

Myths of Carbs, Fats and Proteins

Brown Bag Lecture Series

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Bioenergetics

Defined: Convert food (potential energy) through a chemical process into mechanical energy (kinetic energy)

Energy for Cellular Metabolism

- Carbohydrate, fats, and protein: Provides fuel that our bodies convert to ATP
- Energy: Carbohydrate and protein provides about 4.1 kcal/g while fat provides about 9.4 kcal/g
- Accessibility: Carbohydrate energy is more accessible to the muscles than protein or fat

Carbohydrate

Fuel Source: Readily available (if included in diet) and easily metabolized by muscles

Storage: Limited to liver and muscle in the form of glycogen

Fat

Fuel Source: Provides substantial energy at rest and during prolonged, low-intensity activity

Storage: Body stores of fat are larger than carbohydrate reserves

Limitation: Fat is limited as an energy source by its rate of energy release

Protein

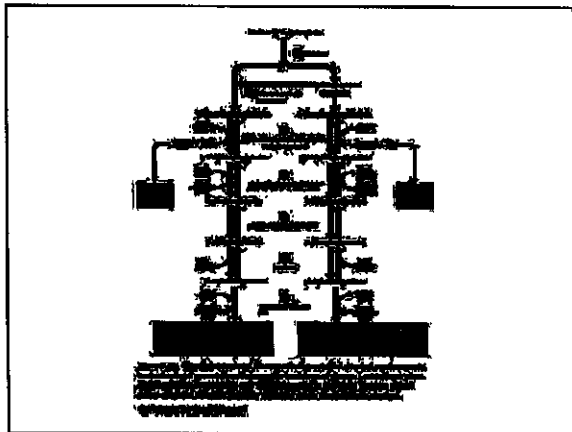
Fuel Source: Can be used as an energy source

Energy System Order of Involvement

1. Phosphagen System – Very high intensity and/or immediate movement
2. Glycolysis – High intensity-several minutes at submaximal effort
3. Oxidative System – Long periods of time (e.g. life)

Hydrolysis of ATP

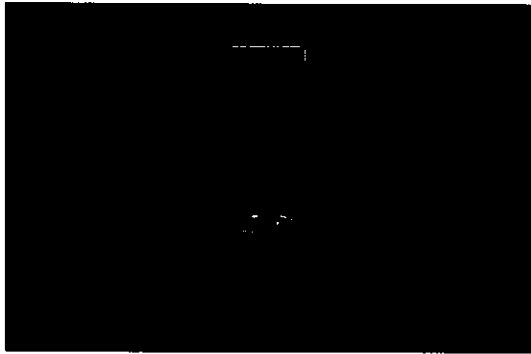




**KREBS
CYCLE**



METABOLISM OF FAT



Carbs and the Body

Primarily serve as energy source

Once storage is reached through diet, excess converted to fat or excreted

- Between 1500 – 2500 kcal (~2000) available

Protein sparer: Preserves protein

Starvation causes glucose depletion and in turn fat/protein energy usage increases ultimately lowering protein content

Carbs and Fat Catabolism

Carbs are a primer for fat catabolism

Low carbohydrate catabolism (transport to cell:
diabetes or depletion: starvation-exercise)
increases fat mobilization

Fat mobilization doesn't lead to fat oxidation

Ketone bodies are produced

- Defined: By-products of incomplete fat breakdown which
increase acid in blood (ketosis)

Carbs and Exercise

Primary and preferred energy source for early
unset exercise and during increased intensity

Carb availability dictates its use

Provides energy 2x faster than protein/fat

Carb per unit of oxygen consumed generates
6% more energy than fat

Fat and the Body

During rest about 60% energy comes from fat

Ideal fuel for prolonged activity

Provides ~ 9 kcal per gram fat

Young males 15% BF and females 25% BF

How much energy?

e.g. 80 kg man @ 15%

> 108,000 kcal = 12,000 grams x 9.0 kcal/g

Training your Fat

Regular training enhances the ability to oxidize fat during mild and moderate exercise

Proteins and the Body

Greek: means "Prime Importance"

Average adult ~10-15% of body mass is protein

- ~10-12 kg protein
- ~ 6-8 kg protein found in skeletal muscle

Average diet ~ 10-15% protein

Body uses little protein during rest (2%) and exercise (~5 to 10%)

Recommendation for Protein

Excess protein does not increase muscle mass

Recommendation

- 18-65 y.o. = 0.83 g protein/kg body mass/day
- Infants/growing children = 2-4 g/kg/day
- Pregnant women increase by 20 g/day
- Nursing mothers increase by 10 g/day
- Harding Training & Athletes ~ 1.2-1.8 g/kg/day

How much would a 29 y.o. 80 kg man require?

- 66.4 g/day = 80 kg x 0.83 g/kg/day

Protein and Exercise

Protein is used in its highest state when Carbs are depleted

Exercise mimics starvation

- What does this mean?

(e.g.) Diet and Endurance Exercise

Classic Experiments (3 day diet)

Group 1: Normal calories but (fat & <5% carbs)

Group 2: Recommended Carb, Pro and Fat

Group 3: High Carb (82%)

Muscle biopsy

Group 1: 0.63 g glycogen/100 g wet muscle

Group 2: 1.75 g glycogen/100 g wet muscle

Group 3: 3.75 g glycogen/100 g wet muscle

Exercise

Group 1: 57 minutes to exhaustion

Group 2: 114 minutes to exhaustion

Group 3: 175 minutes to exhaustion (3 x greater than fat)

Conclusion

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