Metabolic Interelationship of Tissue in Stress or Injury Condition

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Introduction

- **Stress** is the consequence of the failure to adapt to change.
- It is the condition that results when person-environment transactions lead the individual to perceive a discrepancy, whether real or not, between the demands of a situation and the resources of the person's biological, psychological or social systems.
- In medical terms, stress is the disruption of homeostasis through physical or psychological stimuli. Stressful stimuli can be mental, physiological, anatomical or physical reactions.

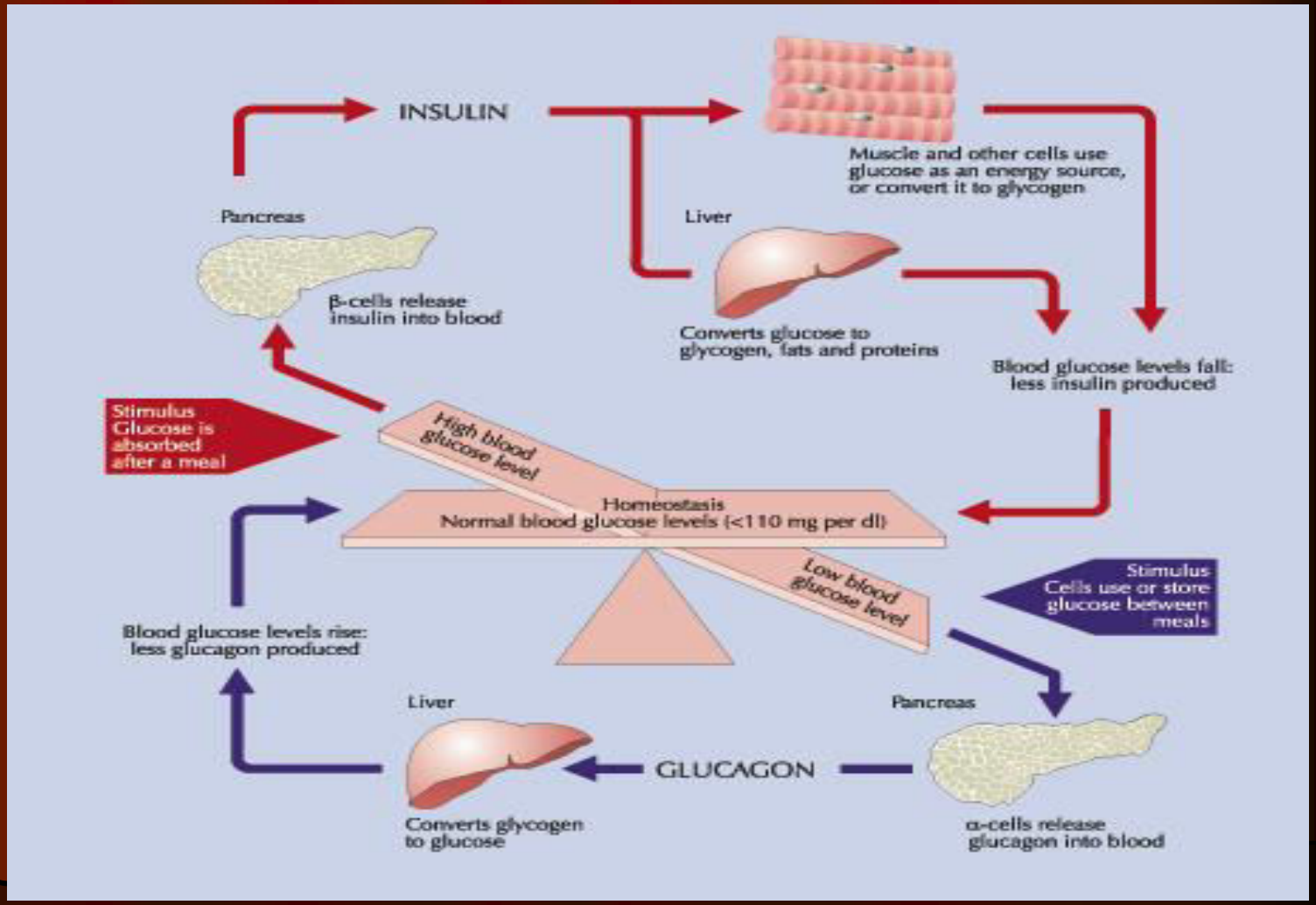
Stress

Common factors of stress

Both negative and positive stressors can lead to stress. Some common categories and examples of stressors include:

- Sensory: pain, bright light
- Life events: birth and deaths, marriage, and divorce
- Responsibilities: lack of money, unemployment
- Work/study: exams, project deadlines, and group projects
- Personal relationships: conflict, deception
- Lifestyle: heavy drinking, insufficient sleep
- Environmental: Lack of control over environmental circumstances, such as food, housing, health, freedom, or mobility
- Social: Struggles with conspecific individuals and social defeat can be potent sources of chronic stresses
- Adverse experiences during development (e.g. prenatal exposure to maternal stress poor attachment histories, sexual abuse) are thought to contribute to deficits in the maturity of an individual's stress response systems.

Metabolic Interelationship of Carbohydrate



Metabolic Interelationship of Carbohydrate

- In Injury or Stress

  When we in the stress or injury condition, our insulin resistance apparent it because it wil be increased in blood cortisol, glucagon, catecholamines, and growth hormone. Thus, the glucose that usually use to change energy in metabolism can't occur. So, our body use fat oxidation to get the energy.

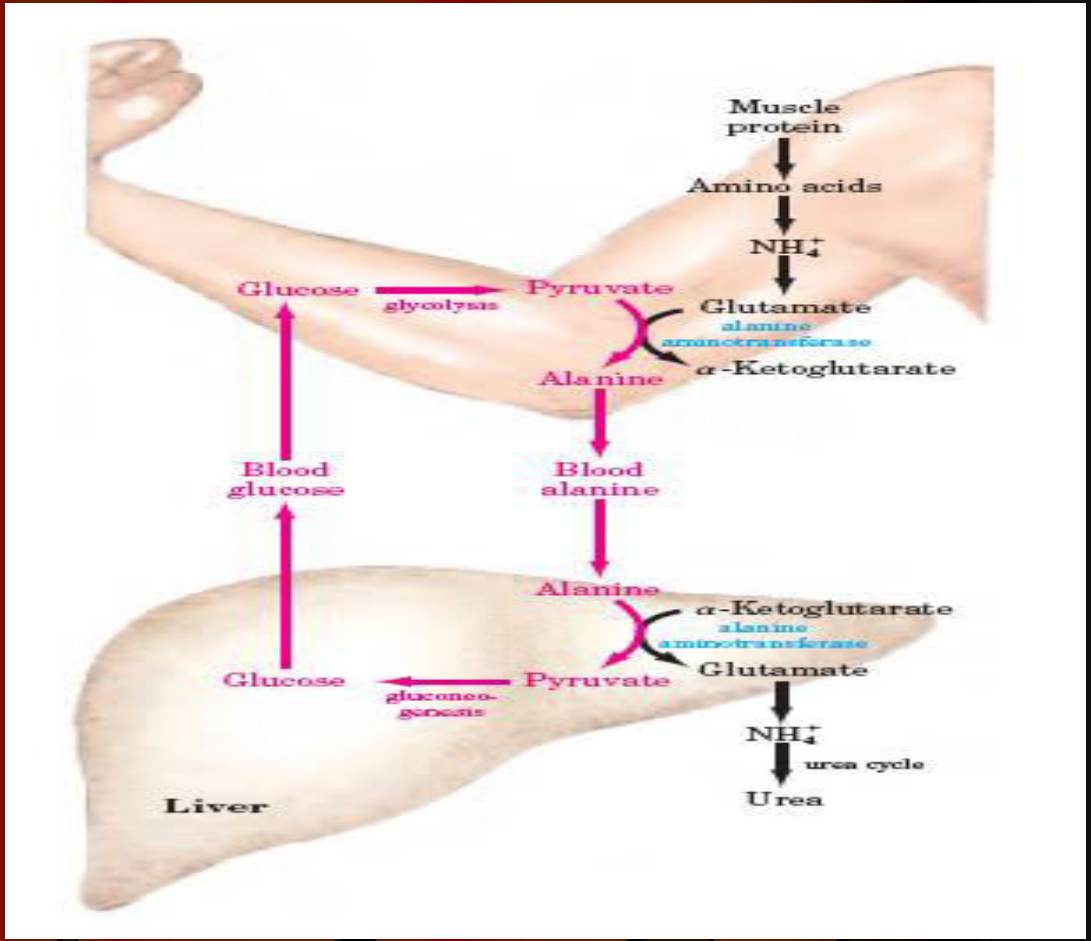
- Insulin resistance

  Peripheral insulin resistance means that insulin is less effective at mediating the uptake of blood glucose by muscle cells. In the liver, insulin fails to suppress the production of new glucose and the breakdown of glycogen. Thus, insulin resistance tips the glucose homeostasis towards high blood sugar levels (diabetes →hyperglycaemia).

Metabolic Interelationship of Protein

GLUCOGENIC AMINO ACID

1. **Protein** in muscle tissue may break down to supply amino acids (alanin).
2. The amino acids are transported into liver (**Gluconeogenesis** occurs mainly in **liver**)
3. Some alanin are catabolized to pyruvate, oxaloacetate, or precursors of glucose

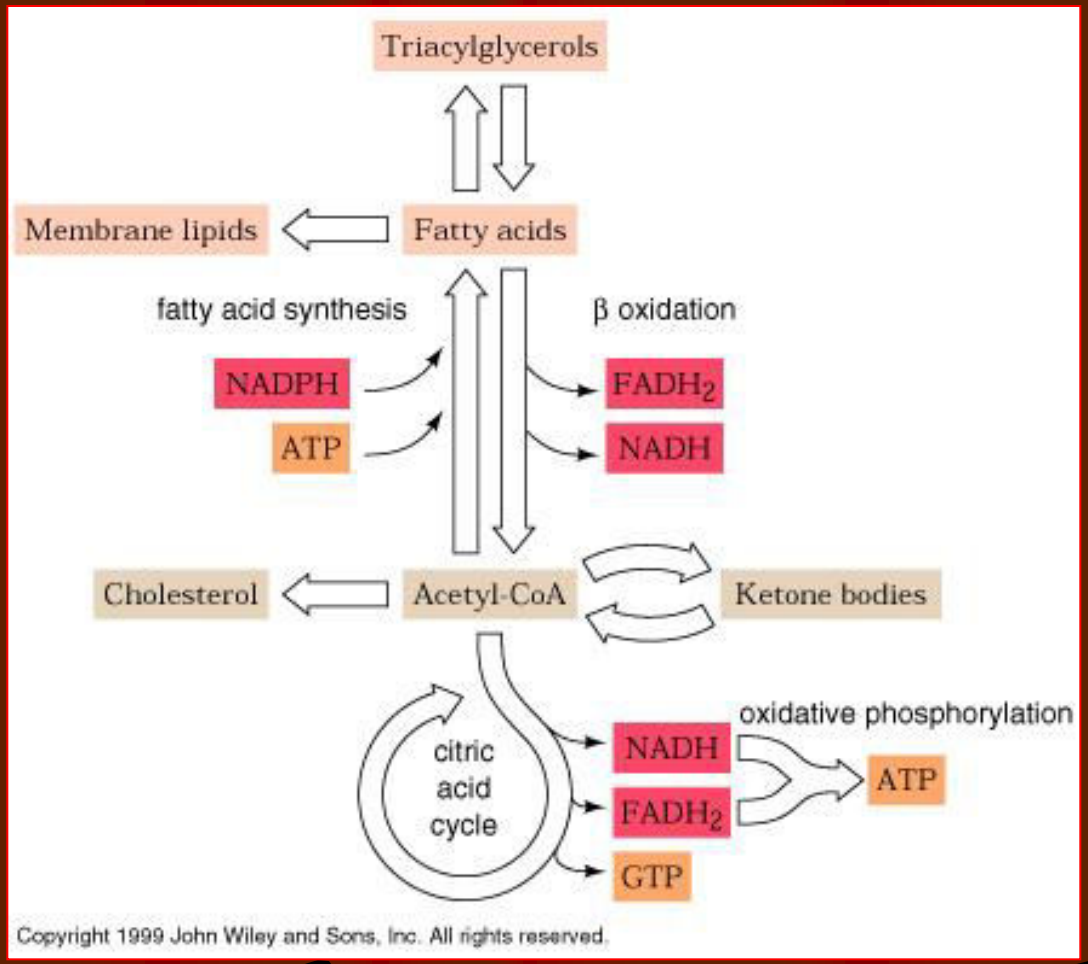


Gluconeogenesis from amino acid (alanin) occuring in fasting state

Metabolic Interelationship of Protein

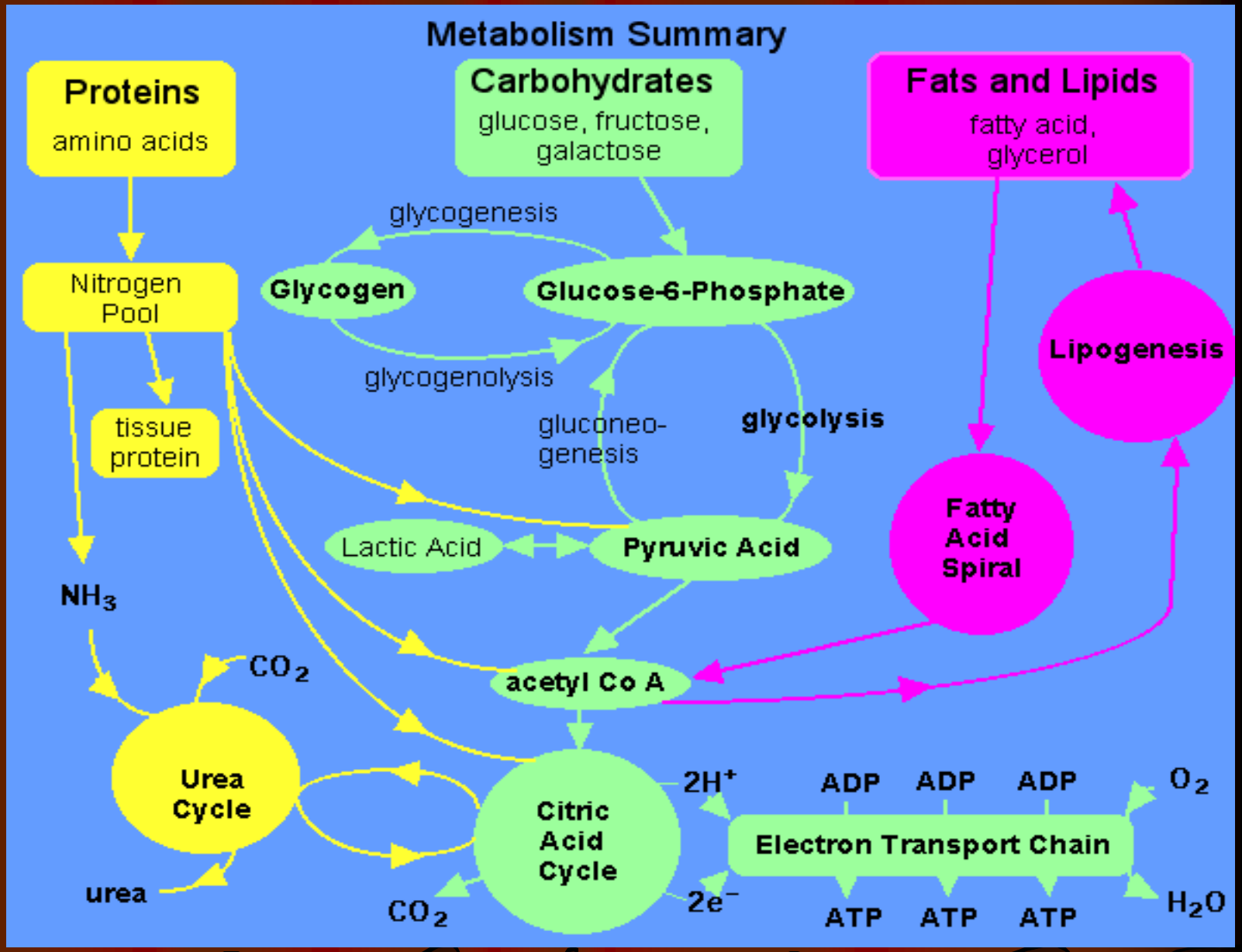
- In stress or injury condition, muscle tissue occur catabolic reaction, protein breakdown to amino acid and then secrete alanine.
- Futhermore, from citric acid cycle, alanine release pyruvate and acetyl Co-A to form glucose and energy (from citric acid cycle).

Metabolic Interelationship of Lipid



Metabolic Interelationship of Lipid

- In injury or stress, our body use fat oxidation to get the energy.
- The source of fat comes from adipose tissue, soon it will be changed to fatty acid.
- In liver, fatty acid will be converted to glycogen and secrete ketons body. This process called ketogenesis.
- The accumulation of ketons body in human body called ketosis.


Metabolism Summary
Proteins
amino acids
Carbohydrates
glucose, fructose, galactose
Fats and Lipids
fatty acid, glycerol
glycogenesis
Nitrogen Pool
Glycogen
Glucose-6-Phosphate
Lipogenesis
glycogenolysis
tissue protein
gluconeo-genesis
glycolysis
Fatty Acid Spiral
Lactic Acid
Pyruvic Acid
NH3
CO2
acetyl Co A
Urea Cycle
Citric Acid Cycle
2H+
ADP ADP ADP
O2
Electron Transport Chain
urea
CO2
2e−
ATP ATP ATP
H2O

Conclusion

- In stress or injury condition, the source of energy comes from lipid and protein metabolism.
- In stress or injury condition, glycolysis can’t occur because insulin resistance apparent.
- So, it can cause diabetes, hyperglycemia, and glycosuria.

References

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Thanks