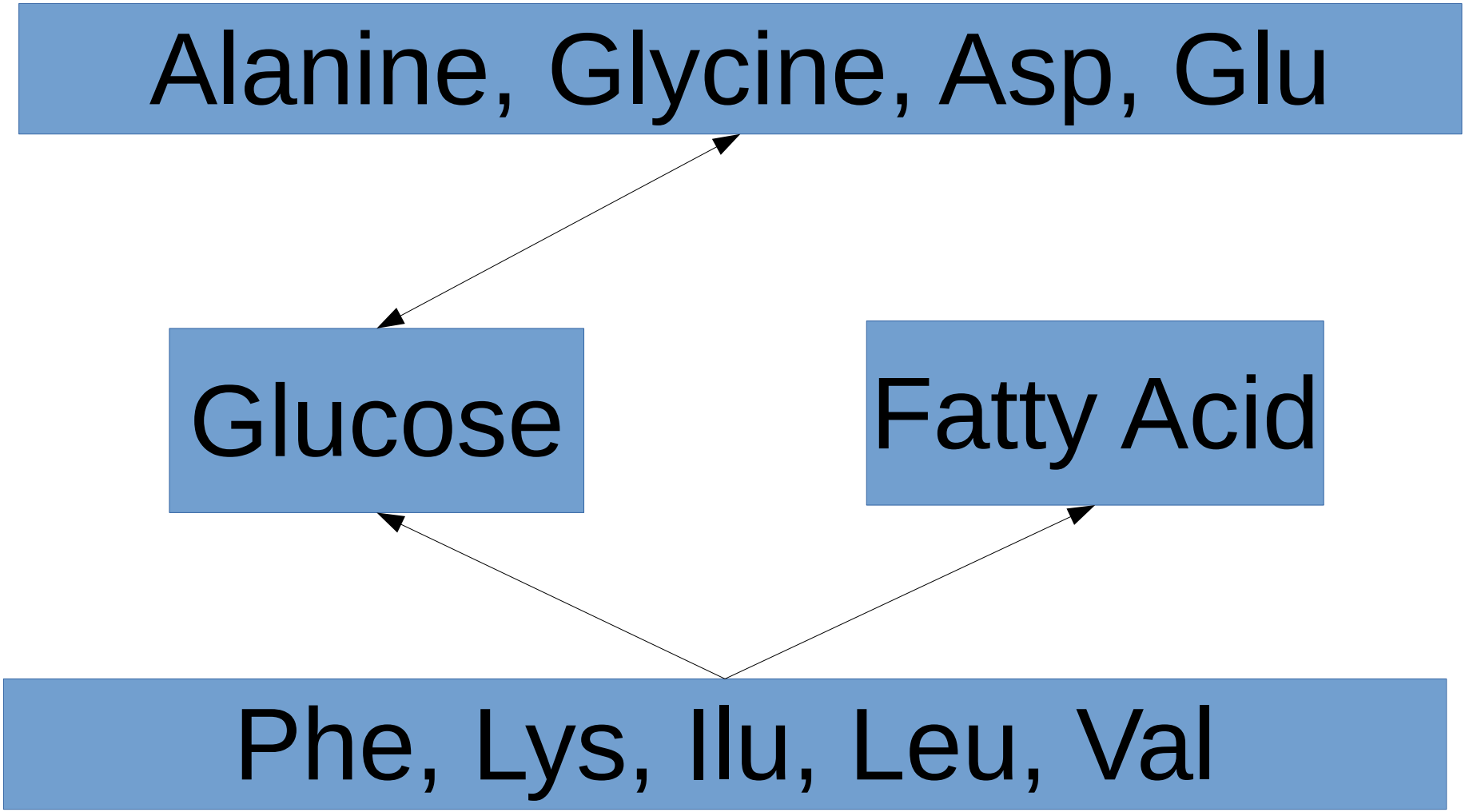
Which are not?

What food we must have?

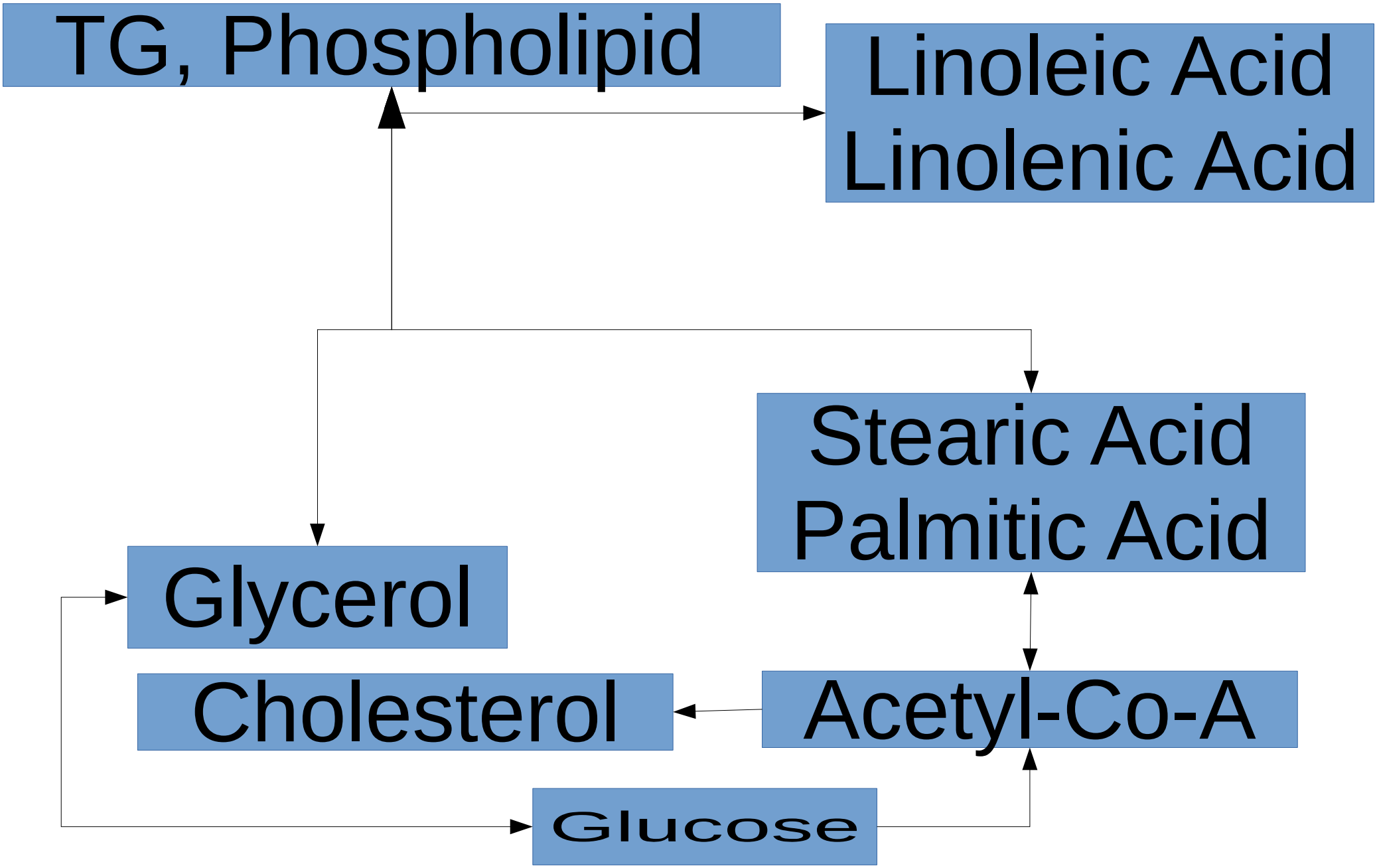
Do we need Carbohydrate in food?



Do we need Protein/AA in food?



Do we need Lipids in food?



What else we need?

A, T, G, C

Vitamins

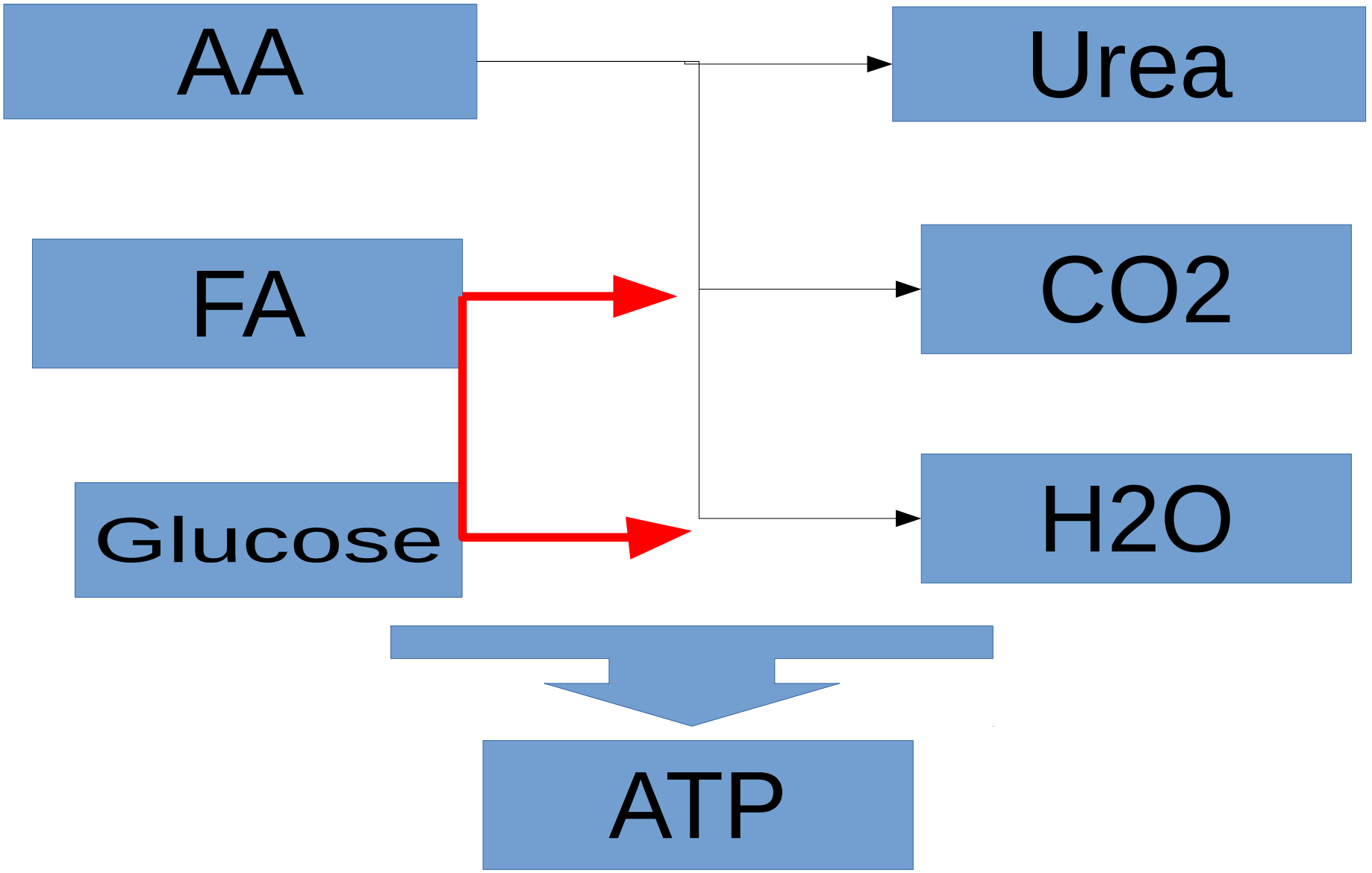
Glucose

Minerals

Water

Find one mistake in this slide

We also need energy
(Why? Not so easy to answer)



What is food?

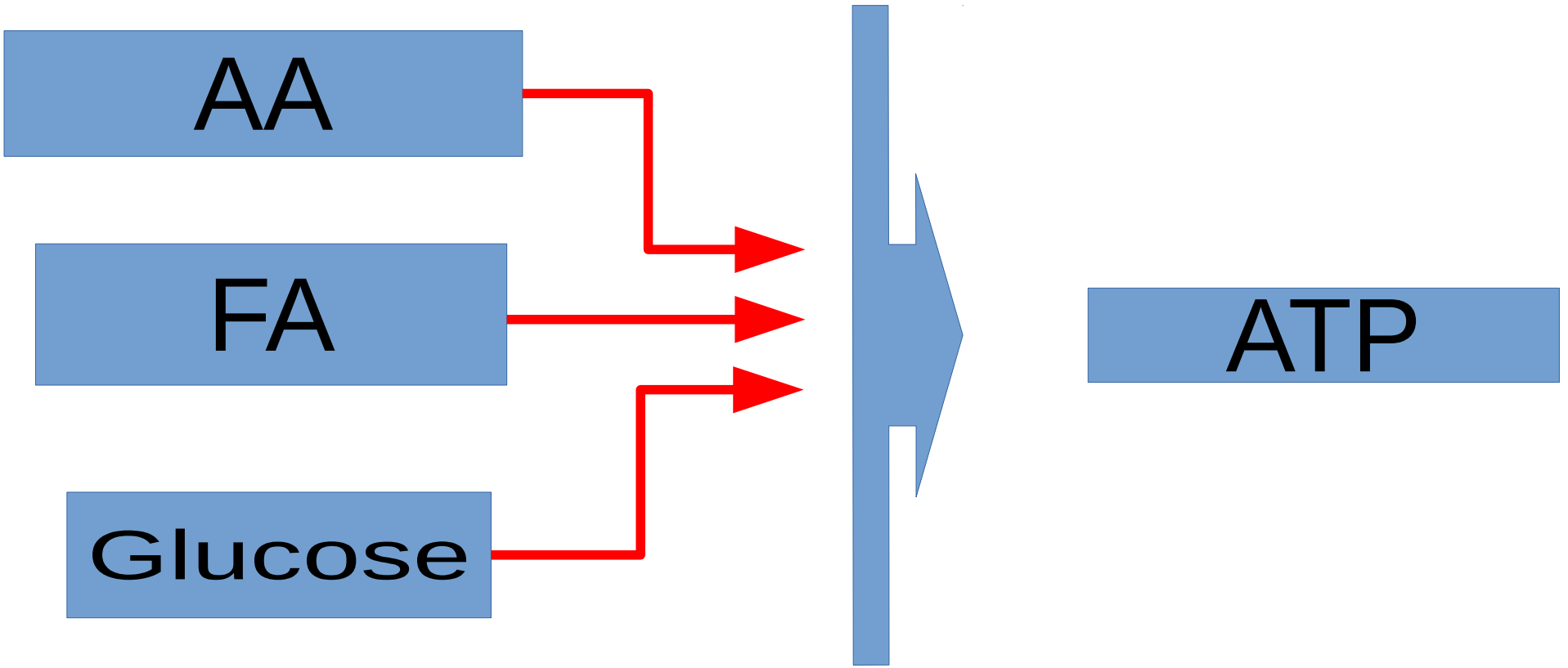
Why we need it?

What food must have?

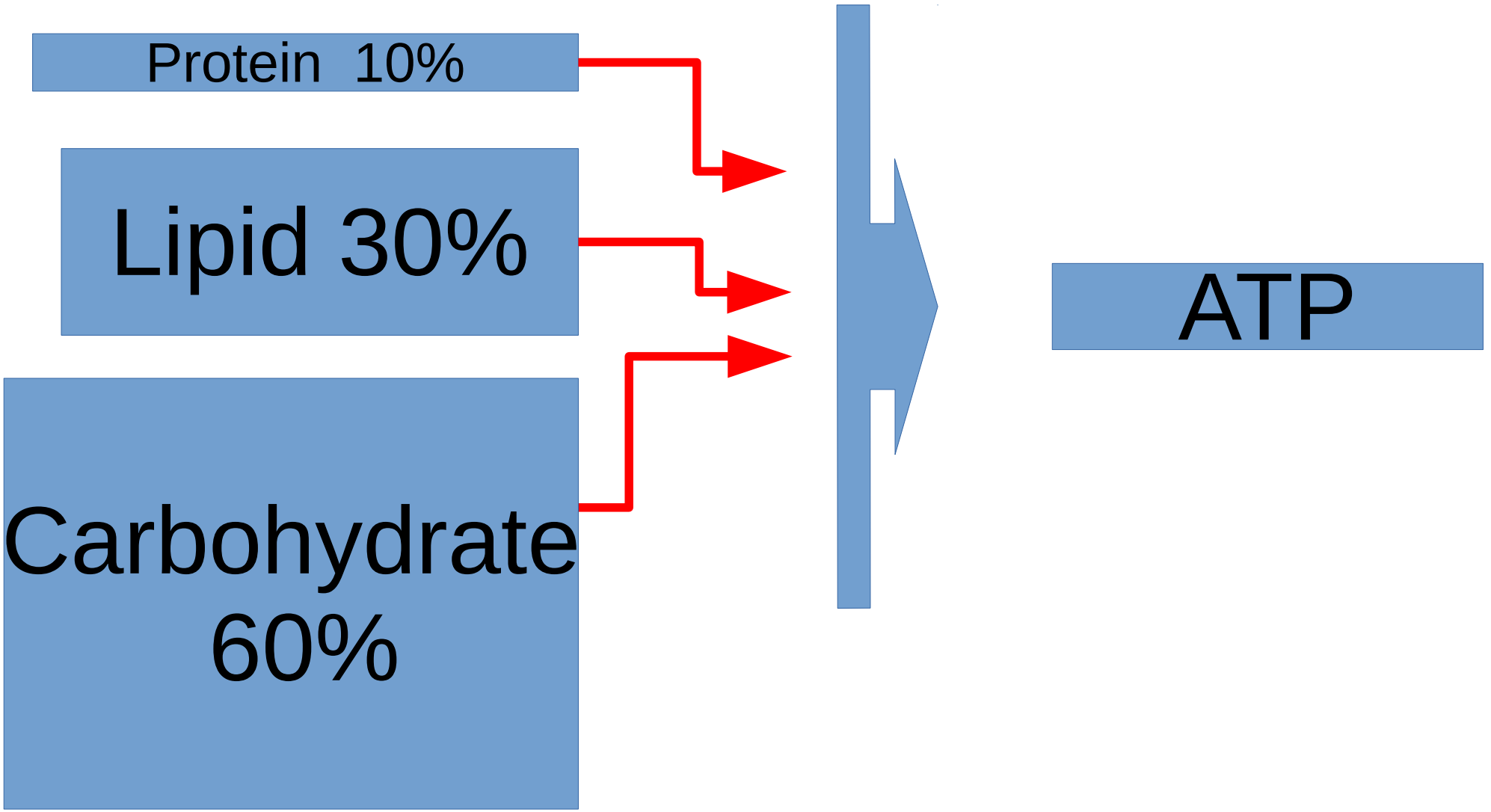
Which are good for health?

Which are not?

Fight of Pyramids



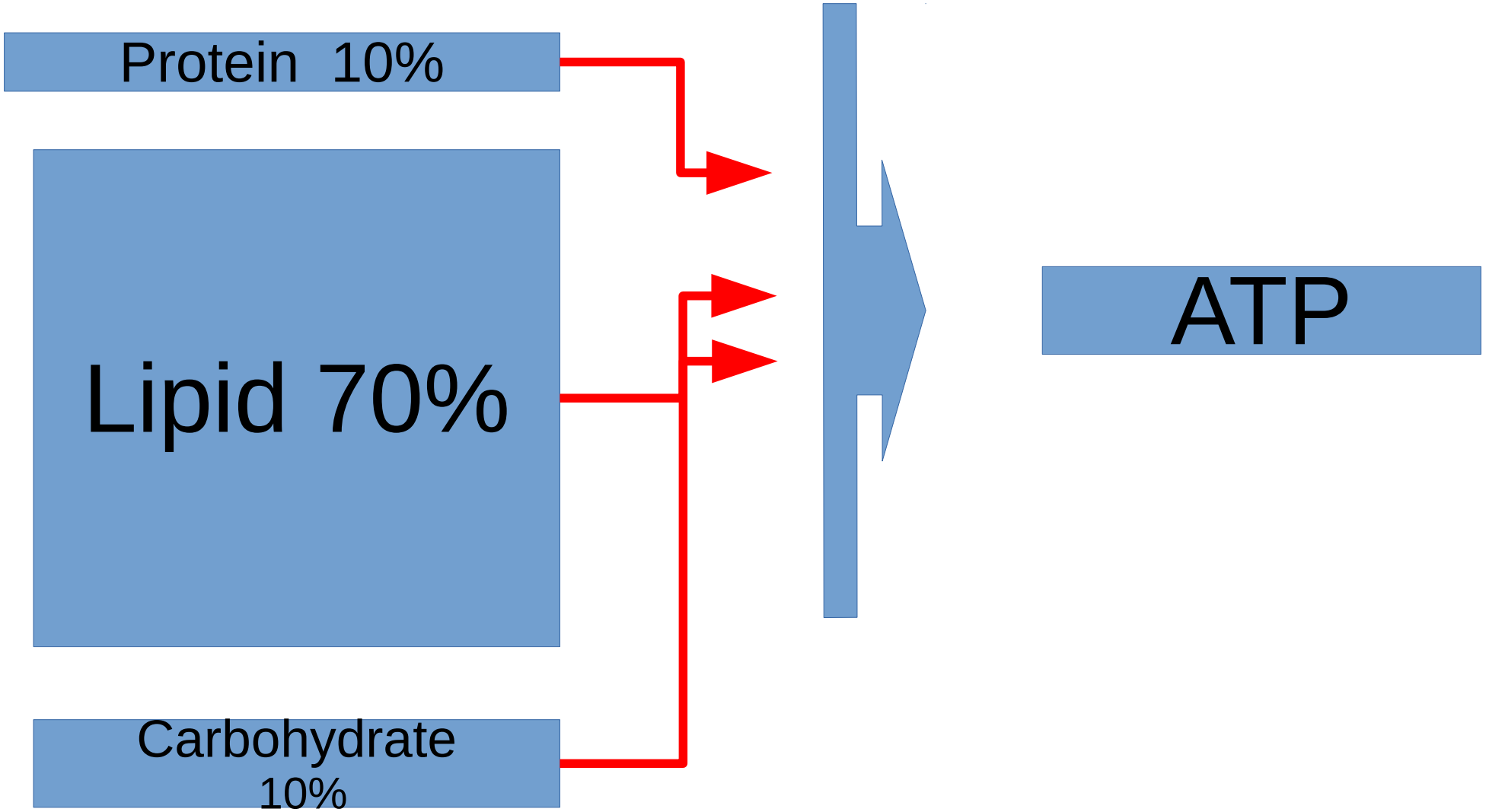
General Pyramid



General Pyramid

kcal/gm	Category	%	2000 kcal/day	gm/day
4	Protein	10	200	50
9	Lipid	30	600	67
4	Carbohydrate	60	1200	300

Keto Diet Pyramid



Keto Pyramid
(Low Carb, High Fat, Normal Protein)

kcal/gm	Category	%	2000 kcal/day	gm/day
4	Protein	10	200	50
9	Lipid	70	1600	178
4	Carbohydrate	10	200	100

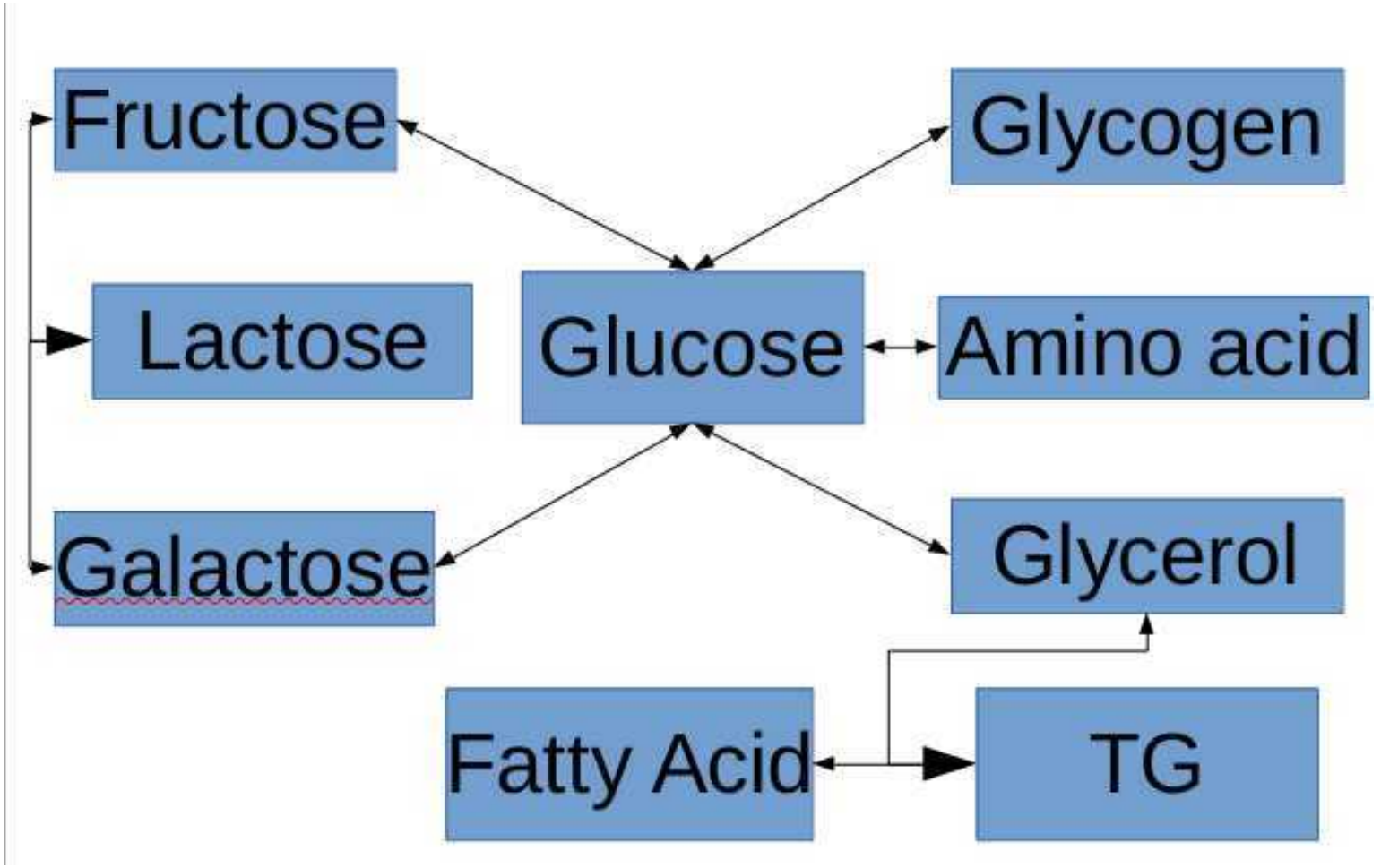
Keto Diet

What are biochemical changes in body when low-carbohydrate, high lipid diet is taken?

What are health effects of such diet?

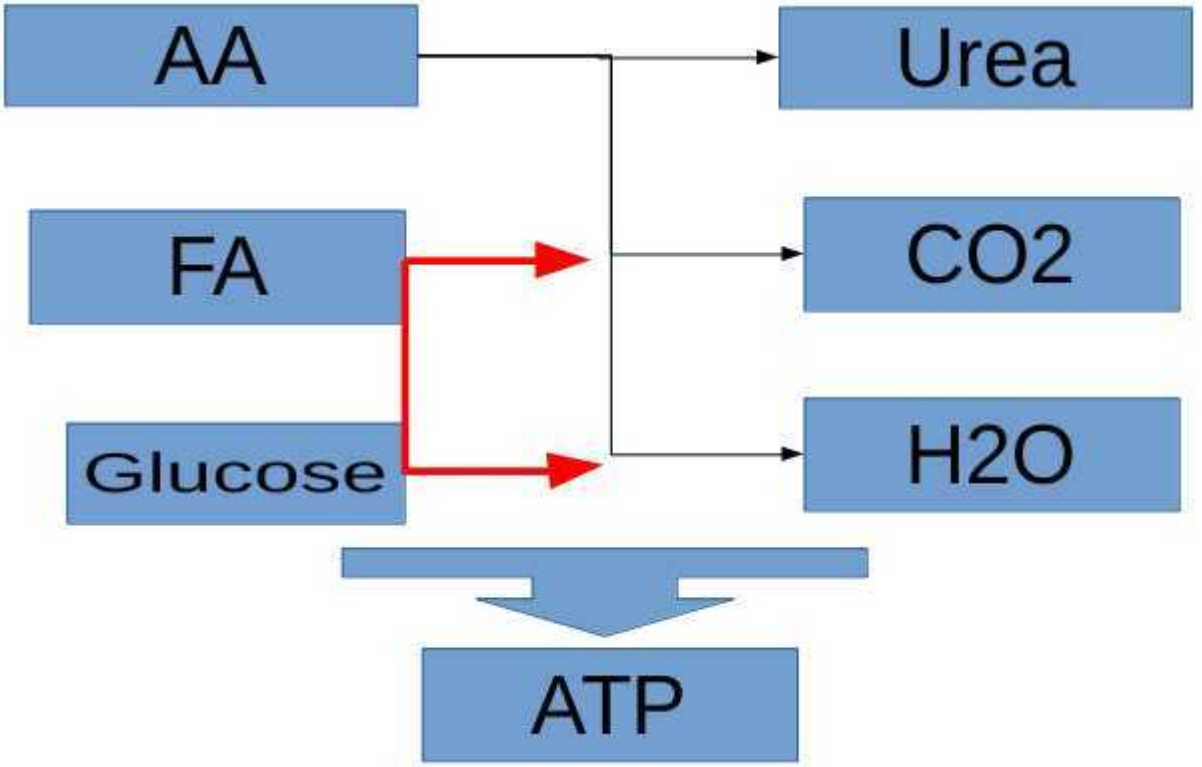
What is current consensus on the matter?

Low-carbohydrate, high lipid diet



Which carbohydrate can not be synthesized in body?

Low-carbohydrate, high lipid diet



Is Glucose must for cells to get energy?

Low-carbohydrate, high lipid diet

For RBC/Brain etc Glucose is must to get energy.

Can TG be converted in to glucose?

Can Glycerol be converted in to glucose?

Can Fatty Acid be converted in to glucose?

Low-carbohydrate, high lipid diet

If someone take little/no glucose/carbohydrate

will there be deficiency of glucose

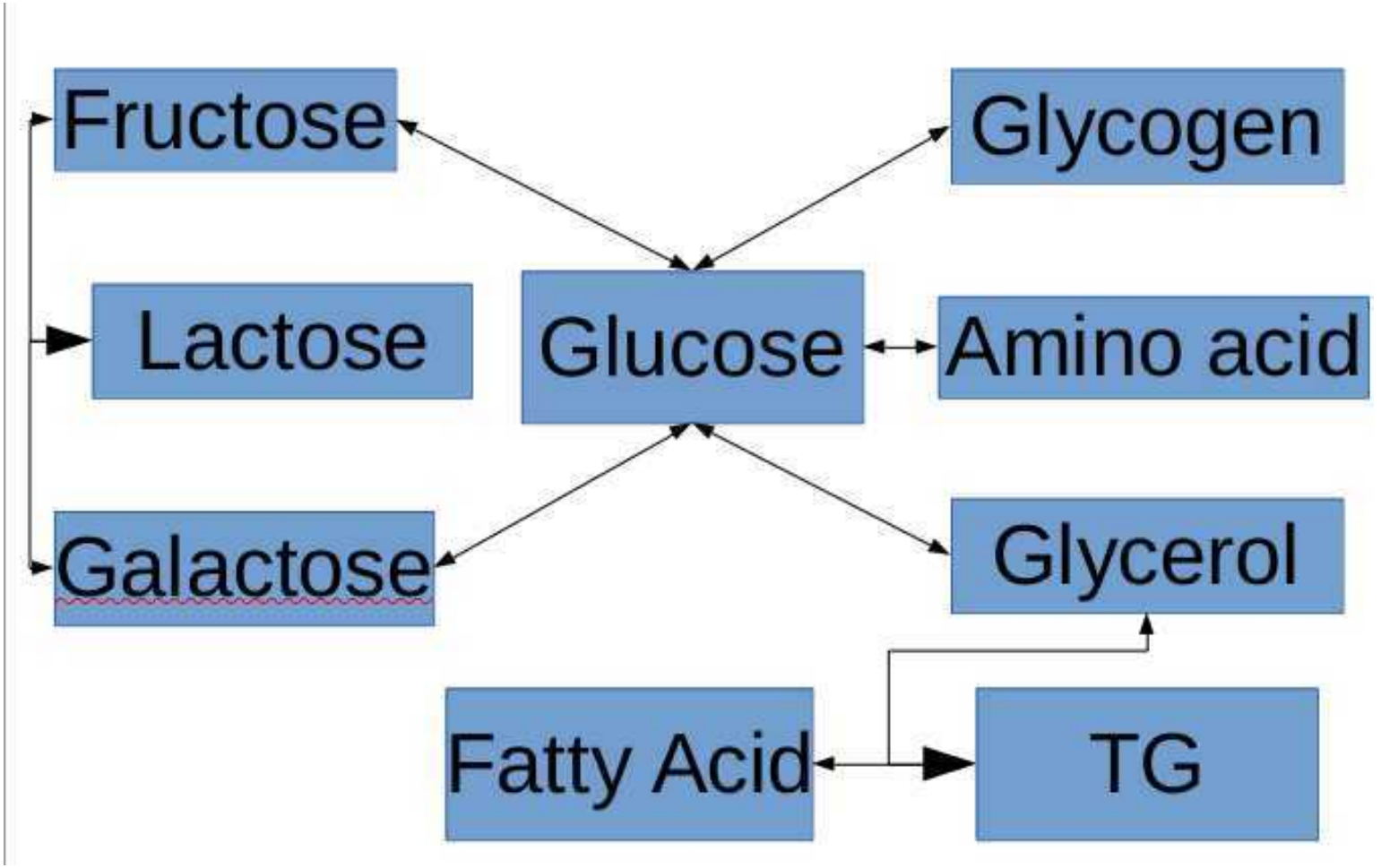
Will cell suffer from lack of energy?

OK, BOSS

We can survive without carbohydrate

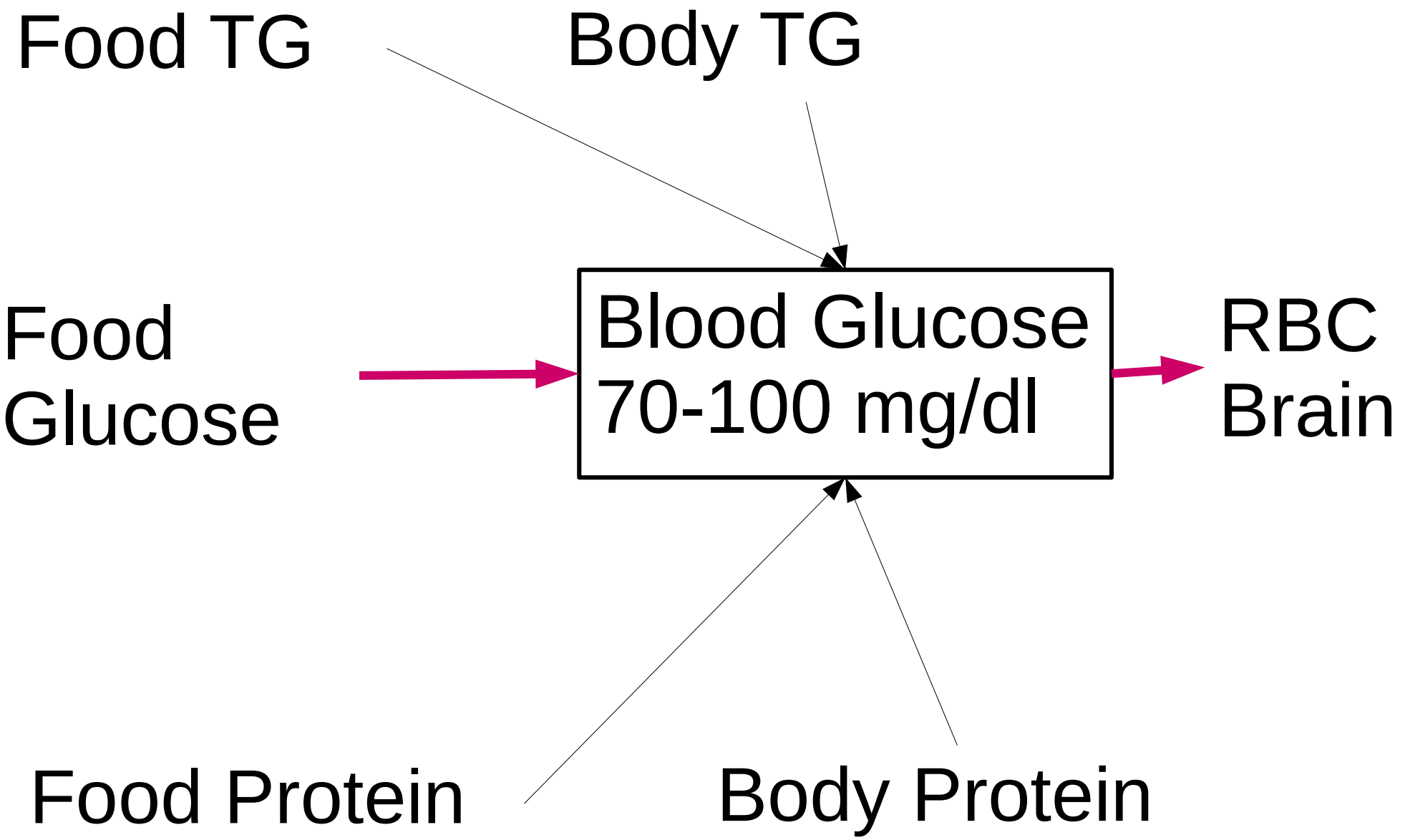
Low-carbohydrate, high lipid diet

Low-carbohydrate, high lipid diet

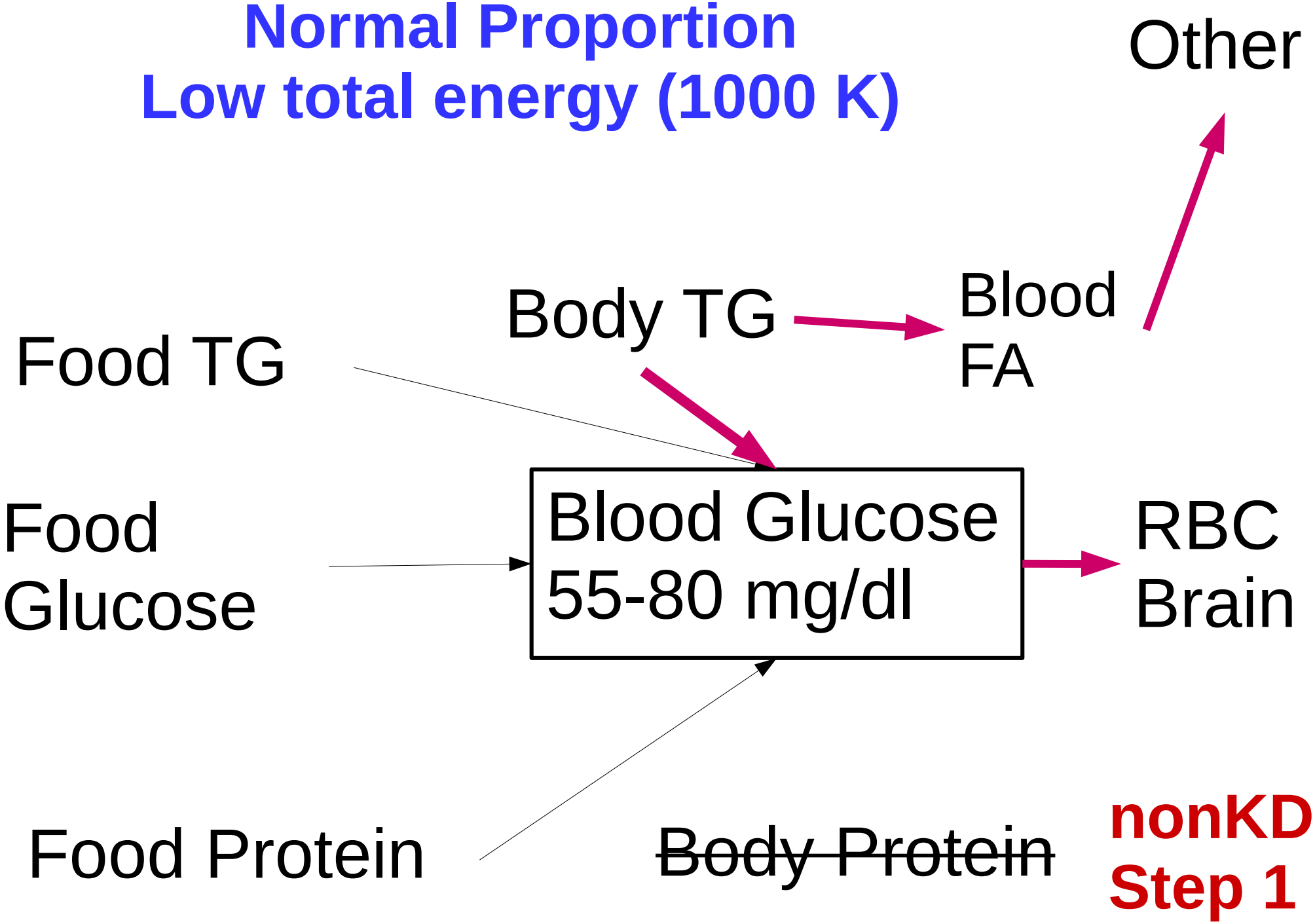


Why adequate protein is must for low carbohydrate diet?

Possible sources of glucose (glycogen?)

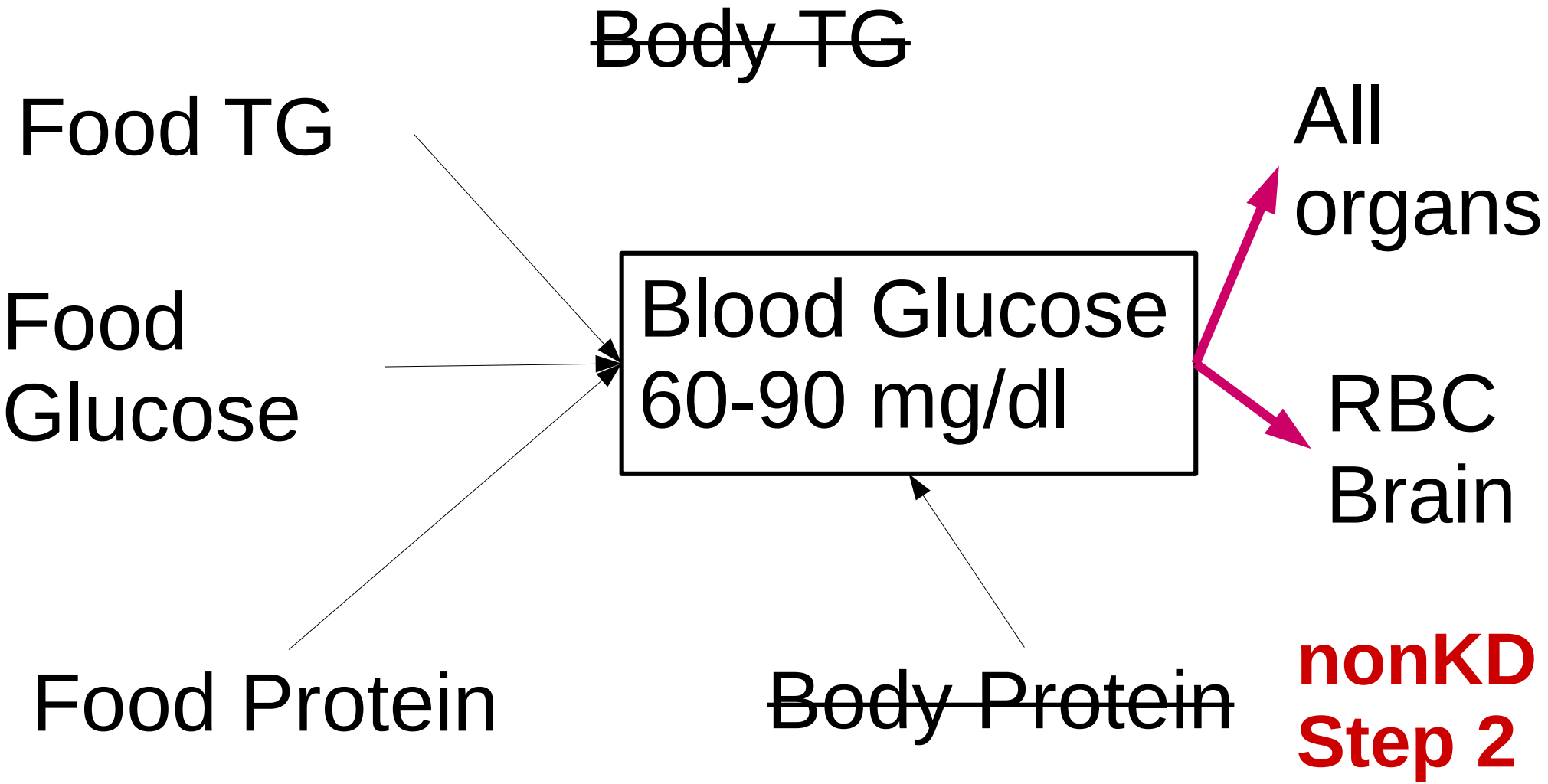


Normal Proportion
Low total energy (1000 K)



nonKD
Step 1

Normal Proportion
adequate total energy (2000 K)



Now look at non ketogenic diet

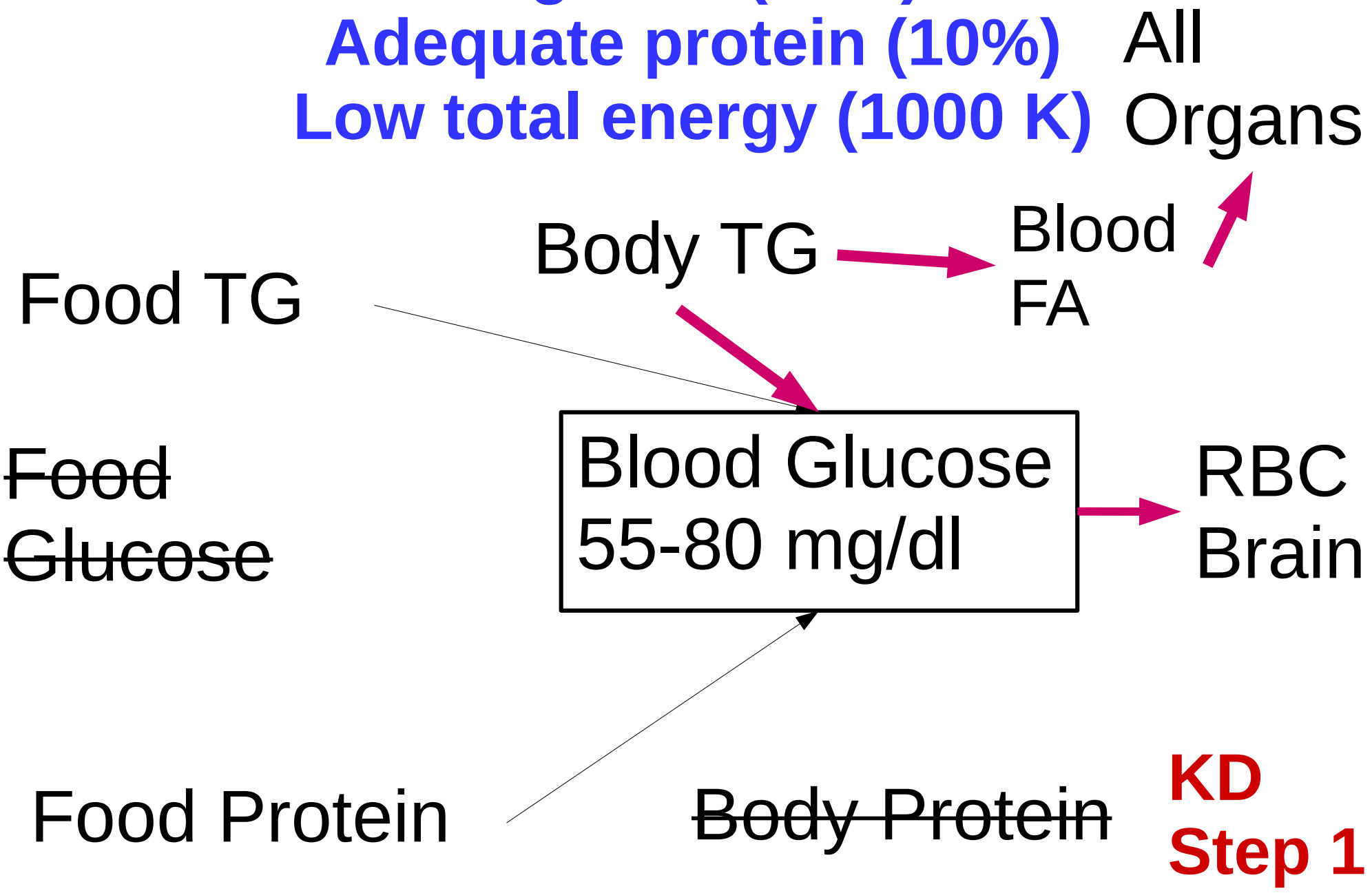
Normal Carbohydate

Normal Fat

Normal Protein

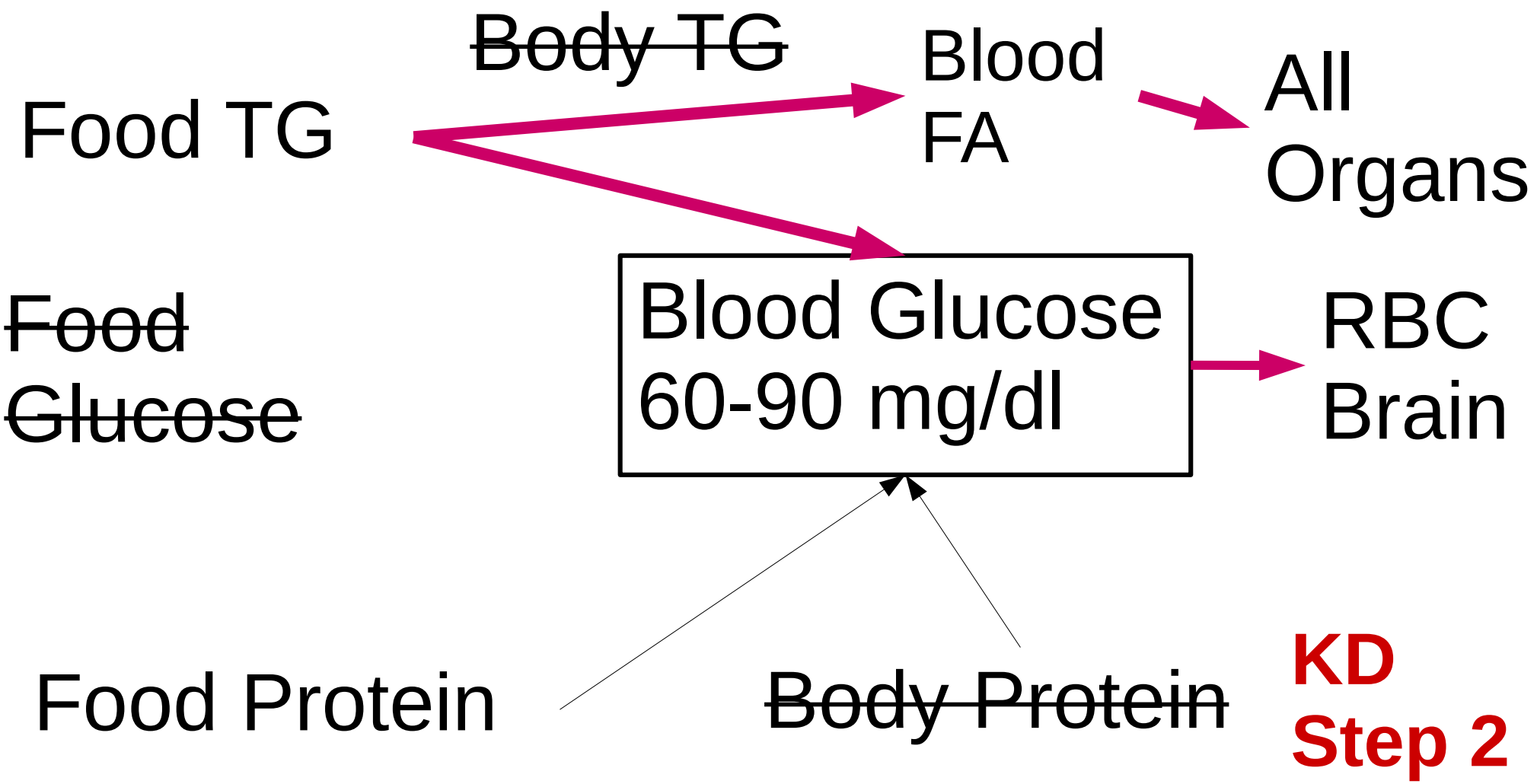
Diet

Low-carbohydrate (10%)
High Fat (70%)
Adequate protein (10%)
Low total energy (1000 K)



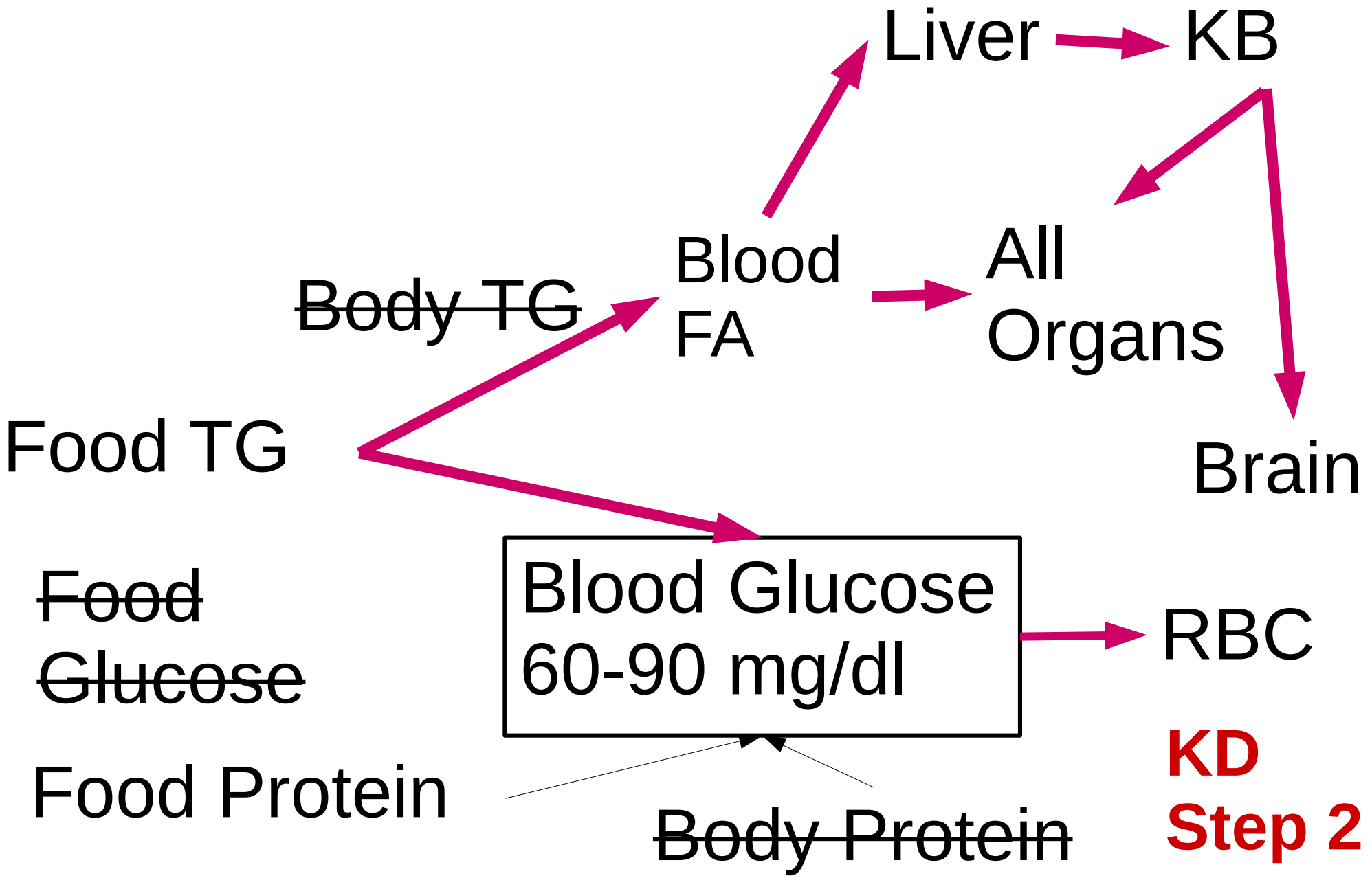
KD Step 1

Low-carbohydrate (10%)
High Fat (70%)
Adequate protein (10%)
adequate total energy (2000 K)

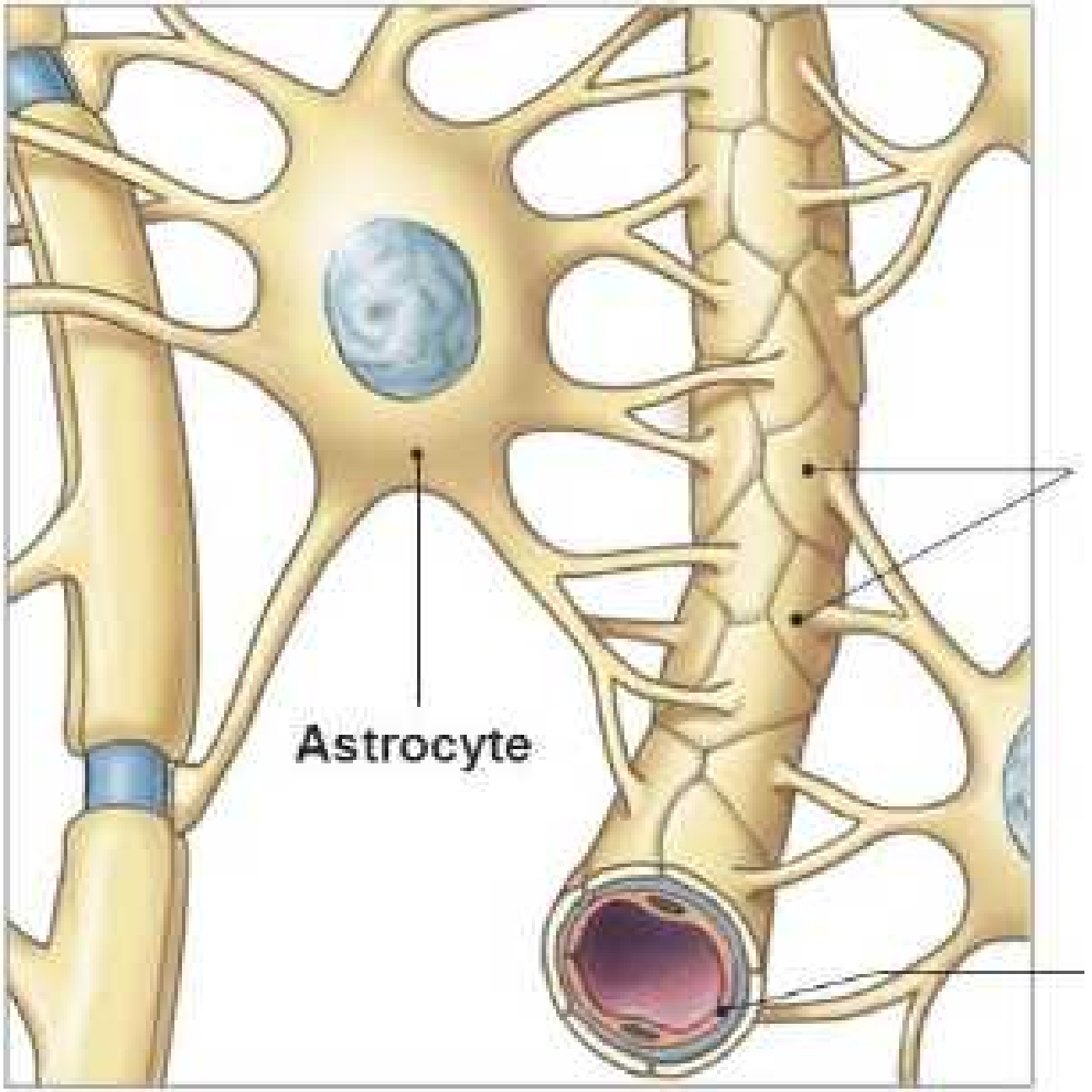


KD
Step 2

Metabolism with high F, low C diet

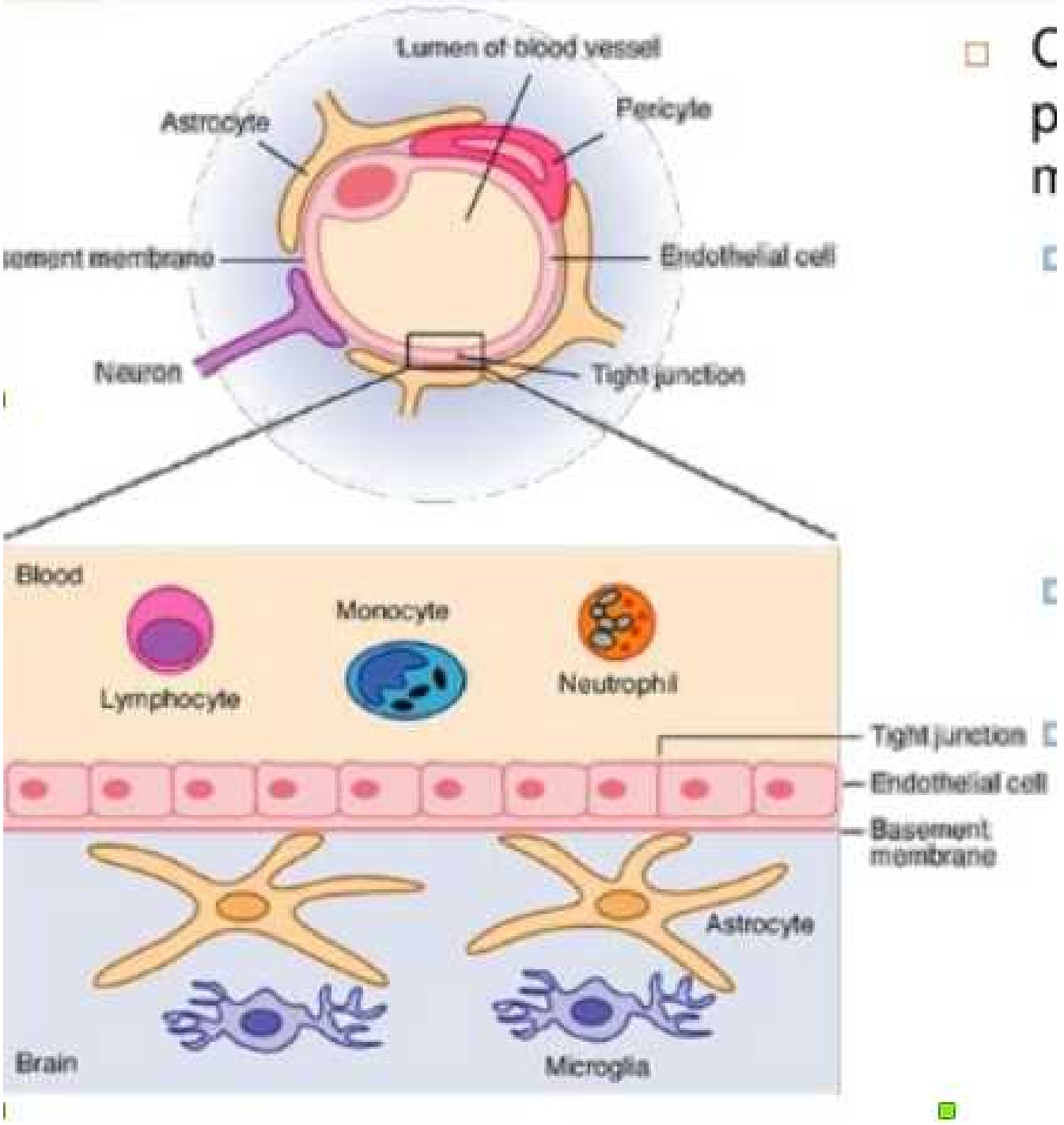


Blood Brain Barrier

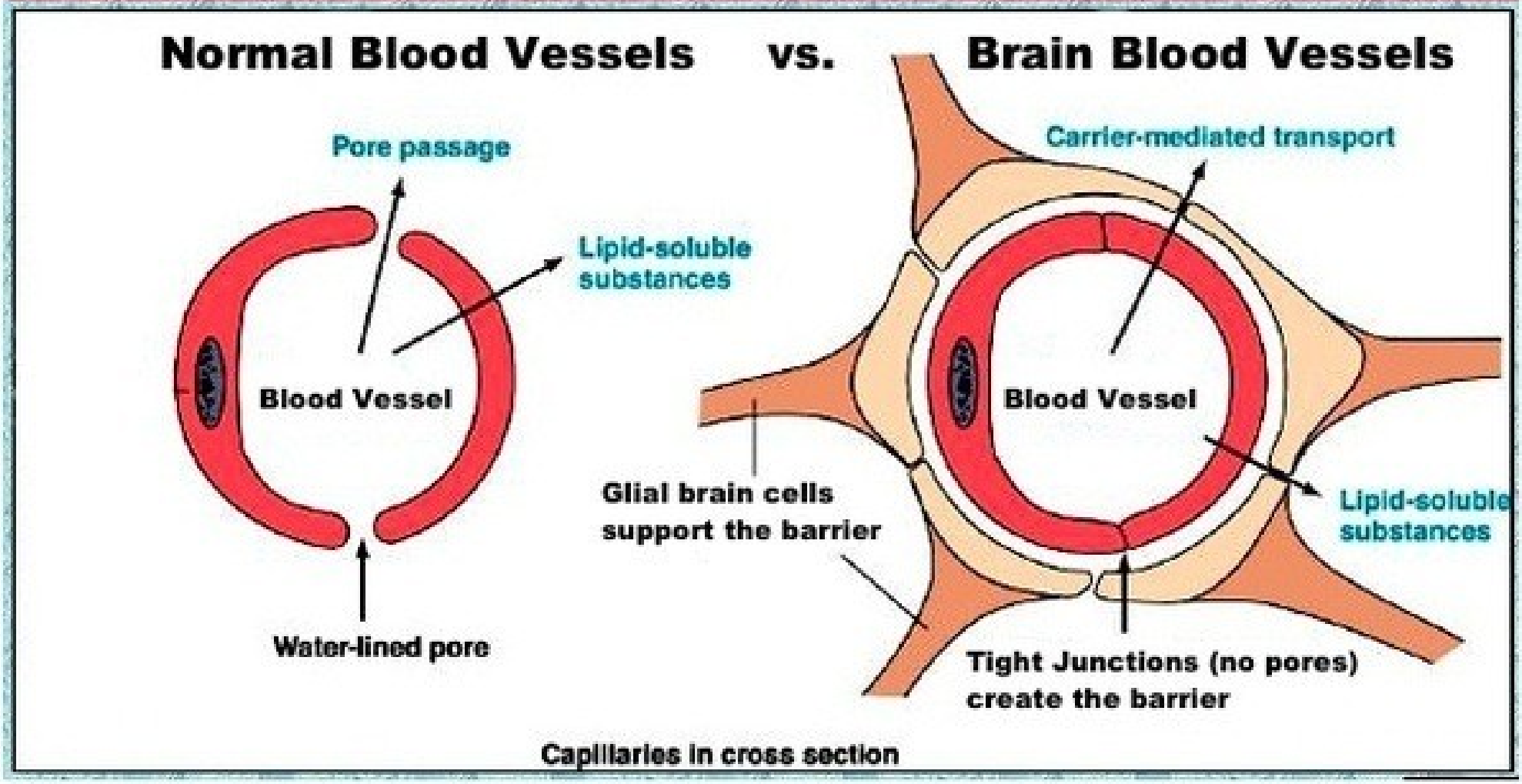


(a)

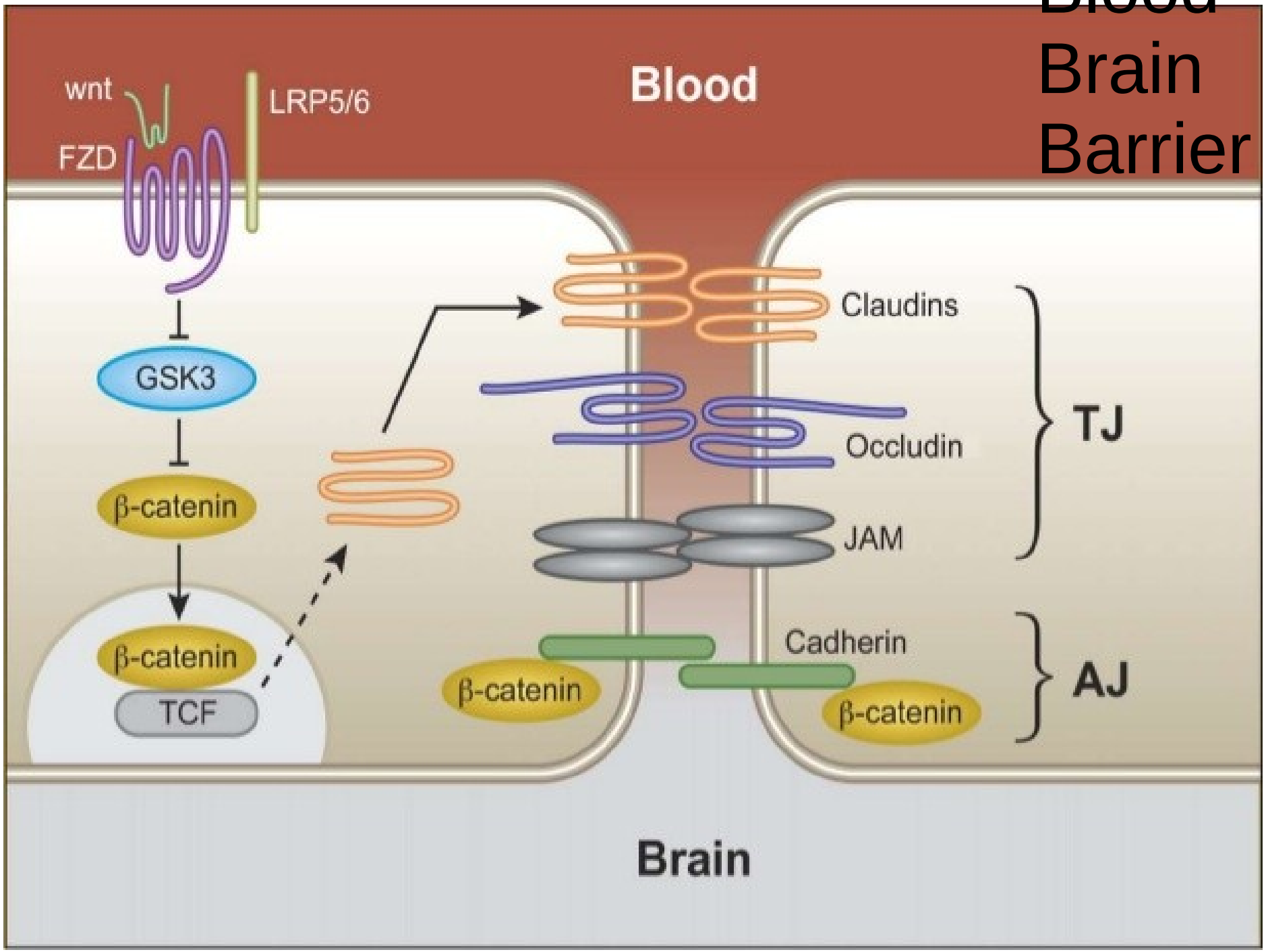
Blood Brain Barrier



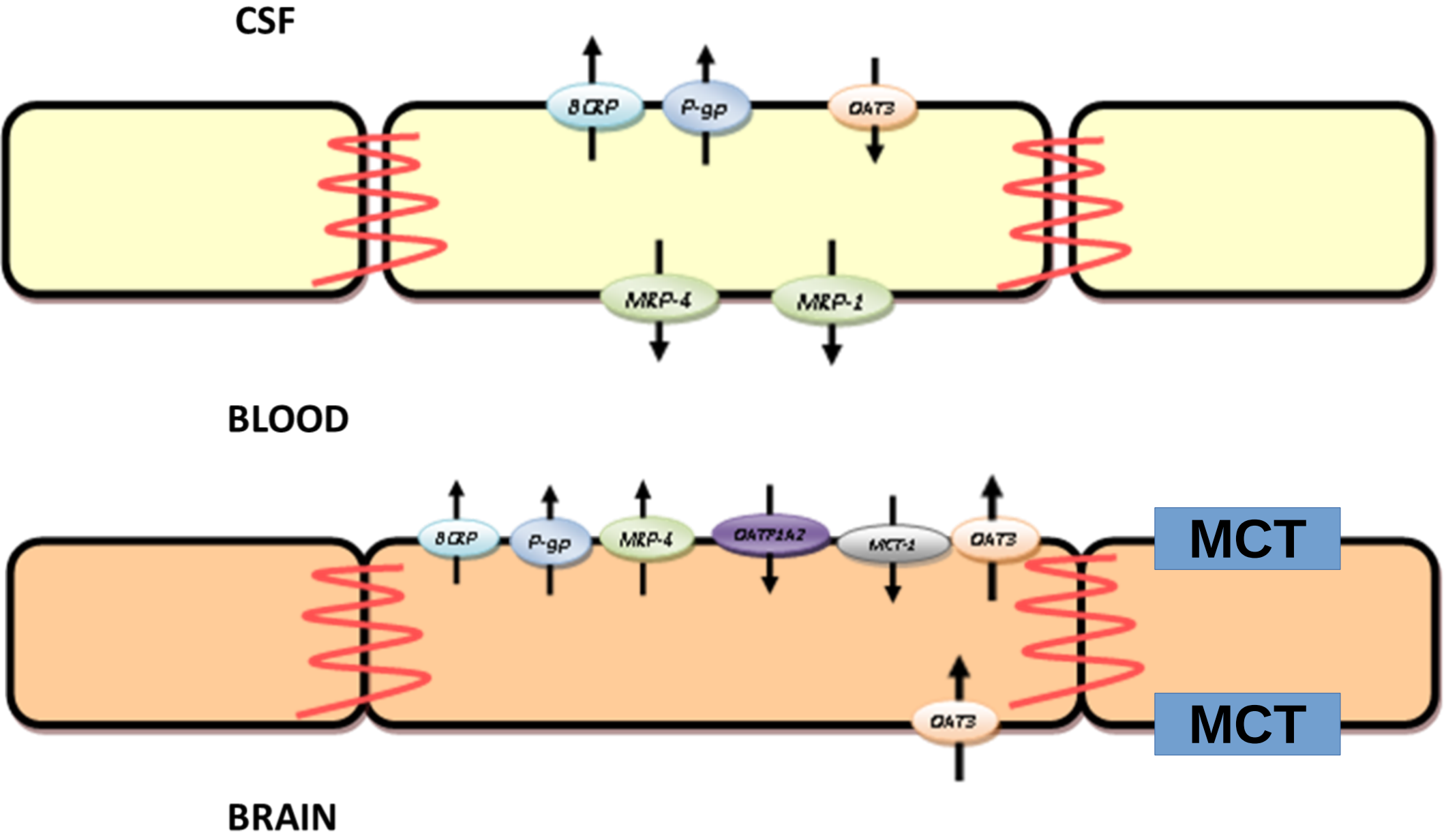
The Blood Brain Barrier



Blood Brain Barrier



BBB: Most molecules require specific proteins to cross

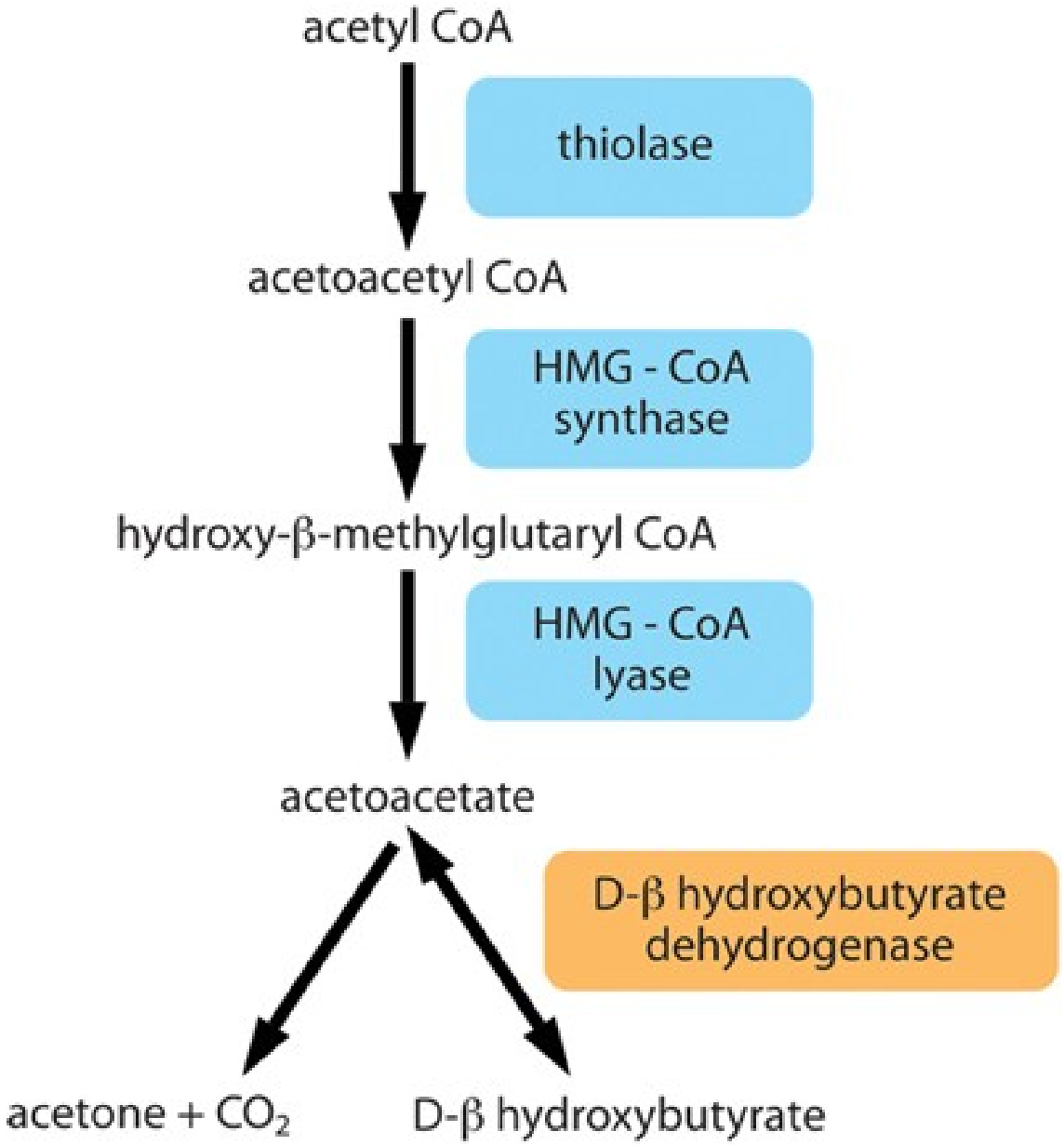


Fatty Acid transporter are limited in capillary endothelium of Brain

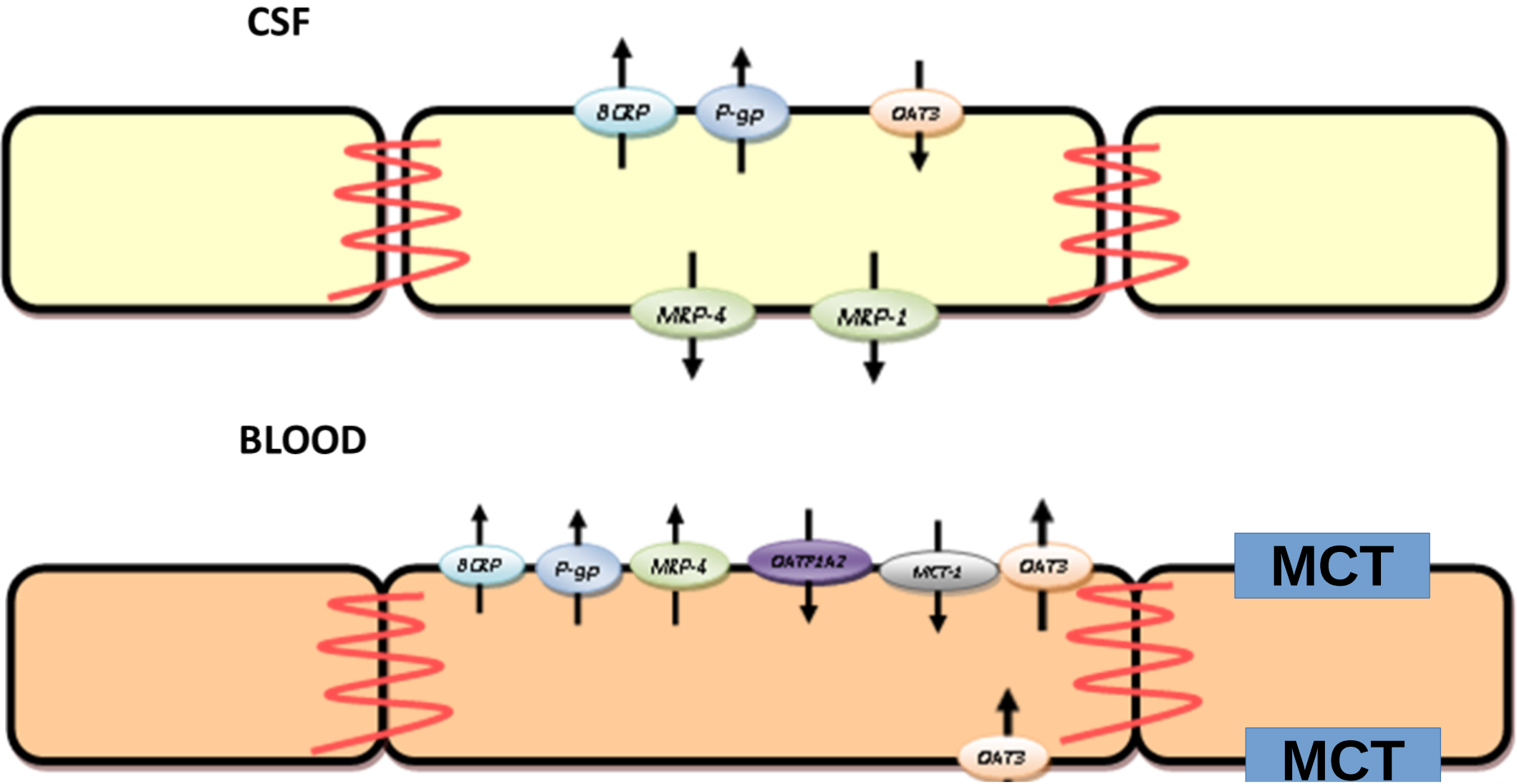
Fatty Acid enter slowly in brain

Brain suffer from ATP deficiency if dependent on Fatty acid

But Liver comes to help Brain

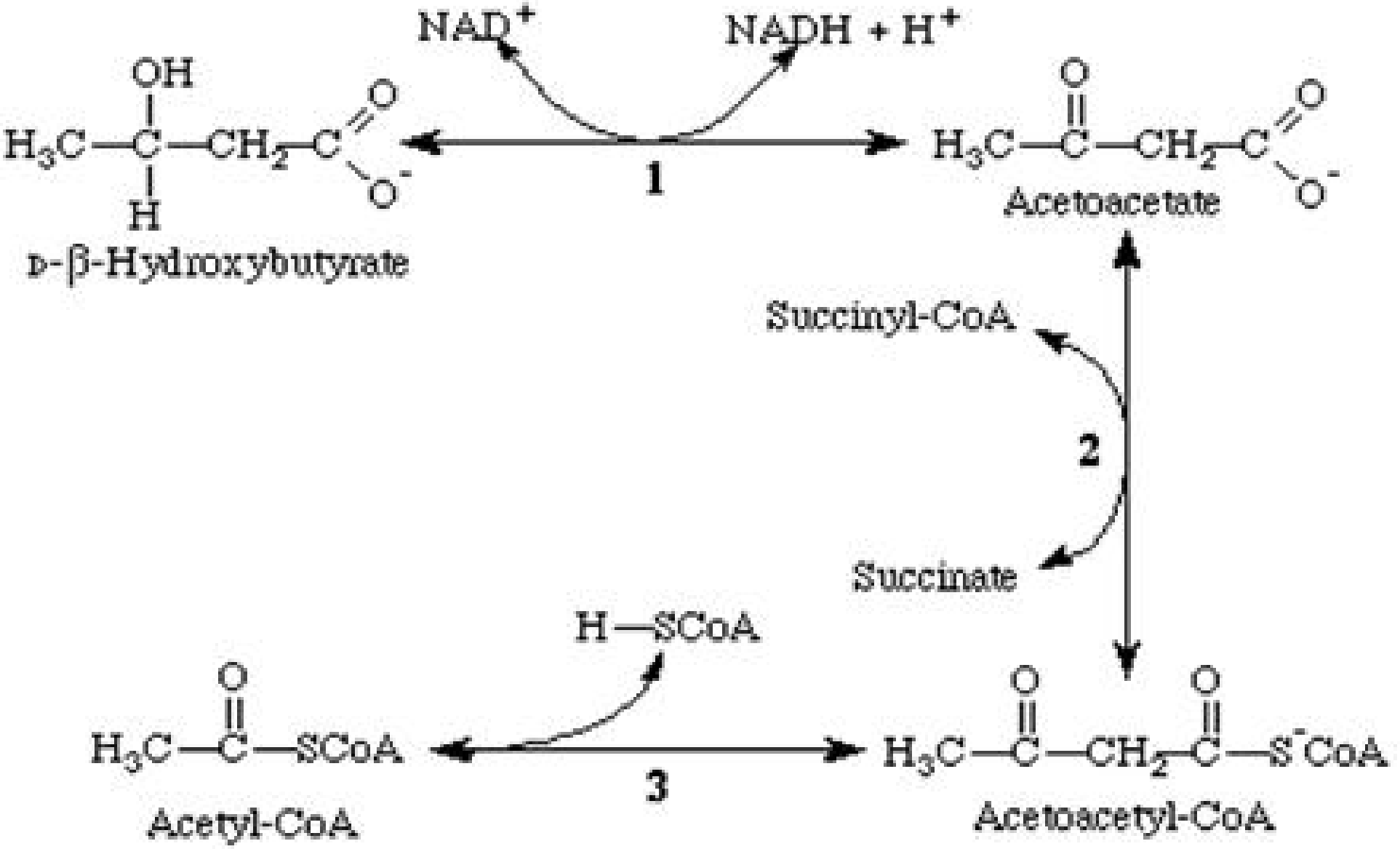


Keton bodies cross via MCT



Monocarboxylic acid transporter

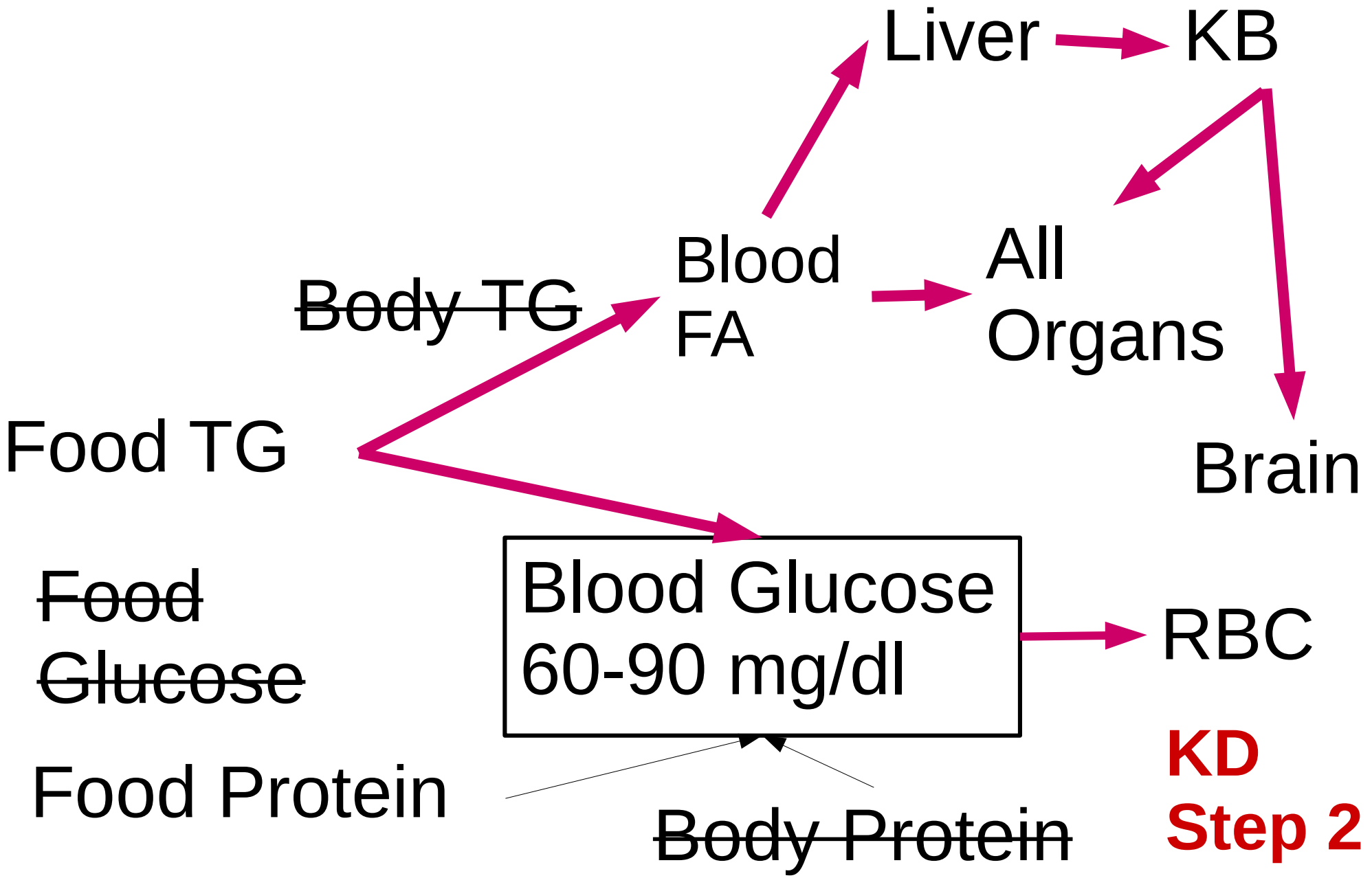
Ketone bodies used by brain / most cells



Fatty Acid vs KB

Fatty Acid	Ketone Bodies
Water insoluble	Water Soluble
Low capacity transport	High capacity transport
Low speed to cross BBB	Repid transport across BBB via MCT

Metabolism with high F, low C diet



Ketone bodies formation and use

is

most important difference

between

Usual diet

and

Low Carb-High Fat Diet

Knowledge is nothing but jumping from answerable questions to new unanswerable questions