Carbohydrates:  The Main Energy Food p 111-146

Dietary Carbohydrates

One of the most important nutrients for athletic performance is dietary carbohydrate.

Role of CHO?

Sources?

How much do you need?

Types of dietary carbohydrate

Common foods high in carbohydrate

CHO needs

Recommended Dietary Allowance (RDA)

130 grams/day

Acceptable Macronutrient Distribution Range (AMDR)

45-65% of daily energy intake

Exercisers

g CHO/kg

Absorption of Nutrients

Common GI issues

GERD

Rapid transit

Causes

Shunting of blood

Jostling

Postural:

Cycling

Rowing

Dehydration

Fat, protein, fiber & concentrated CHO

The Glycemic Index (GI)

Ranking system

Blood glucose response to consuming 50 grams CHO

GI rating scale

70 or more – High GI foods

69-55 – Medium GI foods

55 or less – Low GI foods

How many servings of carrots provides 50 g CHO

The Glycemic Load (GL)

The glycemic load (GL)

Incorporates portion size

GL = (GI x grams of non-fiber carbohydrate in one serving)/100

High GL foods = GL 20 or more

Medium GL foods = GL 11-19

Low GL foods = GL 10 or less

Glycemic index and glycemic load

Glycemic index and glycemic load

Glycemic index and glycemic load

Regulation of Blood Glucose

Table 4.6 Hormones and glucose metabolism

Insulin and GLUT-4 receptors

Insulin and GLUT-4 receptors

Fates of Blood Glucose Figure 4.6

Carbohydrate storage in the body

Gluconeogenesis Figure 4.8

Carbohydrate importance during exercise

Only fuel that can be used both anaerobically and aerobically

https://www.youtube.com/watch?v=YJdHgtiIKFc

Aerobic exercise training and  carbohydrate metabolism

Increases max

Increases ability to work closer to max

Fuel source to allow for longer duration/higher intensity -> greater adaptations

Glycogen Storage

More glycogen is stored in the muscle

 Glycogen synthase activity

How ~~lactic~~ acid production is related to fatigue

~~Lactic~~ acid production is associated with high-intensity anaerobic exercise

The current thinking is that the dissociated hydrogen ion and increased acidity, ~~not lactate itself~~, is the cause of fatigue

Lactate may be used as fuel during exercise

Lactate shuttles from fast-twitch muscle to oxidative slow-twitch muscle

Lactic acid

C3H6O3

Lactate

C3H5O3

Central fatigue hypothesis

The central fatigue hypothesis

Low muscle glycogen and blood glucose will stimulate gluconeogenesis from protein

BCAA are highly glucogenic

Blood levels of BCAA decline

As BCAA levels drop, free tryptophan (fTRP) increases

A high fTRP:BCAA ratio favors entry of fTRP in the brain

Brain TRP increases serotonin -> fatigue symptoms

Adequate carbohydrate will help prevent the decline in BCAA

BCAA supps?

Start with full stores Eat along the way Eat when done, so you can…

During Ex: strength v. aerobic

Exogenous carbohydrate may be used as an energy source within 5-10 minutes

Depending on concentration ingested

1.0 - 1.5 (1.7) g/min exogenous carbohydrate provided during exercise

After Ex:

Before Ex:

Recommended Guidelines for Carbohydrate Intake

Carbohydrate Intake Between/After Training

Post is an ideal physiological environment for restoring muscle glycogen – why?

Prep for next workout

Rate of glycogen synthesis depends on:

Glucose availability

Transport into cells

Glycogen synthase activity

Carbohydrate consumption after exercise

Strategies:

What?

CHO w/ small amounts of protein

When?

CHO consumption as soon as practical after exercise

Small, frequent CHO-containing meals

High GI foods. See Table 6.1

How much?

1-1.2 g/kg/h immediately

Depending on sport, 5-12+ g CHO/kg/d

Will a high-carbohydrate diet enhance my daily training?

Sport nutritionists generally recommend

5-7 grams of carbohydrate daily for general training

7-10 for endurance athletes

High-carbohydrate diets may help training both physiologically and psychologically

Not all athletes need very high carbohydrate diets; some elite trained endurance athletes may sustain training on lower amounts.

Carbohydrate consumption days prior to competition

Supercompensation

Endurance events

High-intensity intermittent sports

In Practice:

Depends on event: single vs. multiple days

Intake is usually lower than recommendations

Lower for women than for men

Carbohydrate Intake Prior to Competition: Classic Supercompensation

 Modified Carbohydrate Loading