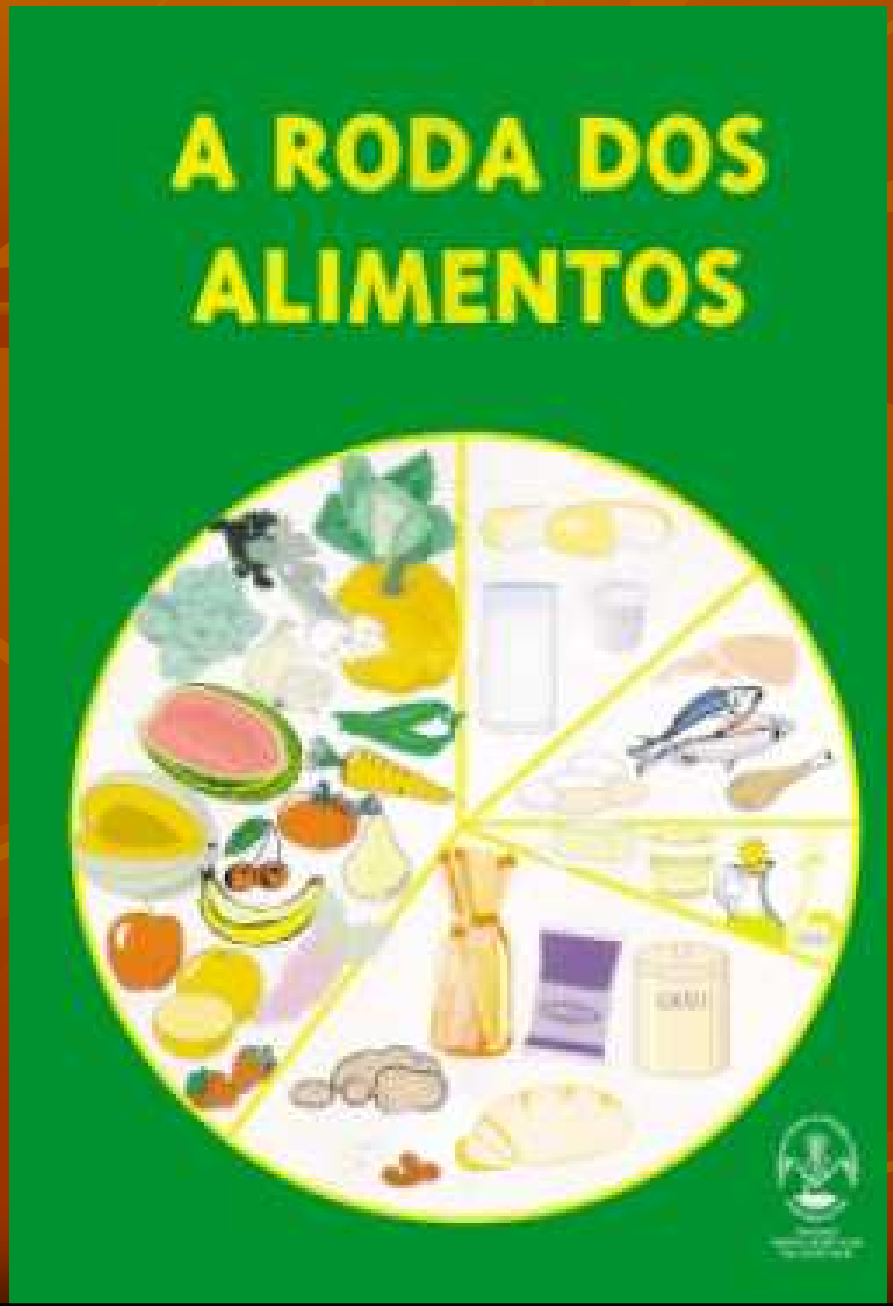
The Portuguese food wheel



- 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),

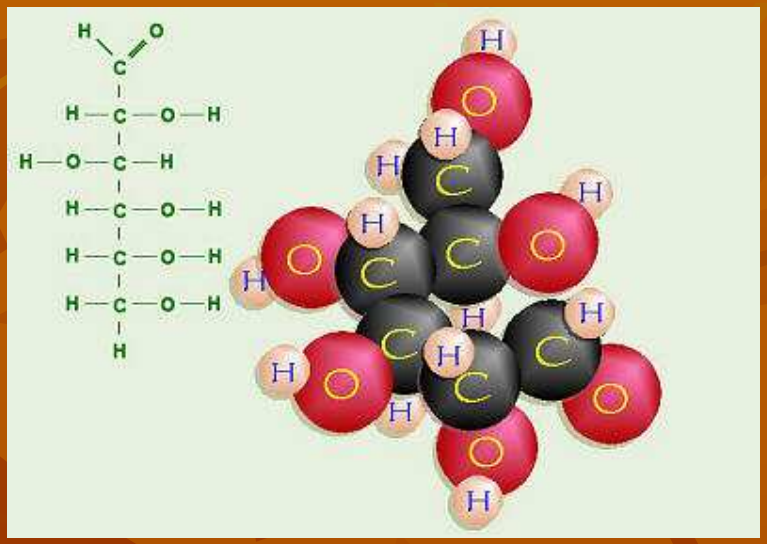
  - higher intakes of total fat, saturated fat, fibre/energy, protein and carbohydrates
  - lower intakes of alcohol by women.

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

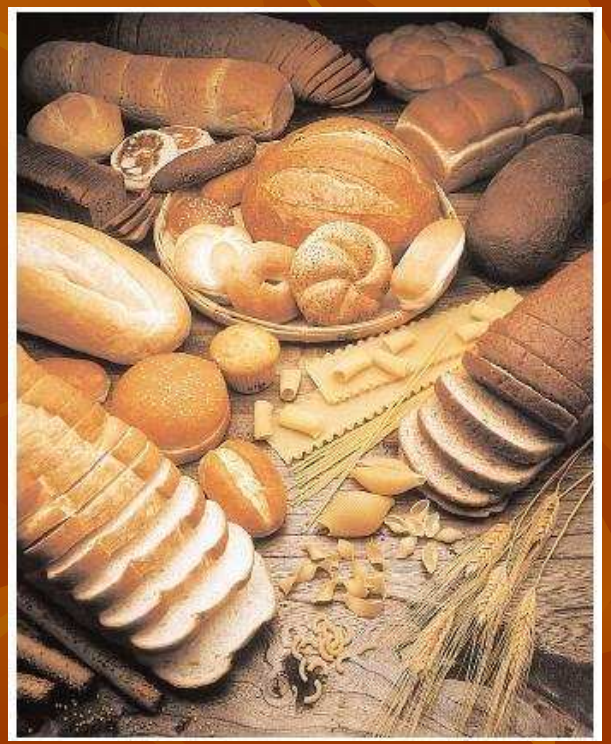
1. Total carbohydrates should contribute a total daily energy value of 50–70 %;
2. Fibre intake should vary between 27 and 40 g/d;
3. Total lipids consumption ≤ 30 % of total daily energy;
4. Consumption of saturated fatty acids <10 % of total daily energy;
5. Cholesterol consumption < 300 mg/d;
6. Total saccharose < 20–30 g/d;
7. Salt < 6 g/d;
8. Reduce alcohol consumption;
9. Calcium – total daily intake of 800 mg.

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

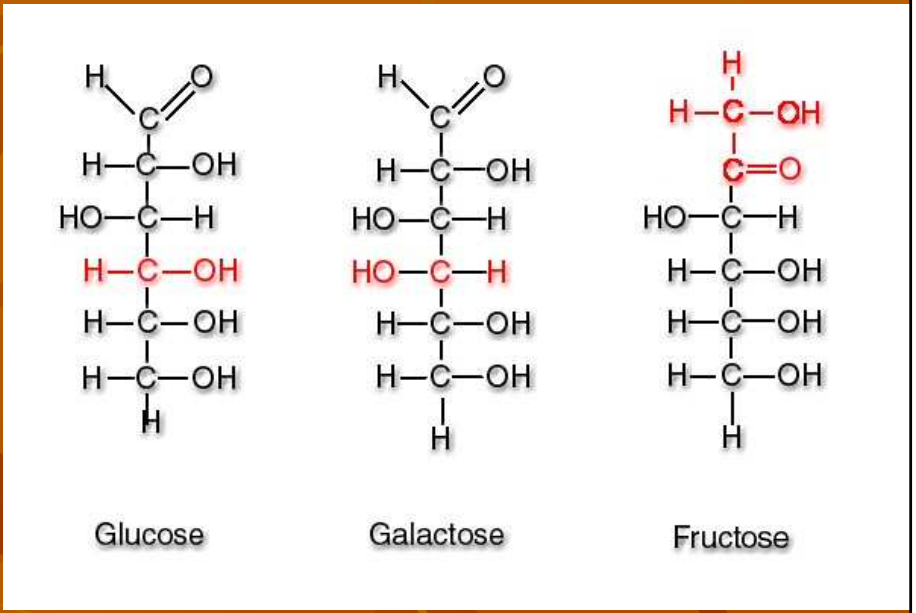
- *Carbohydrates are classified in various ways*
  - (1) according to their molecular or biological structure
    - Simple Carbohydrates (or "simple sugars")
      - Monosaccharides and Disaccharides
    - Complex Carbohydrates (or "complex sugars")
      - Oligosaccharides and Polysaccharides
  - (2)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

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

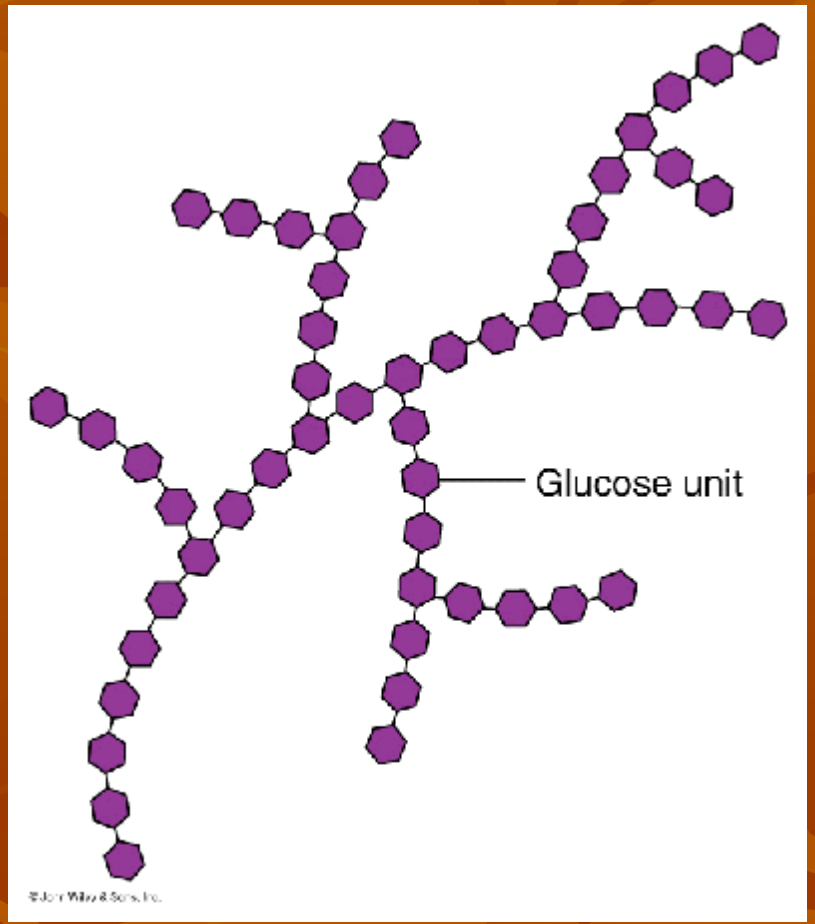
    - Stachyose
    - Raffinose

Complex Carbohydrates

- **Polysaccharides** - > 100 unit of simple sugar
  - Most natural carbohydrates

  - **Starch polysacharides**
    - 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 polysacharides (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 polysacharides)
- 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

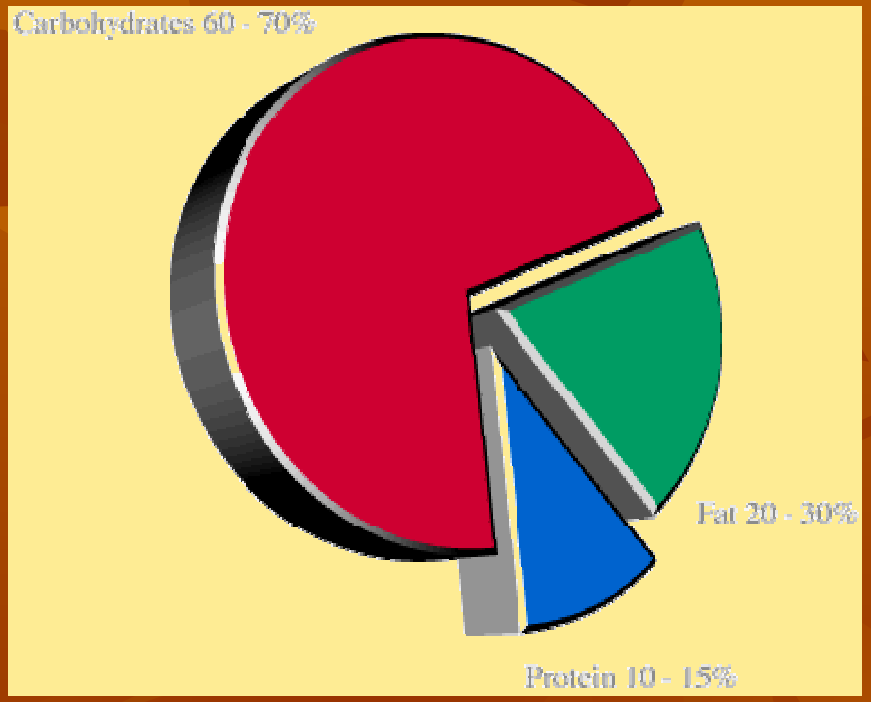
Good source of starch for athletes

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

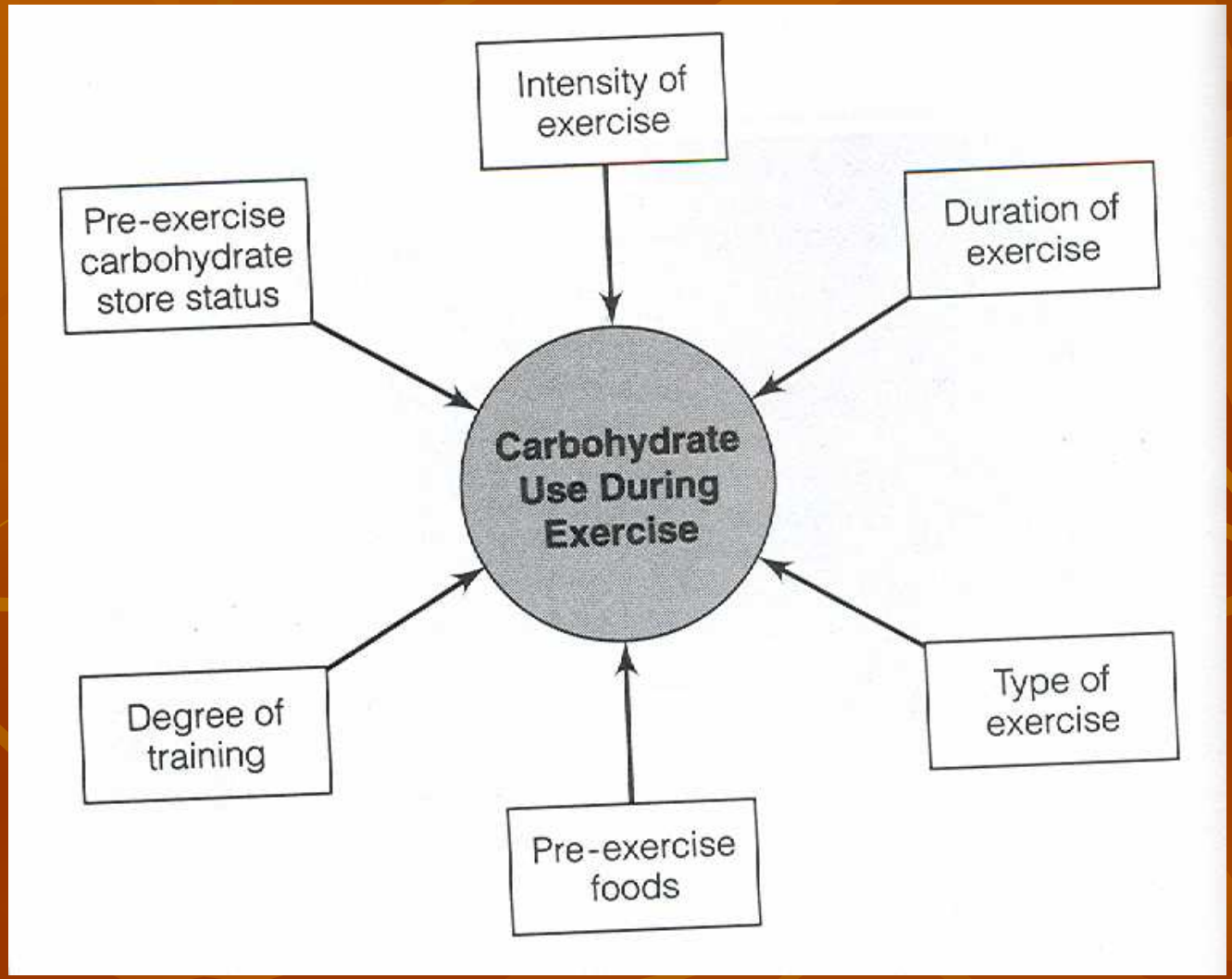
How much carbohydrate should you eat?

- Minimum of 60 percent to 70 %

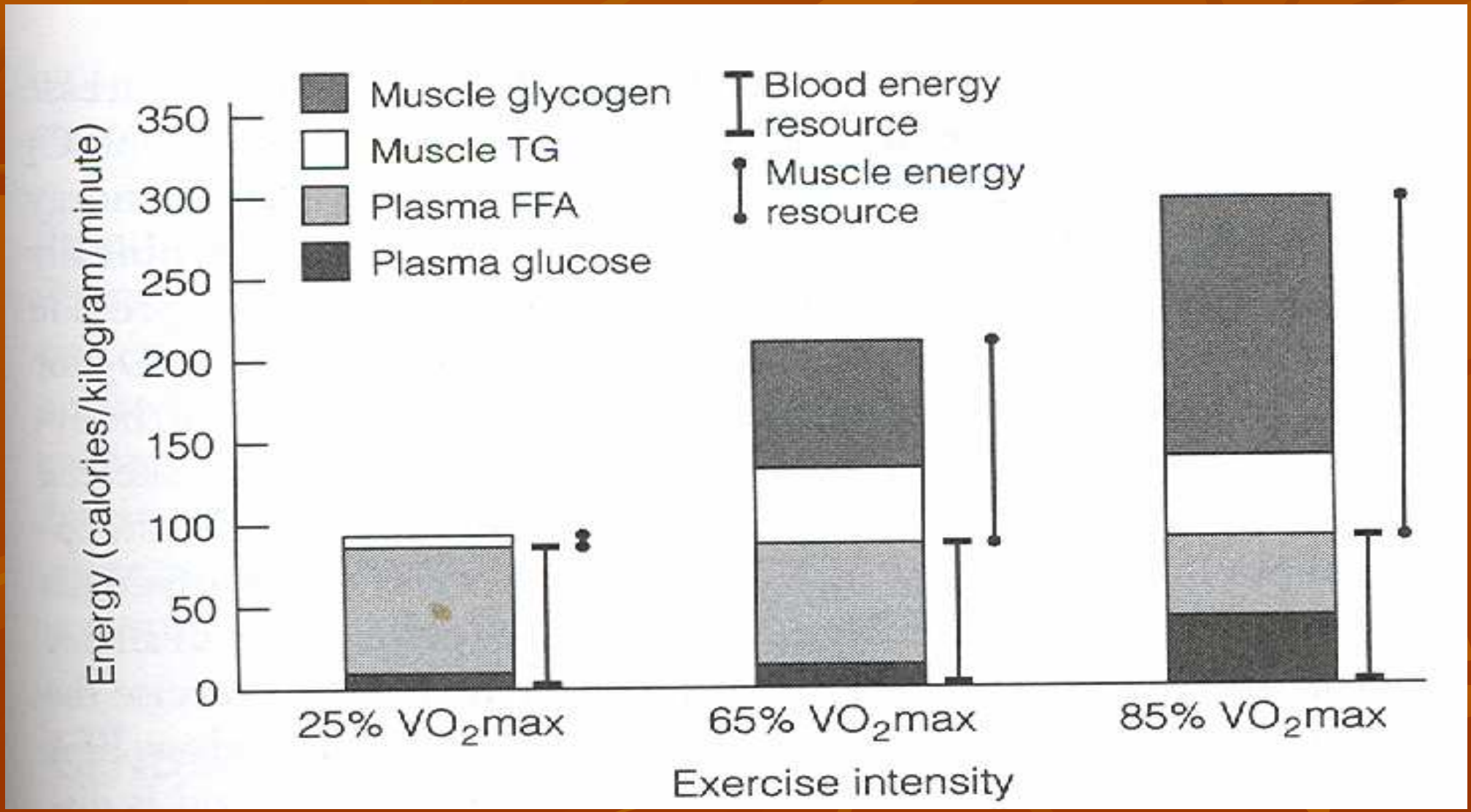
- Example
  - Total calorie intake - 3,000 calories/day
  - calories from carbohydrate 3,000 X 60 % = 1800 calories
  - 1 gram of carbohydrate = 4 calories
  - Therefore, 1,800 calories is equivalent to 450 grams of carbohydrate



Factors influencing metabolism of carbohydrate during exercise

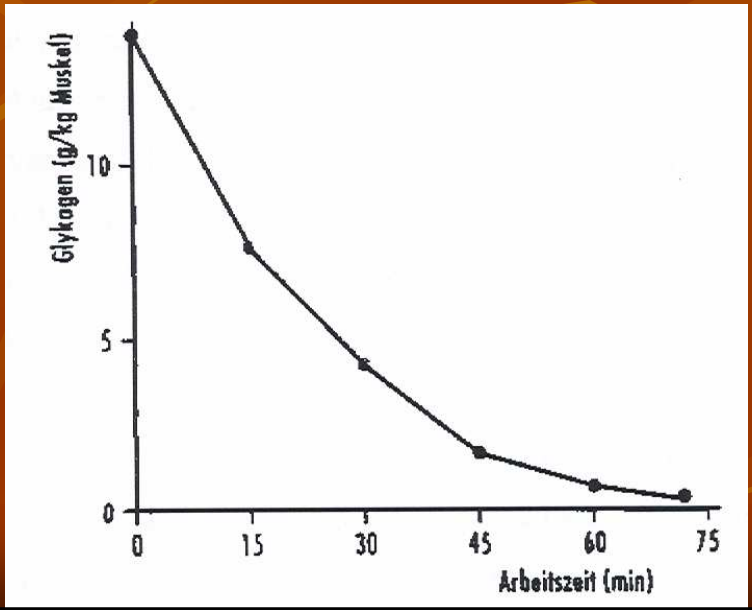


Expenditure of energy



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 carbphydrates/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	Endurence 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