Fat: An Important Energy Source during Exercise

Outline

Function

Needs

Metabolism

RER

High fat diets & fat loading

Periodization

Functions of fats

Functions

Provide structure

To provide essential fatty acids

Provide metabolic regulation

Absorb essential fat-soluble vitamins

Provide energy

Dietary fat: Dietary Reference Intakes

Total fat

An AMDR of 20-35% of daily energy intake

Exercise: 0.8-1.2 (maybe 1.4) g fat/kg/d

Ultra-endurance: up to 3 g fat/kg/d

Essential fat

Omega-6

Omega-3

Metabolism of fat

Absorption of lipids

Once in the body

Circulate as chylomicrons

Muscle and fat cells take up FFA and store as TAGs

Intramyocellular triacylglycerol (IMTG)

Glycerol -> liver for glucose

Energy stored in body as fat

Fat energy storage is anhydrous

80,000 to 100,000 Calories in adipocytes

2,500-2,800 fat Calories stored in the muscle cells

How can we force our body to burn fat?

Why can’t we burn all our fat stores?

FFA use during exercise

Oxidation of Carbohydrates, Proteins, and Fats

Fat oxidation inversely related to intensity

Energy Expenditure and Fuel Utilization

RER for Fat (Palmitate)

 Suggested limiting factors to fat oxidation during ex

Inadequate FFA mobilization from adipose tissue

Limited transport of FFA into the muscle cell

Suboptimal metabolism of intramuscular FFA

Increased carbohydrate oxidation may inhibit fat oxidation

Aerobic ex & fat utilization

Aerobically fit people are better fat burners

Increased blood flow and capillarization to muscle

Increased IMTG storage

Increased sensitivity of muscle and adipose cells to epinephrine

Increased FFA transporters on myocytes

Increased number and size of mitochondria

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High fat diets and exercise performance

Results in increase FA oxidation: “Train low compete high”

May result in longer duration (but may not)

Time to exhaustion vs. time for a given distance

Think specificity of training

Effective as part of CHO loading