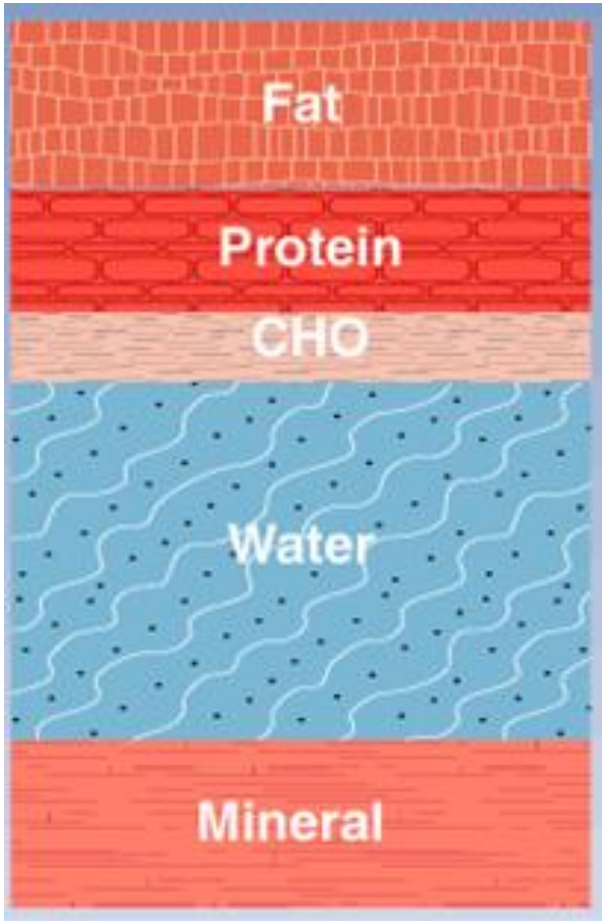
Principles of obesity Physiology

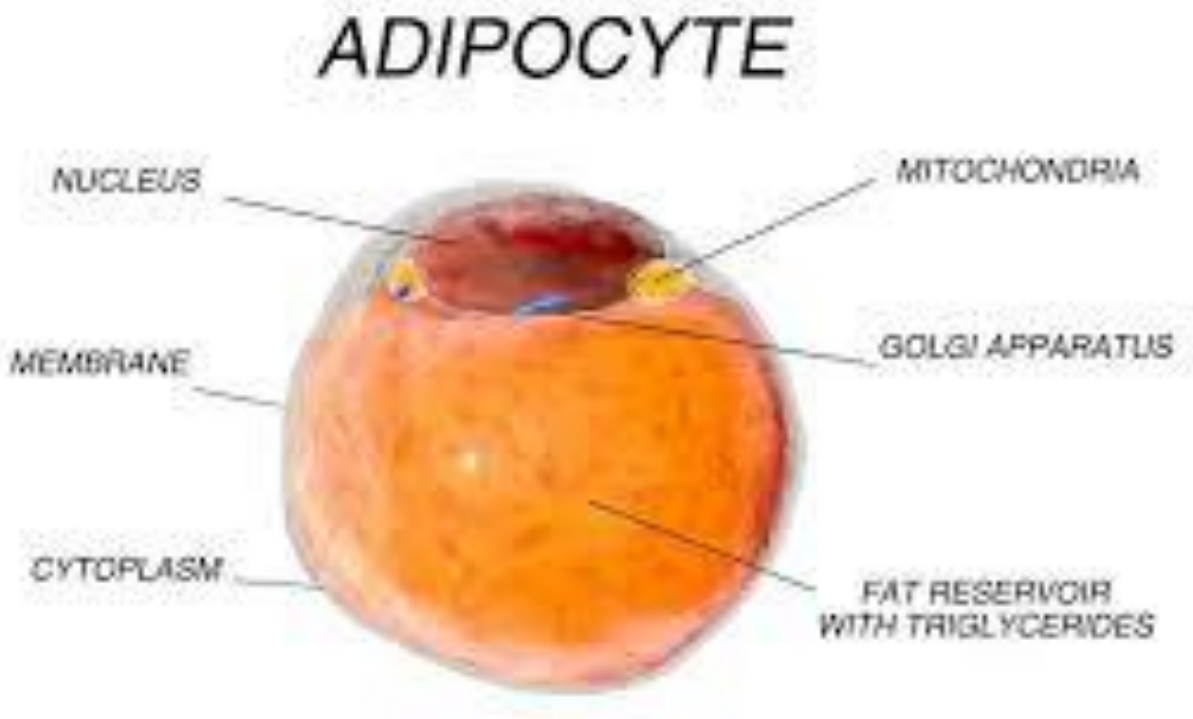
مرکز پزشکی آموزشی و درمانی
آیت الله طالقانی

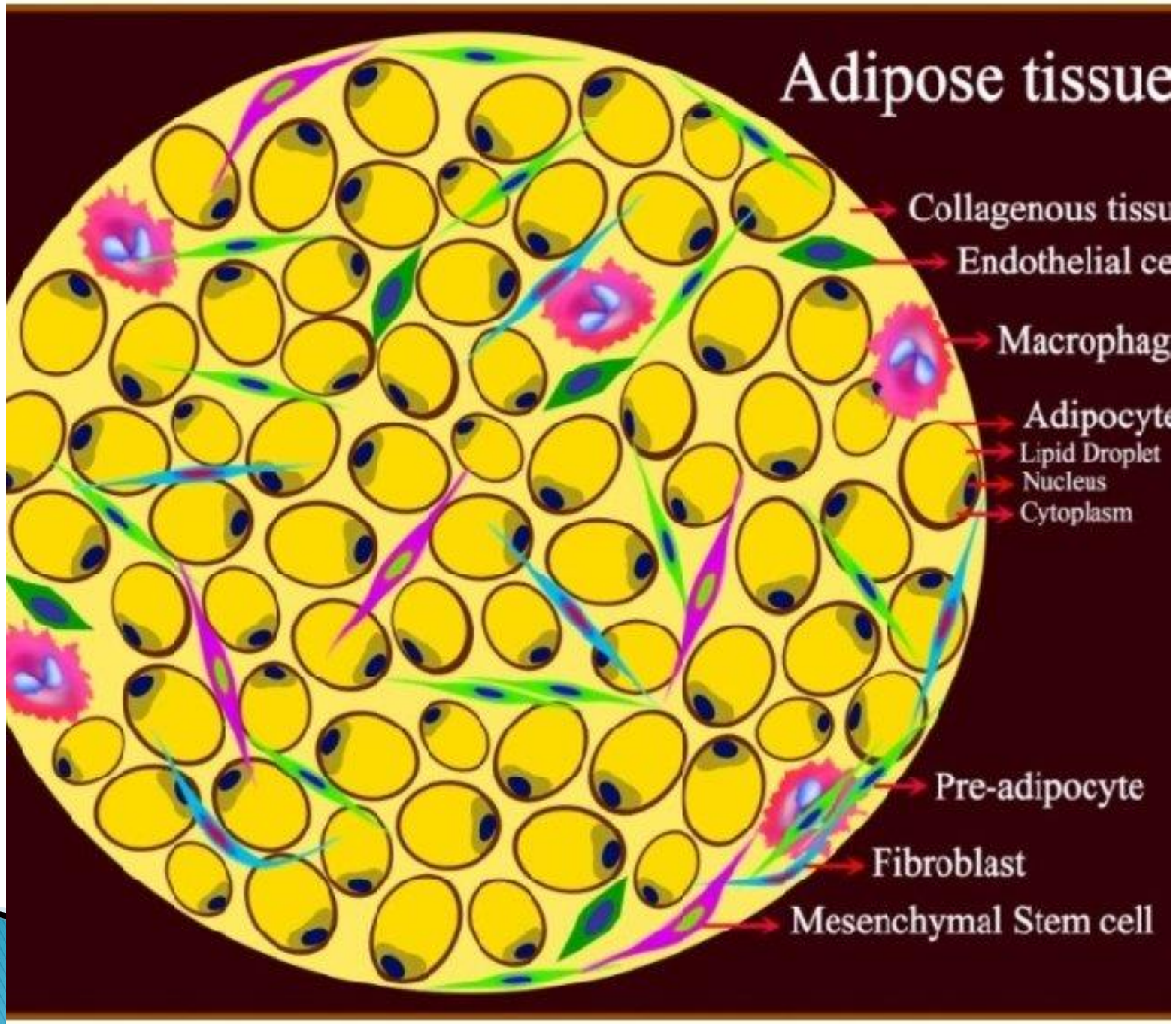
دکتر امیر حسین عابدی یکتا
متخصص پزشکی ورزشی
هیات علمی دانشگاه علوم
پزشکی شهید بهشتی

Body component



Adipose cells




Adipose tissue
Collagenous tissu
Endothelial ce
Macrophag
Adipocyte
Lipid Droplet
Nucleus
Cytoplasm
Pre-adipocyte
Fibroblast
Mesenchymal Stem cell

Ways of excretion ?

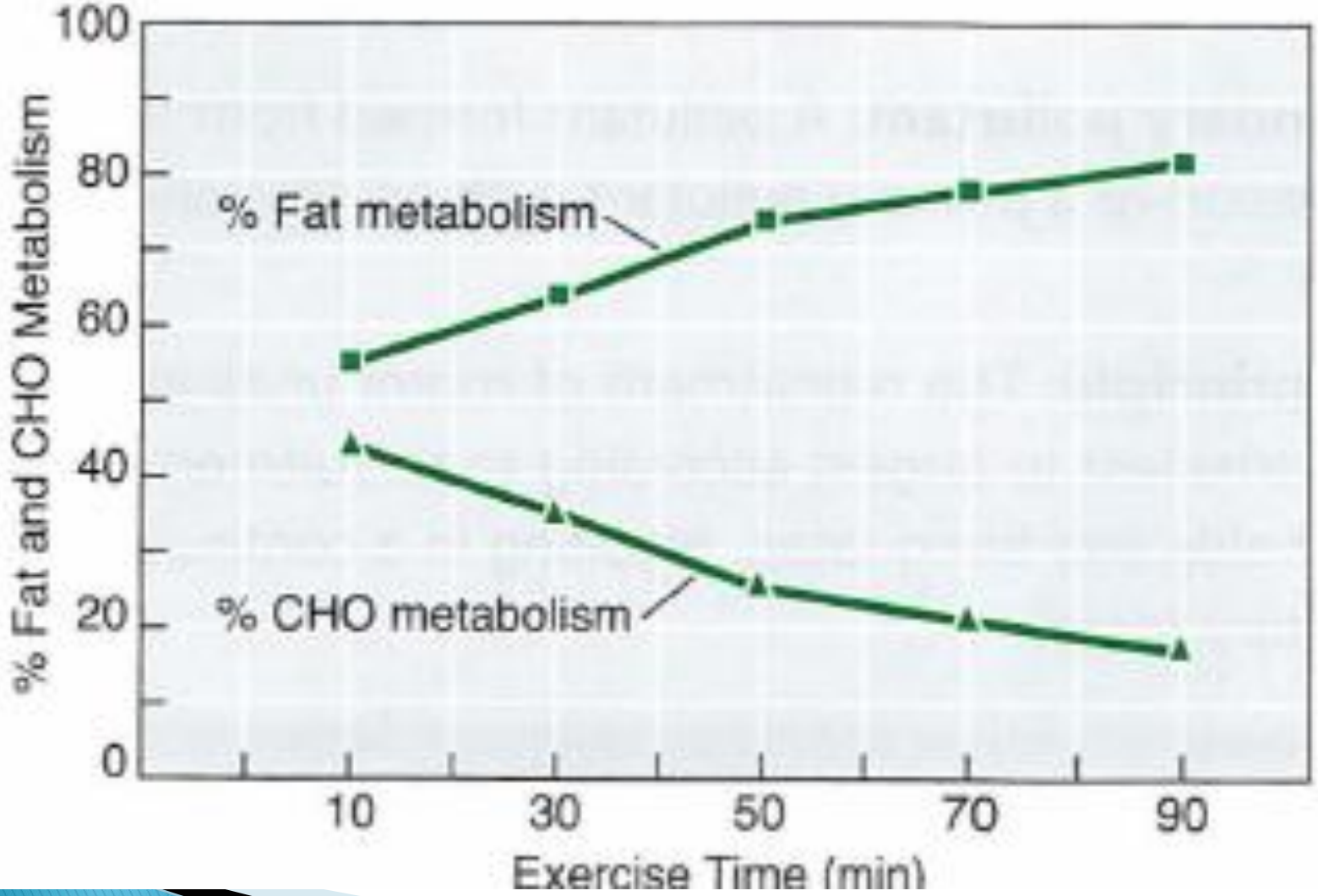
Only way is negative energy balance

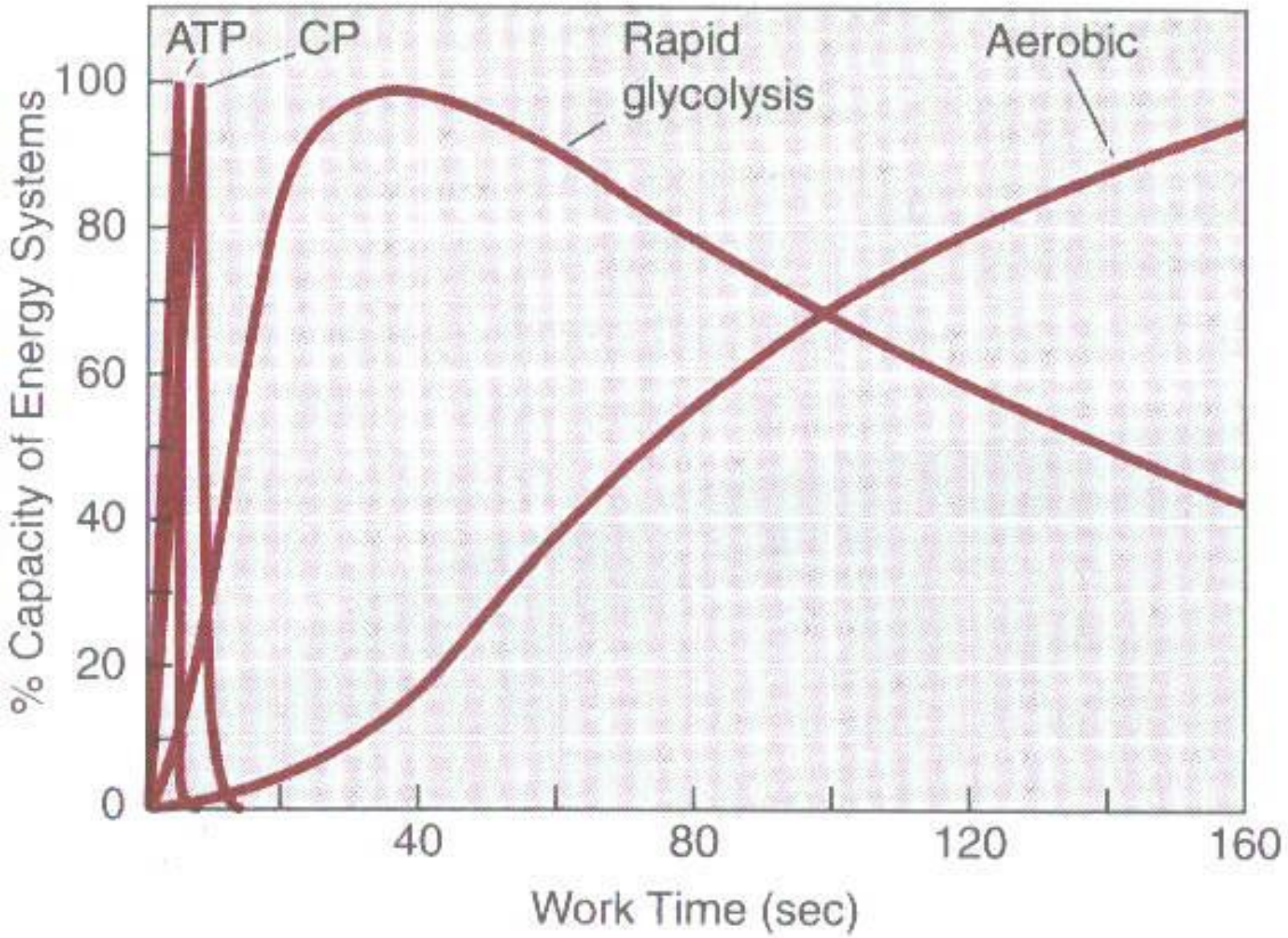
Fundamental of exercise metabolism

- At rest for 70 Kg human has a energy expenditure of about 1.2 Kcal/min
- <20% total energy for musculoskeletal
- During intense exercise ,total energy expenditure increase to 15 to 25 time more than resting value (18 to 30 Kcal/min)

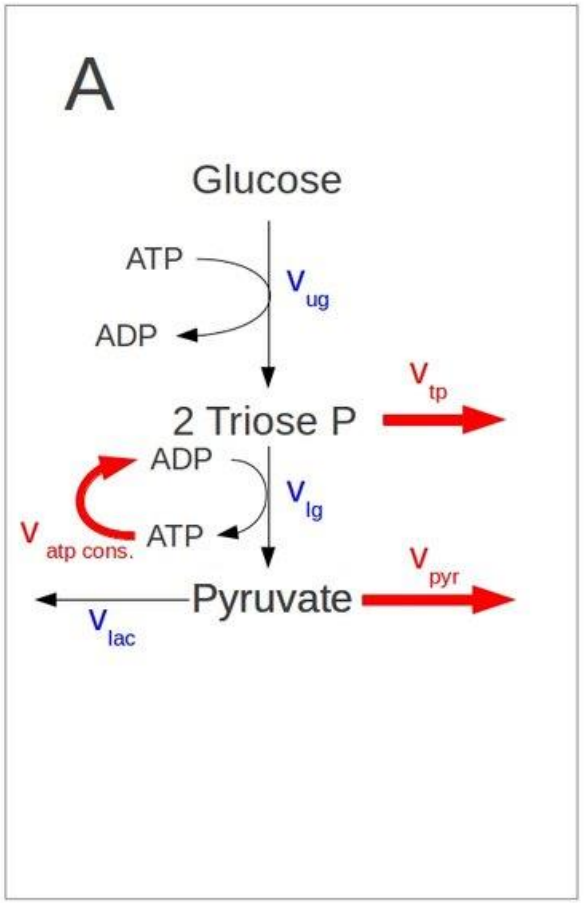
Substrate

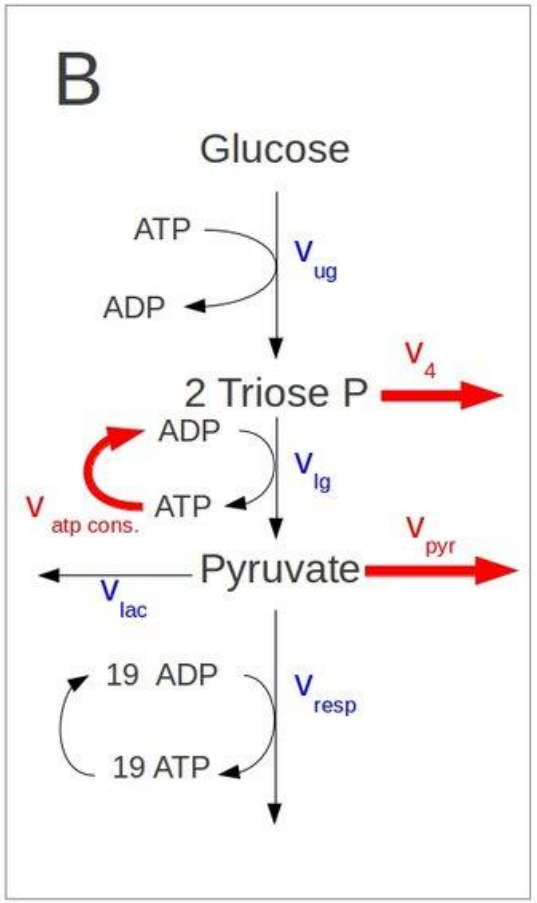
- CHO is only fuel in anaerobic systems (CP and glycolysis)
- CHO is a primary fuel in aerobic system
- During prolong exercise of low to moderate intensity and longer than 30 min , a gradual shift from CHO to fat substrate.
- Greatest amount of fat use occur at about 60% of VO_2max.
- Protein can use in aerobic system .


100
80
60
40
20
0
% Fat and CHO Metabolism
% Fat metabolism
% CHO metabolism
10
30
50
70
90
Exercise Time (min)

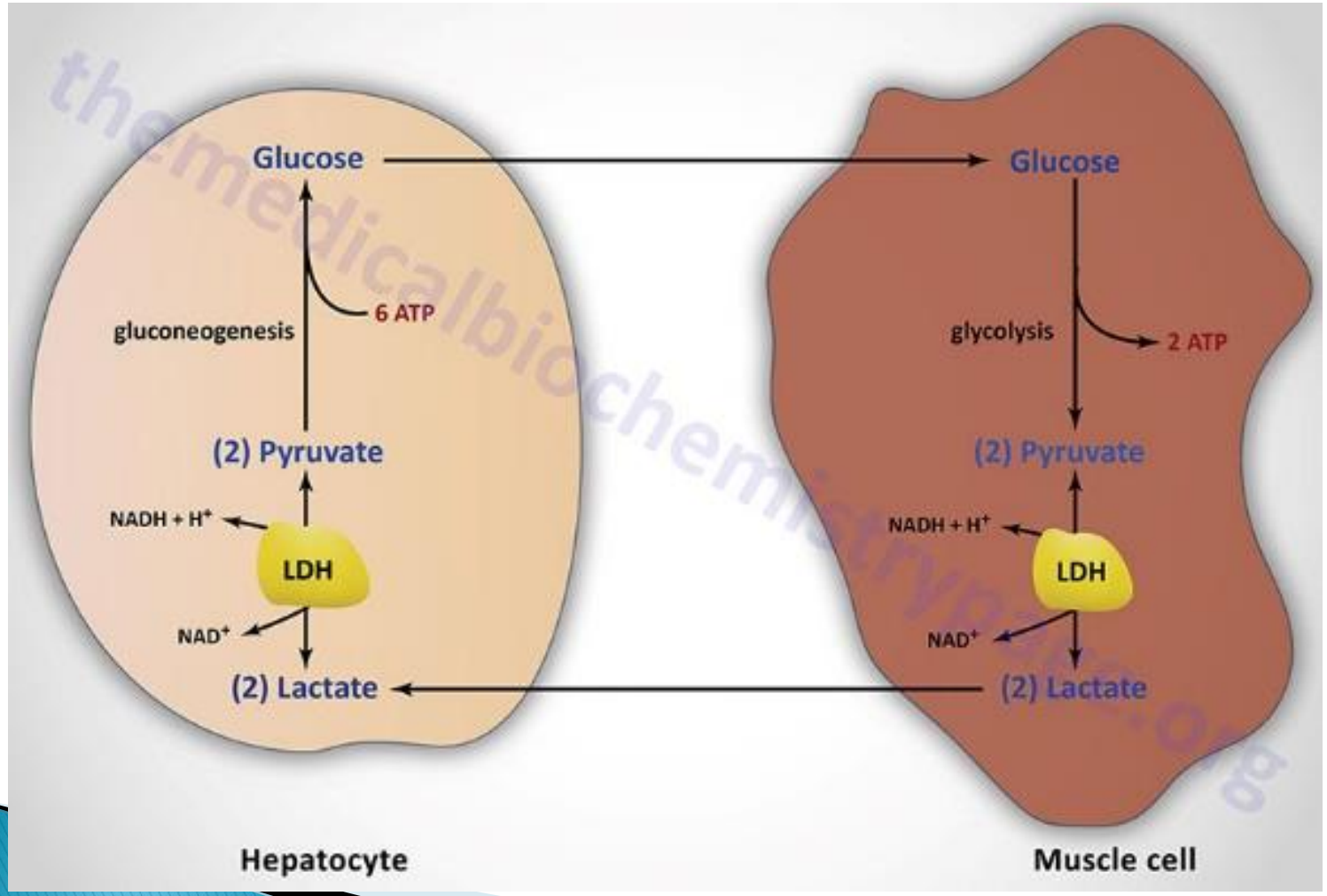

ATP
CP
Rapid glycolysis
Aerobic
% Capacity of Energy Systems
100
80
60
40
20
0
40
80
120
160
Work Time (sec)

Anaerobic glycolysis

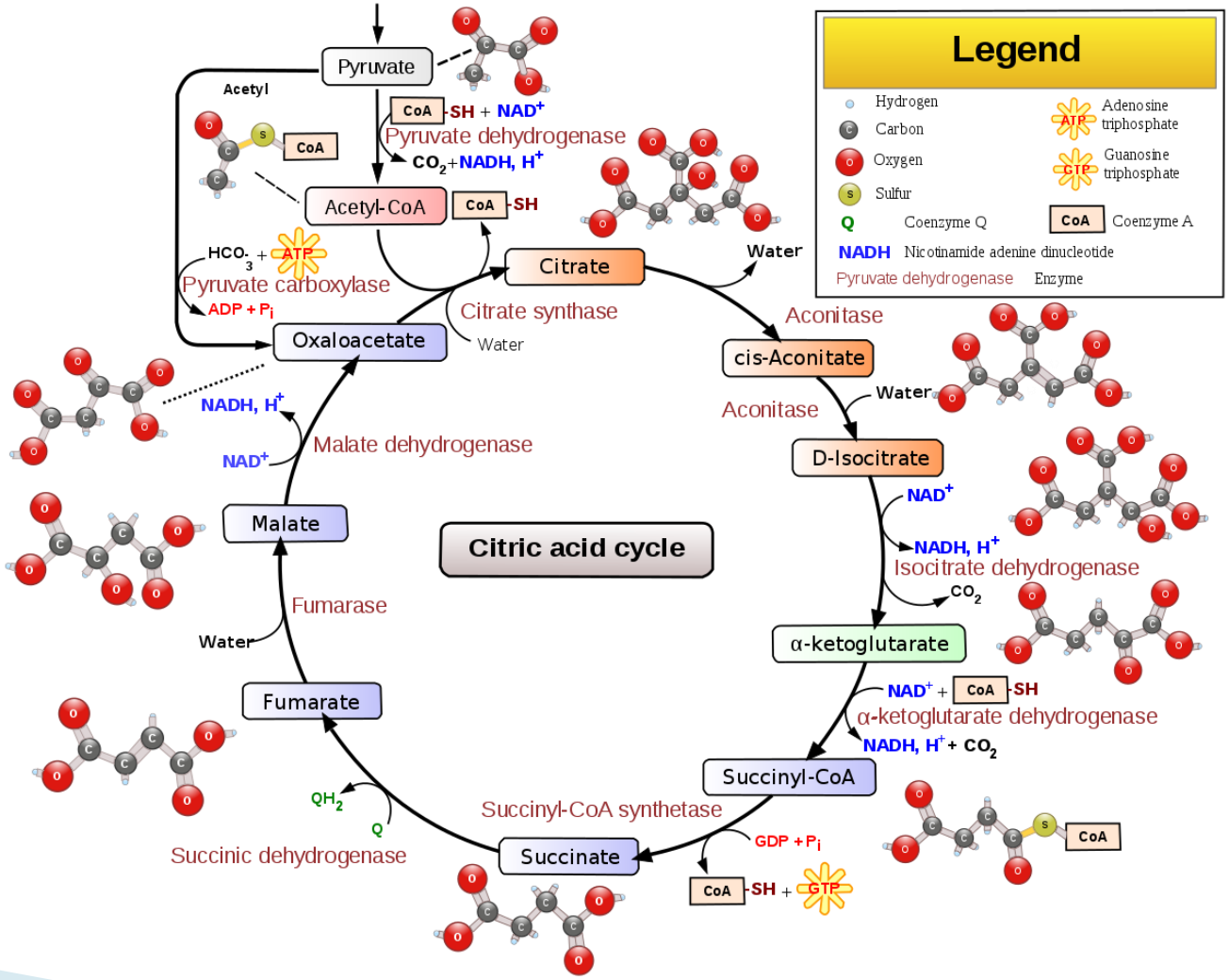




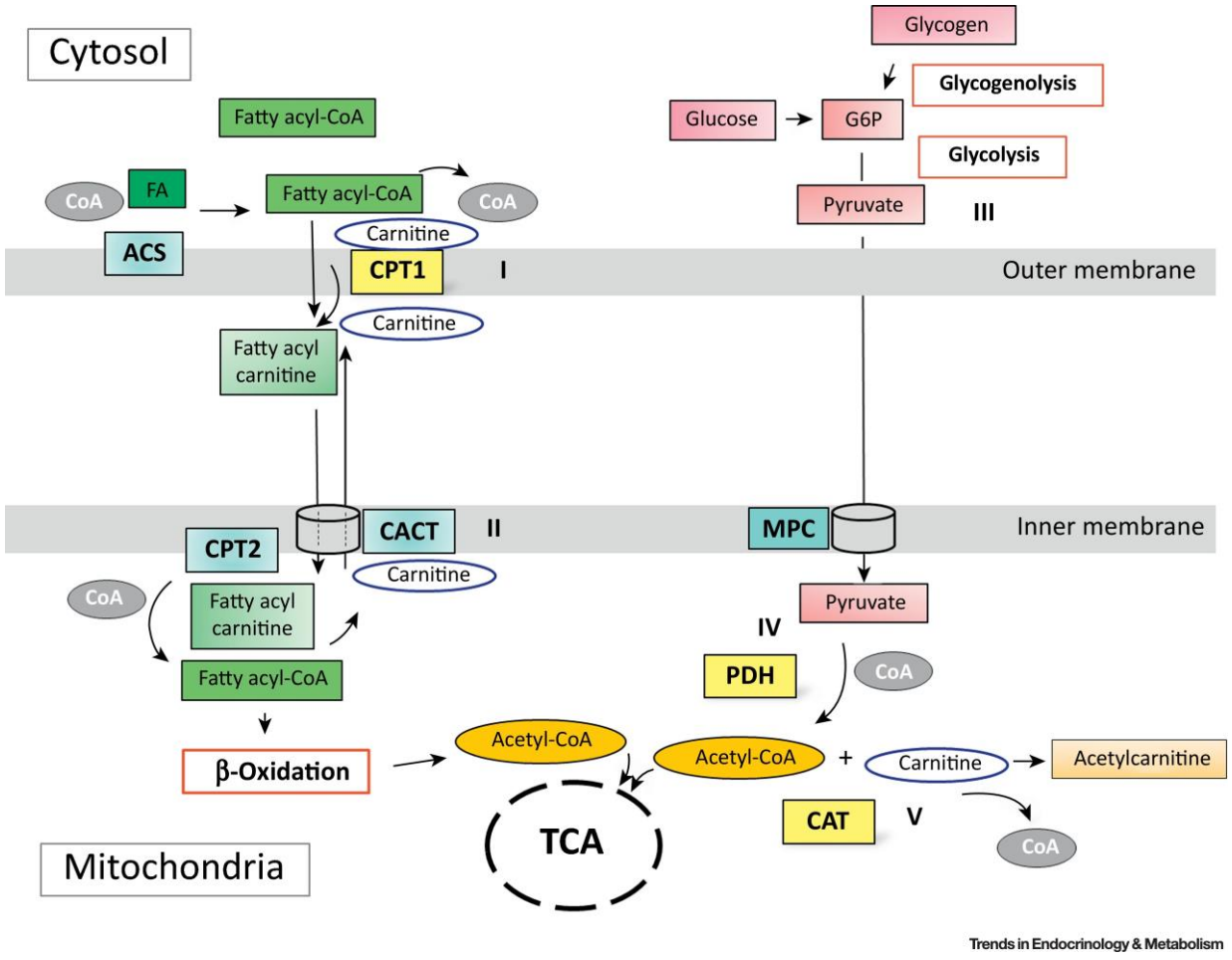
gluconeogenesis



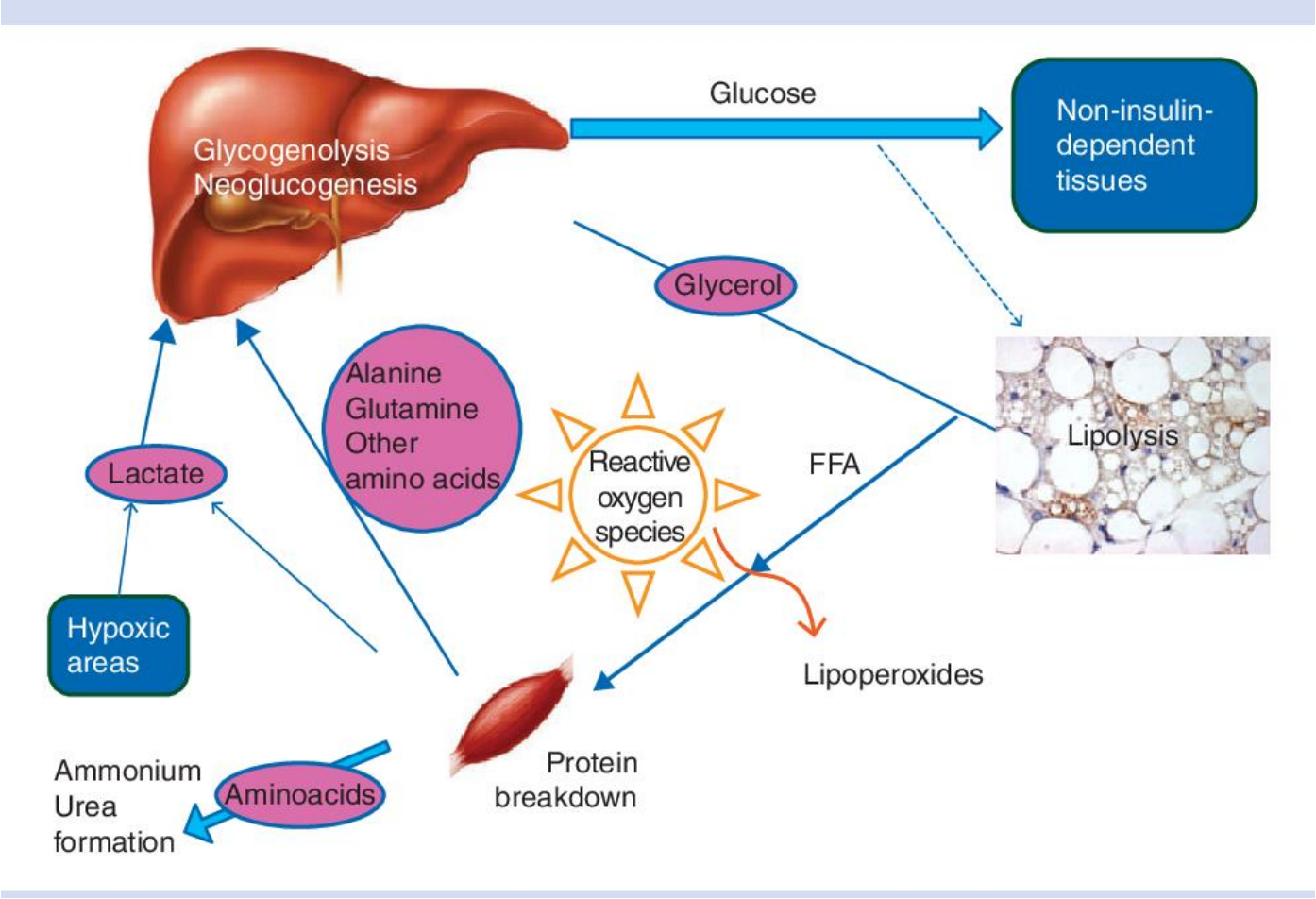
Krebs cycle


Legend
Hydrogen
Carbon
Oxygen
Sulfur
Coenzyme Q
Nicotinamide adenine dinucleotide
Enzyme
Adenosine triphosphate
Guanosine triphosphate
Coenzyme A
Pyruvate
Acetyl
CoA
Pyruvate dehydrogenase
Acetyl-CoA
Citrate
Water
Pyruvate carboxylase
Citrate synthase
Oxaloacetate
Aconitase
cis-Aconitate
D-Isocitrate
Malate dehydrogenase
Malate
Citric acid cycle
Isocitrate dehydrogenase
Fumarase
α-ketoglutarate
α-ketoglutarate dehydrogenase
Fumarate
Succinyl-CoA
Succinyl-CoA synthetase
Succinic dehydrogenase
Succinate

Beta oxidation



Neoglucogenesis



Transition from rest to exercise

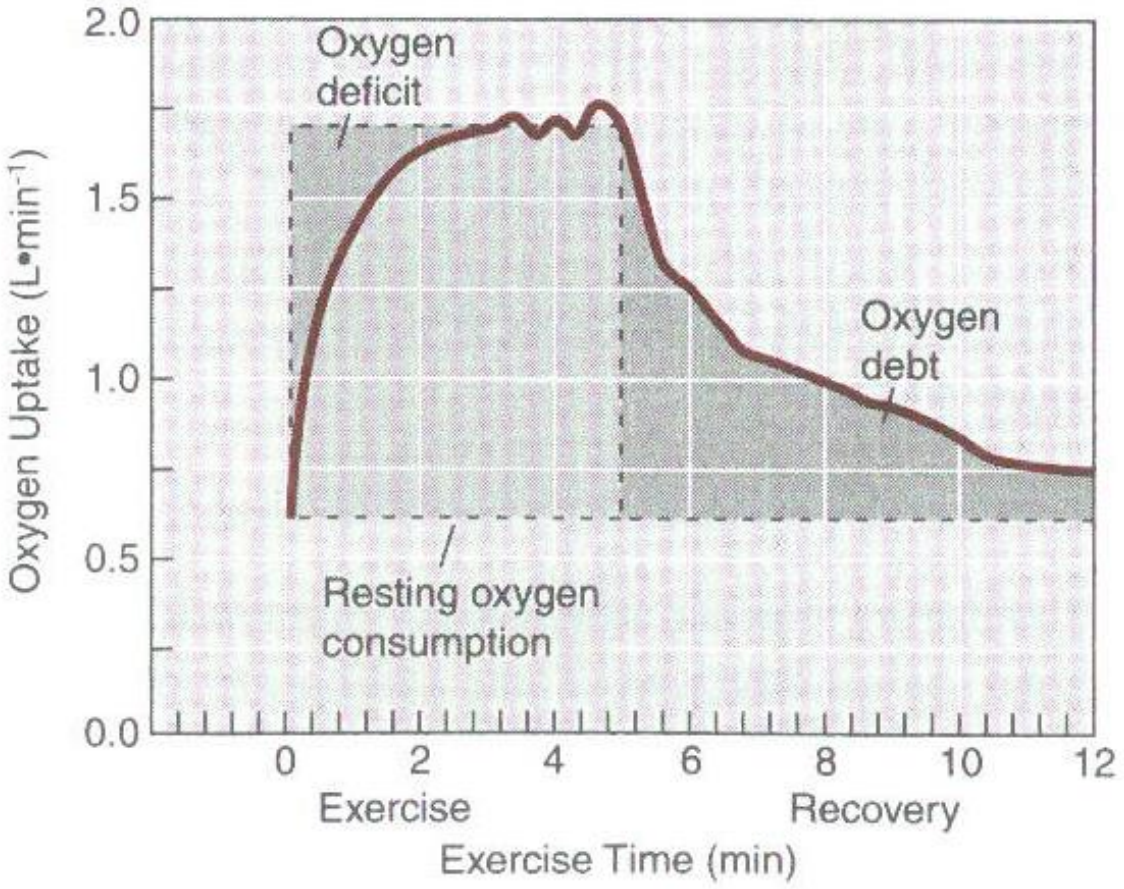


FIGURE 3-5. Oxygen uptake dynamics at onset and offset of exercise. See text for details.