

# The Portuguese food wheel

## A RODA DOS ALIMENTOS



- avoid taking the quantitative approach in the recommendation
  - approximate proportion of food weight for only 5 food group
  - proportion of each food group is expressed in percentage
- *Study - Graca P, 1999 the National Council of Food and Nutrition.*
  - Higher intakes of total fat and saturated fat,
  - lower intakes of fibre/energy and carbohydrates were shared by younger people (40-55 years),
  - higher intakes of total fat, saturated fat, fibre/energy, protein and carbohydrates
  - lower intakes of alcohol by women.

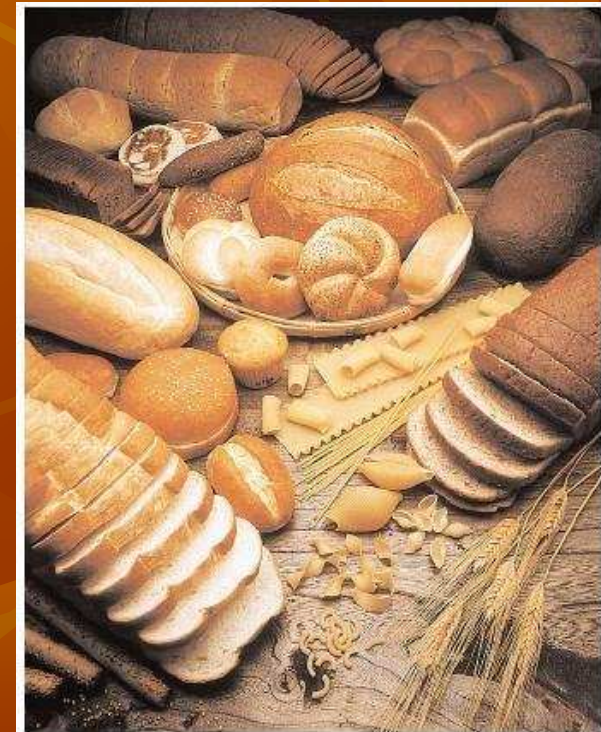
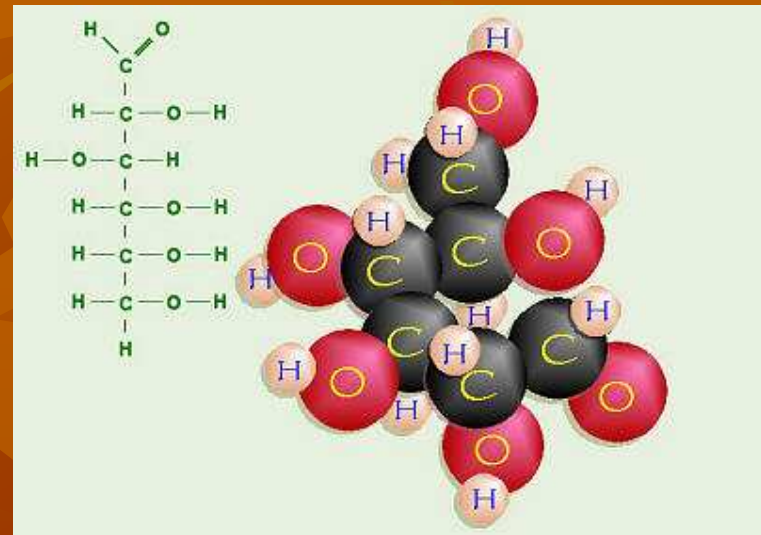
**Table 1.** Recommendations for the Portuguese Adult Population by the National Council of Food and Nutrition (CNAN) and translated dietary recommendations

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1. Total carbohydrates should contribute a total daily energy value of 50–70 %;
  2. Fibre intake should vary between 27 and 40 g/d;
  3. Total lipids consumption  $\leq$  30 % of total daily energy;
  4. Consumption of saturated fatty acids  $<$  10 % of total daily energy;
  5. Cholesterol consumption  $<$  300 mg/d;
  6. Total saccharose  $<$  20–30 g/d;
  7. Salt  $<$  6 g/d;
  8. Reduce alcohol consumption;
  9. Calcium – total daily intake of 800 mg.
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1. Breast-feeding in the first months of a baby's life, especially during the first six months;
  2. Adequate consumption of cereals and cereal products;
  3. Increase of the consumption of vegetable products and fresh fruit;
  4. Reduction of the consumption of fats, especially solid and overheated fats; preference given to olive-oil consumption;
  5. Increase of fish consumption;
  6. Reduction of sugar and sugar-like products consumption;
  7. Reduction of salt consumption;
  8. Moderate consumption of alcoholic drinks. Pregnant women, children and those younger than 17 should not drink alcohol.
  9. Adequate consumption of milk and dairy products;
  10. Weight control kept through a balanced diet and physical activity;
  11. A balanced meal first thing in the morning.

# Carbohydrates

- "carbohydrate" - a mixture of carbon, hydrogen and oxygen
- Carbohydrates are manufactured inside plants from carbon dioxide in the air and water, under the influence of sunlight (photosynthesis)
- Consist of monosaccharide sugars, of varying chain lengths, that have the general chemical formula  $C_n(H_2O)_n$
- The main energy source for the human body
  - 60 % of energy (4- 5g/kg)
  - Athletes 5 - 10 g/kg
- 1 g of carbohydrates = 4 kcal = 17 kJ



# Types of carbohydrates

- *Carbohydrates are classified in various ways*
  - (1) according to their molecular or biological structure
    - Simple Carbohydrates (or "simple sugars")
      - Monosaccharides and Disaccharides
    - Complex Carbohydrates (or "complex sugars")
      - Oligosaccharides and Polysaccharides
  - (2)
    - Sugars - "simple carbs",
    - Starches "complex carbs"
    - Dietary fiber "complex carbs"

# Types of carbohydrates

- *Carbohydrates are classified in various ways*

- (3) how fast they are digested, and thus how quickly they raise our blood sugar levels

## The Glycemic Index

- High glycemic index foods
  - Medium glycemic index foods
  - Low glycemic index foods
- (4) depending on how "processed" they are by food manufacturers
    - refined carbohydrates
    - unrefined carbohydrates

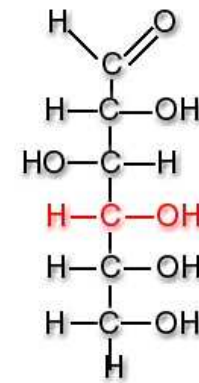
# Simple Carbohydrates

- **Monosaccharides** - one unit of sugar

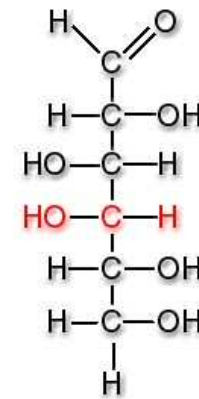
- Sweet tasting
- Rapidly metabolized into energy
- Honey, fruit
  - Glucose (dextrose, blood sugar, grape sugar)
  - Fructose (sweetest of all sugar)
  - Galactose

- **Disaccharides** - two unit of sugar

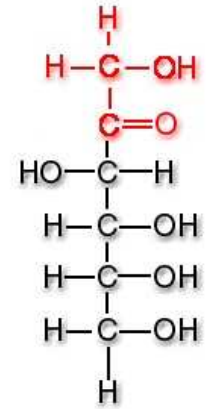
- High glycemic index
  - Sucrose = glucose + fructose (table sugar – sugar cane, sugar beet)
  - Lactose = glucose + galactose (milk sugar)
  - Maltose – glucose + glucose (malt sugar, germinating grains)



Glucose



Galactose



Fructose

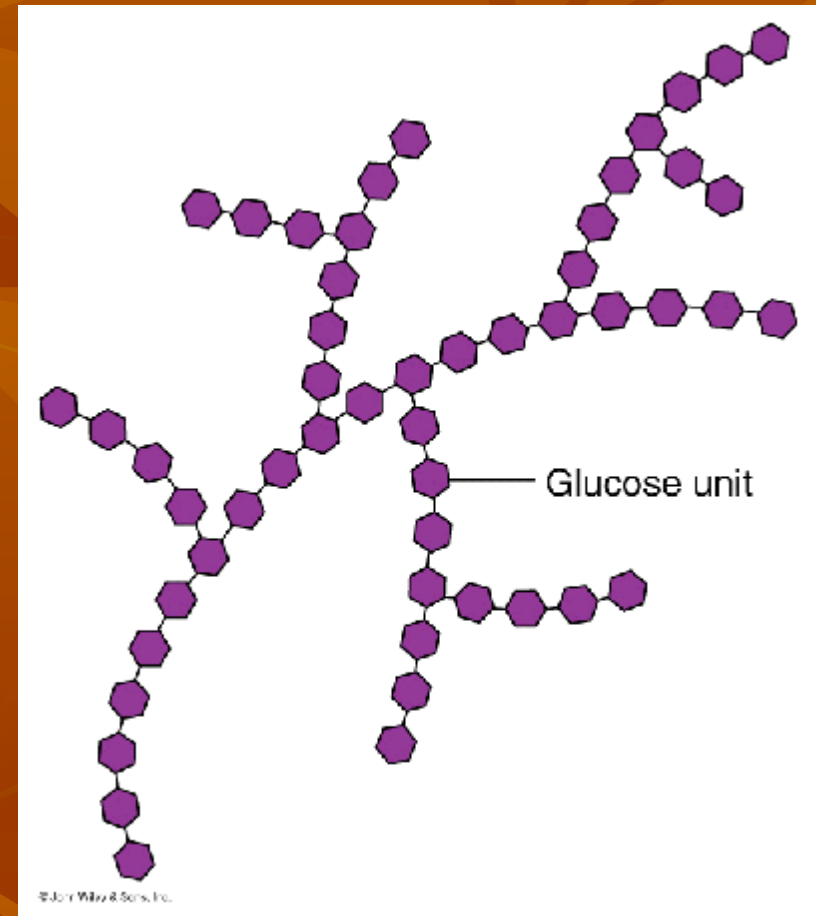
# Complex Carbohydrates

- **Oligosaccharides**
  - 3 – 6 units of simple sugars
  - Found in plants – beans, legumes
  - Can not be digested
  - Low glycemic index
    - help to maintain stable blood glucose level
- Stachyose
- Raffinose



# Complex Carbohydrates

- **Polysaccharides** - > 100 unit of simple sugar
  - Most natural carbohydrates
  - **Starch polysaccharides**
    - Starch (to store glucose) – energy storage in plant
      - Amylose and amylopectin (chains up to 4000 unit)
      - Grains, potatoes, beans, legumes
    - Glycogen
      - energy storage in human body
      - liver and muscle glycogen
  - **Non- starch polysaccharides (fiber)**
    - Cellulose, hemicellulose (insoluble fiber)
    - Pectin, gum and mucilage (soluble fiber)
    - Cannot be digested
    - Keep our intestine clean and healthy
    - beans, wholegrain cereals, fruits, vegetables and nuts





# Benefits of carbohydrates

- **Easily-obtained energy in the form of glucose**
- Carbohydrate are rapidly break it down into simple sugars and ultimately glucose
- The **glucose** is then absorbed and distributed to cells and muscles with the help of insulin
- The glucose can be retained as and energy reserve in the liver and muscles – **glycogen**
- The glucose can be store as body fat

# Metabolism of sugar

- Two major metabolic pathways of monosaccharide catabolism:
  - Glycolysis
    - a molecule of glucose is oxidized to two molecules of pyruvic acid
    - generation of high-energy molecules (ATP and NADH)
    - production of a variety of six- or three-carbon intermediate metabolites (may be removed at various steps in the process for other intracellular purposes)
    - Glycolysis alone produces less energy per glucose molecule than complete aerobic oxidation
  - Citric acid cycle (Krebs cycle)
    - a series of chemical reactions of central importance in all living cells that utilize oxygen as part of cellular respiration.
    - part of a metabolic pathway involved in the chemical conversion of carbohydrates, fats and proteins into carbon dioxide and water to generate a form of usable energy.
    - It is the second of three metabolic pathways that are involved in fuel molecule catabolism and ATP production, the other two being glycolysis and oxidative phosphorylation
    - The citric acid cycle also provides precursors for many compounds such as certain amino acids, and some of its reactions are therefore important even in cells performing fermentation

# Benefits of carbohydrates for athletes

- The major energy providers in your diet
- Carbohydrate should provide 60 % of your total dietary energy (most energy from starch polysaccharides)
- Starch - the body's favourite "fuel,,
- Dietary carbohydrate increases the amount of CHO available to the working muscles
- We store very little glucose in the body - vital to have a regular intake of starch (starch → glucose → glycogen → glucose)
- If the muscles run out of glucose they can also burn body fat (is not as efficient an energy source)
- High levels of glycogen => help you exercise at your optimum level
- Low level of glycogen => early fatigue and reduced exercise intensity
- Athletes should ingest 9-10 grams CHO/kg of body weight per day

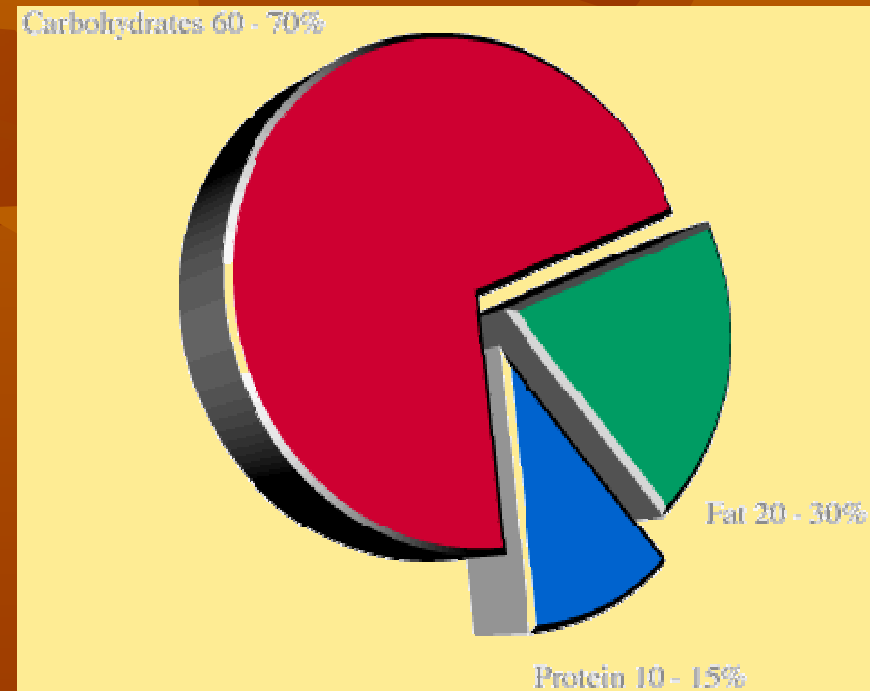
# Good source of starch for athletes

- bread
- cereals
- porridge oats
- potatoes
- beans
- lentils
- rice
- pasta
- noodles

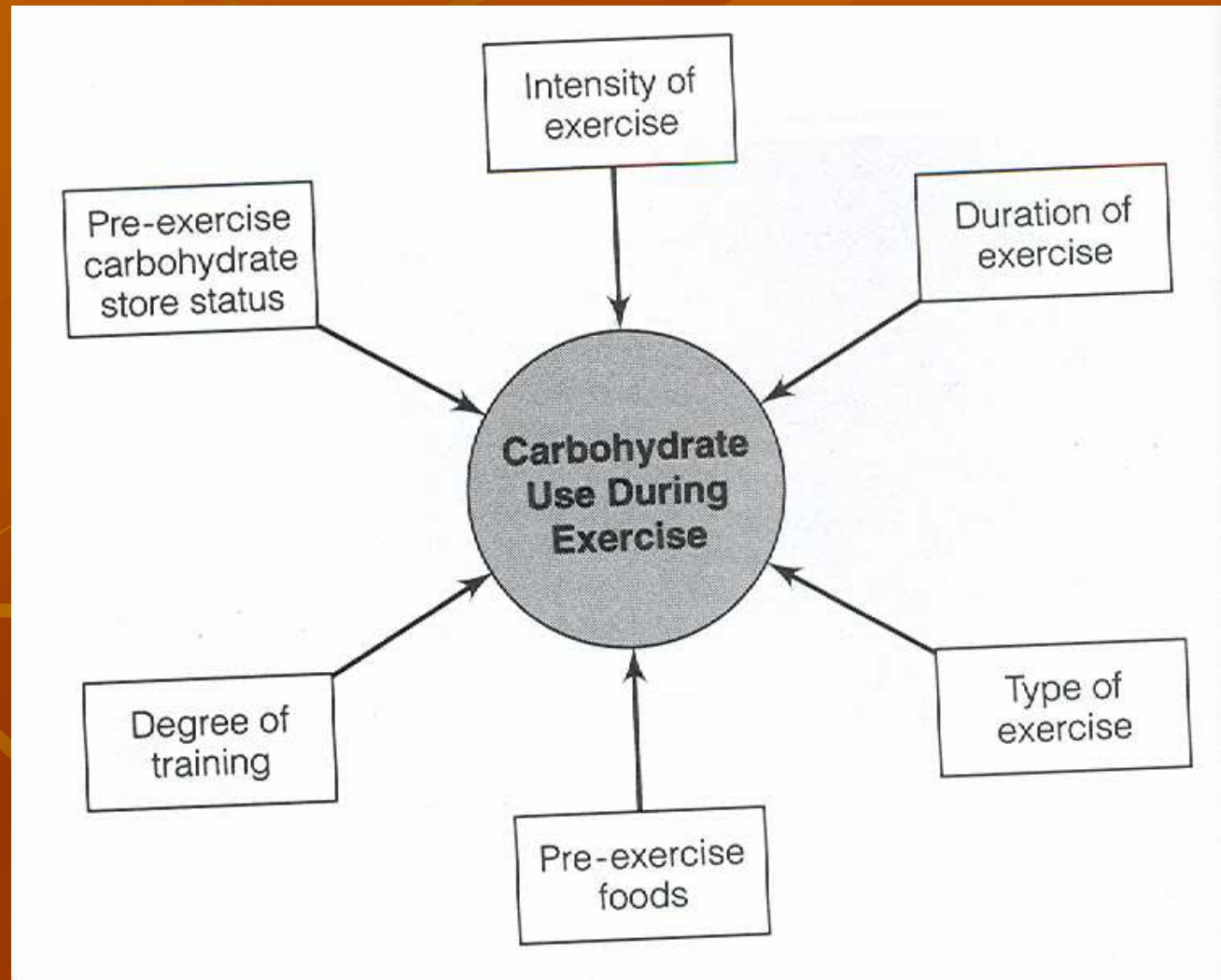


# How much carbohydrate should you eat?

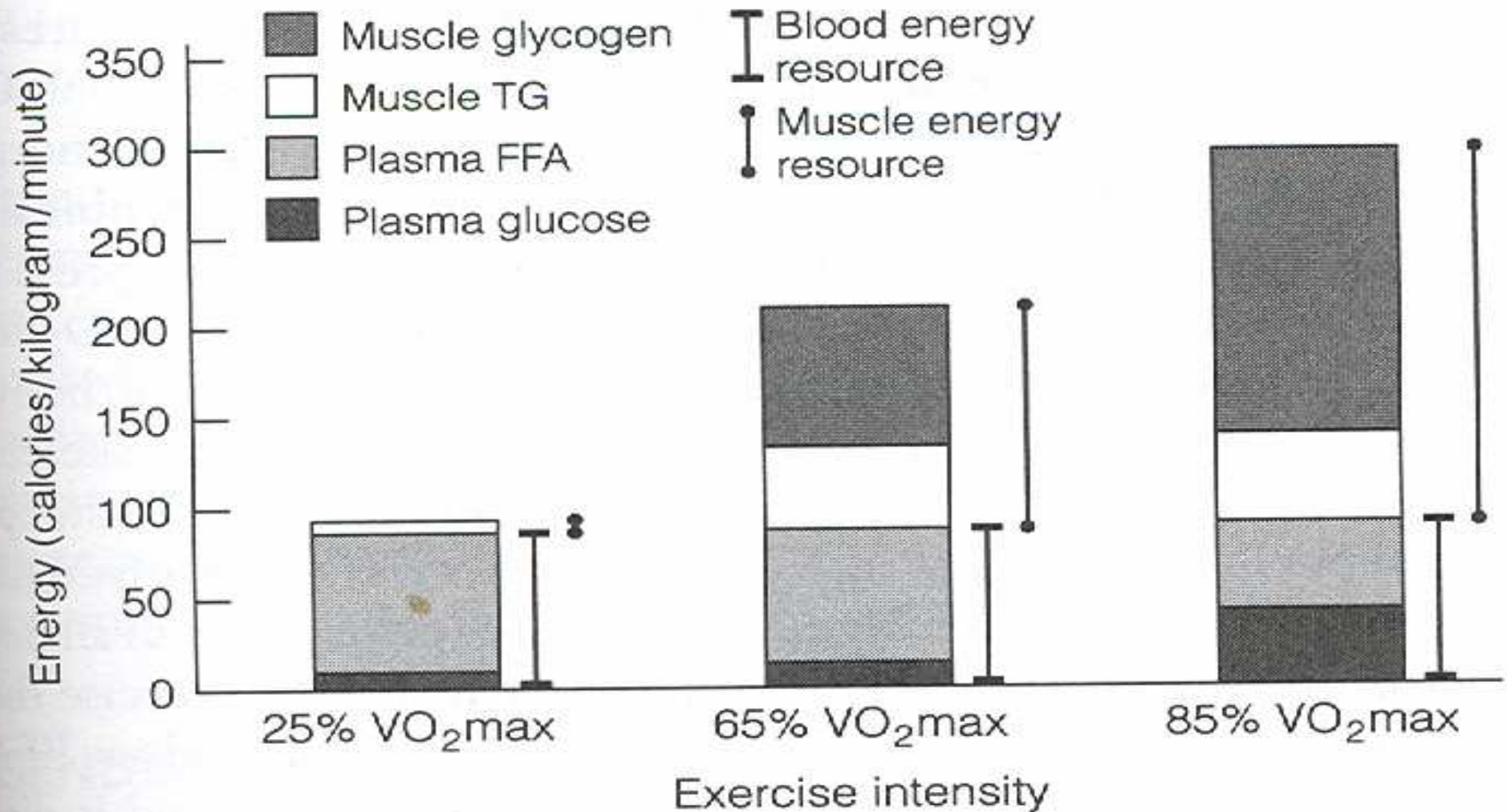
- Minimum of 60 percent to 70 %
- Example
  - Total calorie intake - 3,000 calories/day
  - calories from carbohydrate  $3,000 \times 60\% = 1800$  calories
  - 1 gram of carbohydrate = 4 calories
  - Therefore, 1,800 calories is equivalent to 450 grams of carbohydrate



# Factors influencing metabolism of carbohydrate during exercise



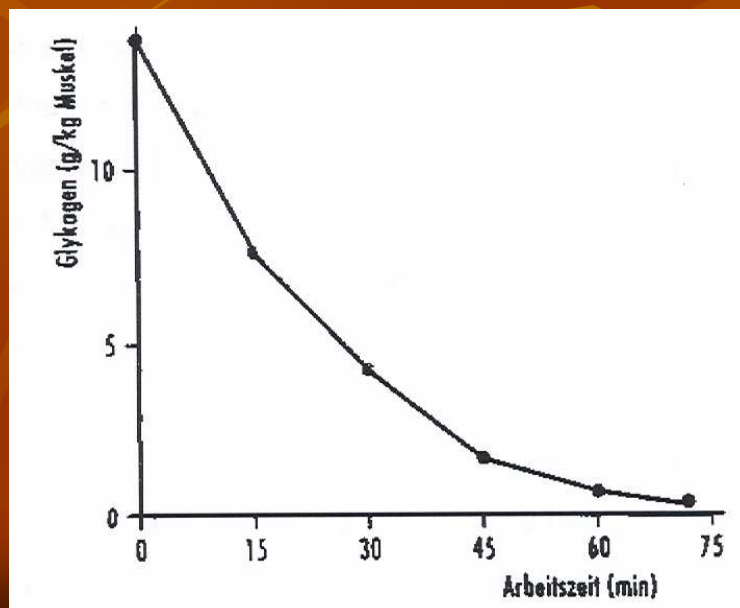
# Expenditure of energy



# Carbohydrate loading

- **⇒ increase of muscle glycogen stores above normal levels**
- **⇒ delay the onset of fatigue during an event**

Method for achieving carbohydrate loading over a seven-day period prior to an event



Day 1

Endurance training for one hour to deplete your muscle glycogen stores.

Days 2, 3 & 4

Taper off your training and eat a moderate carbohydrate diet - 5 grams to 7 grams per kilogram of body weight.

Days 5, 6 & 7

Taper off training further and rest. While doing this, have a high carbohydrate intake - 8 grams to 10 grams per kilogram of body



# Carbohydrate intake while exercising

- Longer exercise sessions (more than an hour)
  - => deplete supplies of glycogen
- Eat carbohydrates during sport event
  - Hypotonic sport drink (30 – 60 g carbohydrates/hour)
  - Fruit, musli bar, dry fruit
- Greater amounts have no further benefit
- Start taking in carbohydrate soon after the exercise session begins

# Carbohydrate intake after exercise

- It depends on, how depleted are your stores of glycogen
- Take carbohydrates as soon as possible after exercise session
- During the first two hours, replenishment is most rapid and is approximately one and a half times the normal rate
  - eat or drink 200 to 400 carbohydrate calories
- During the following four hours, the rate slows down but remains higher than normal
  - eat or drink again 200 to 400 carbohydrate calories
- Restoring your glycogen levels as quickly as possible is very important, particularly if you train every day or every other day

# 200 to 400 calorie

- Two pieces of fruit such as a banana and orange or apple
- 12 oz. fruit juice cocktail, like cranberry, or fruit juice like grapefruit or orange
- 1 cup non-fat frozen or regular yogurt topped with 1 cup blueberries or raspberries
- 1 cup of grapes and 1 bagel
- 1 oz. of cereal with 1/2 cup skim milk and 1/2 cup sliced banana
- 1 cup low-fat vegetable soup with 1 pita pocket
- 1 bran, blueberry, or cranberry low-fat muffin with a cup of skim milk

# Carbohydrate intake before, during and after exercise

Time scale	The amount of carbohydrate
3 - 4 hours before exercise	200 - 350 g carbohydrates for maximum loading of glycogen (4 - 5 g/kg)
30 - 60 minute before exercise	50 - 75 g carbohydrates (1 - 2 g/kg)
< 5 minute before exercise	50 g (less for women) can improve performance)
During exercise	Endurance event 30 - 60 g/h - for stable blood glucose level
	Drinking 600 - 1200 ml 6 - 8% carbohydrates drinks/hour
After exercise	To supply glycogen
	1,2 - 1,5 g carbohydrates/h during first 30 minute and every 2 hours (4 - 6 hodin) 2. dinner rich in complex carbohydrates