High protein diet and weight-loss

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Why a high protein diet?

- Protein is the most important essential nutrient for the organism (essential amino acids). Body protein is structural (e.g. muscle, the inner parts of bone and hair, tendons.), form enzymes, immune system compounds (antibodies), carrier molecules etc.
- Carbohydrate is not essential – the organism can make carbohydrate (glucose) from protein (gluconeogenesis)
- Very little fat is essential for the organism (only essential fatty acids in limited amounts)

Essential nutrients for humans

- 1) Essential amino acids (Isoleucine, Lysine, Leucine, Methionine, Phenylalanine, Threonine, Tryptophan, Valine, Histidine, (Arginine))
- 2) Essential fatty acids (a-Linolenic acid (omega-3) Linoleic acid (omega-6)

Essential nutrients for humans

- 3) Vitamins
  - Vitamin A (retinol)
  - Vitamin Bp (choline)
  - Vitamin B1 (thiamin)
  - Vitamin B2 (riboflavin, vitamin G)
  - Vitamin B3 (niacin, vitamin P, vitamin PP)
  - Vitamin B5 (pantothenic acid)
  - Vitamin B6 (pyridoxine, pyridoxamine, or pyridoxal)
  - Vitamin B7 (biotin, vitamin H)
  - Vitamin B9 (folic acid, folate, vitamin M)
  - Vitamin B12 (cobalamin)
  - Vitamin C (ascorbic acid)
  - Vitamin D (ergocalciferol, or cholecalciferol)
  - Vitamin E (tocopherol)
  - Vitamin K (naphthoquinoids)

Essential nutrients for humans

- 4) Dietary minerals
  - Calcium (Ca)
  - Chloride (Cl-)
  - Chromium (Cr)
  - Cobalt (Co)
  - Copper (Cu)
  - Iodine (I)
  - Iron (Fe)
  - Magnesium (Mg)
  - Manganese (Mn)
  - Molybdenum (Mo)
  - Nickel (Ni)
  - Phosphorus (P)
  - Potassium (K)
  - Selenium (Se)
  - Sodium (Na)
  - Sulfur (S)
  - Zinc (Zn)

Why is carbohydrate (glucose) not essential?

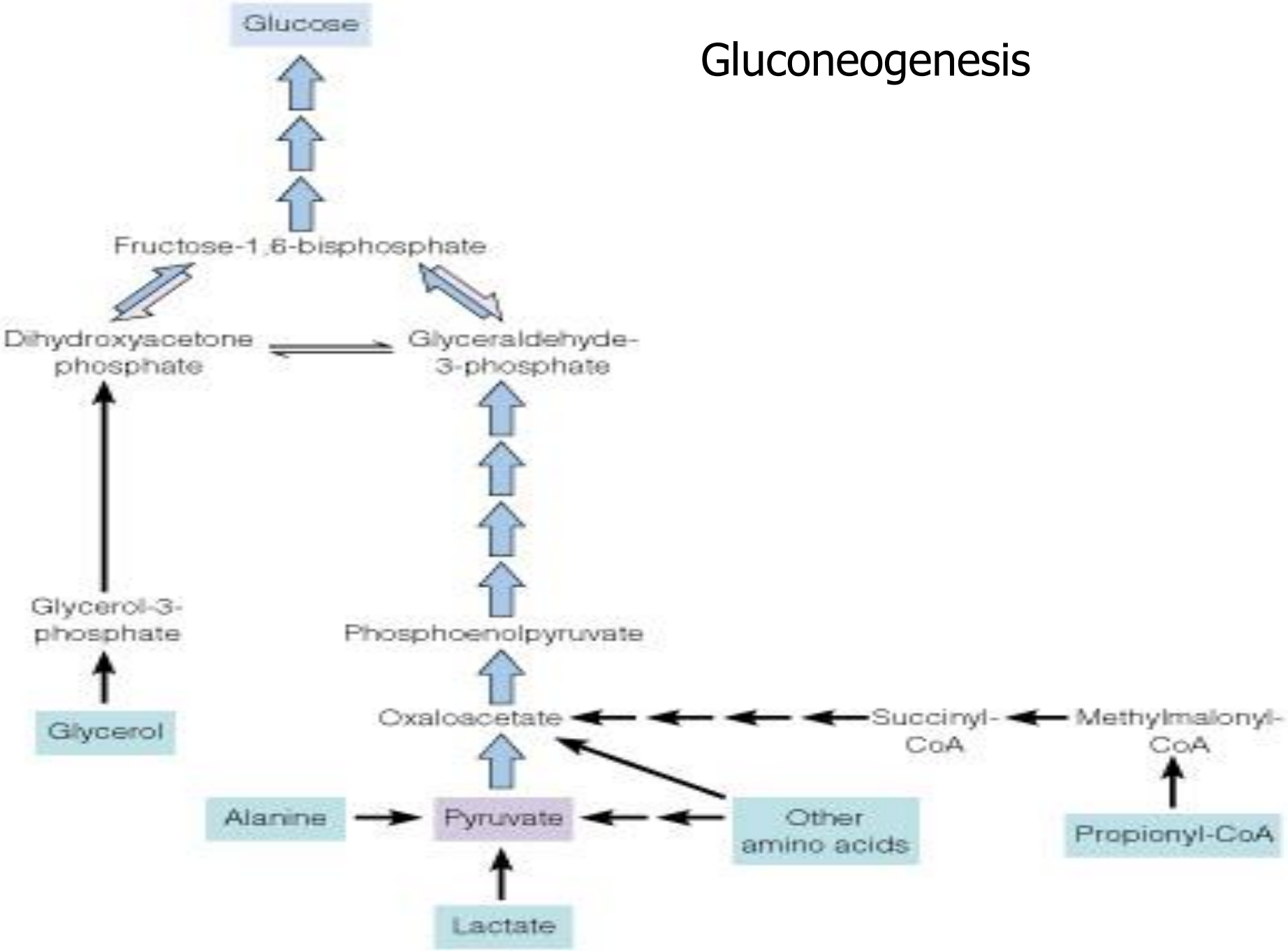
- Because of **gluconeogenesis**:

  a metabolic pathway that results in the *generation of glucose from non-carbohydrate* carbon substrates such as lactate, glycerol, and glucogenic amino acids

  The amino acids are being converted to alpha keto acids and then to glucose in the liver.

Glucogenic amino acids are:
Glycine, Serine, Valine, Histidine, Arginine, Cysteine, Proline, Alanine, Glutamate, Glutamine, Aspartate, Asparagine, Methionine.
Amino acids that are **both glucogenic and ketogenic**:
Isoleucine, Threonine, Phenylalanine, Tyrosine, Tryptophan.
Only leucine and lysine are **not glucogenic**.

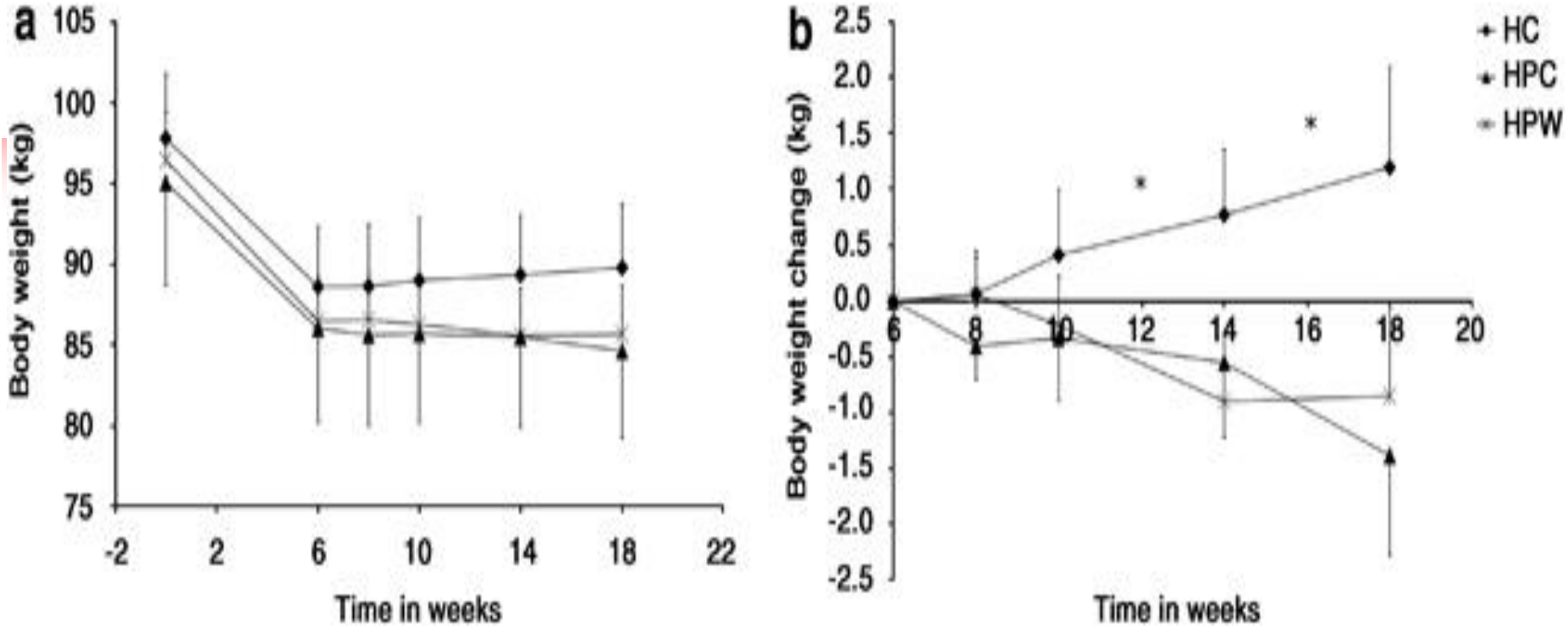
Gluconeogenesis



Protein + vitamins, minerals and essential fatty acids are sufficient

- You do not develop deficiency symptoms
- You stimulate the basal metabolic rate by ingesting foods (**the specific dynamic action** (SPA)). Protein has the largest specific dynamic action **(30%)**. SPA is 7% for carbohydrates and 12% for lipids.
- Protein reduces appetite.
- You maintain all important metabolic functions.
- You do not break down muscle or other protein rich tissues.

Does a high protein diet reduce overweight?



Mean body weight over time (a) and **body weight change during weight maintenance (compared with immediately after weight loss) (b)** in the diet groups. *Body weight change significantly different between high-carbohydrate (HC) and high-protein (HP) group ($P<0.05$).

During weight maintenance subjects received **maltodextrin (HC group**) or protein (HP group) (**casein (HPC subgroup**) or **whey (HPW subgroup**)) supplements (2 × 25g per day), respectively and consumed a low-fat diet.

International Journal of Obesity (2009) **33,** 296–304

Other beneficial effects of a high protein diet

- Preserves lean body mass
- Improves several cardiovascular risk factors more than a high carbohydrate diet: triglyceride ↓, HDL cholesterol ↓, fasting glucose ↓, blood pressure ↓, C-reactive protein ↓, abdominal fat ↓.

Curr Opin Endocrinol Diabetes Obes. **2008** Oct;15(5):416-21.
Nutr Metab Cardiovasc Dis. **2009** Oct;19(8):548-54.

Are there side effects of a long-term high protein diet?

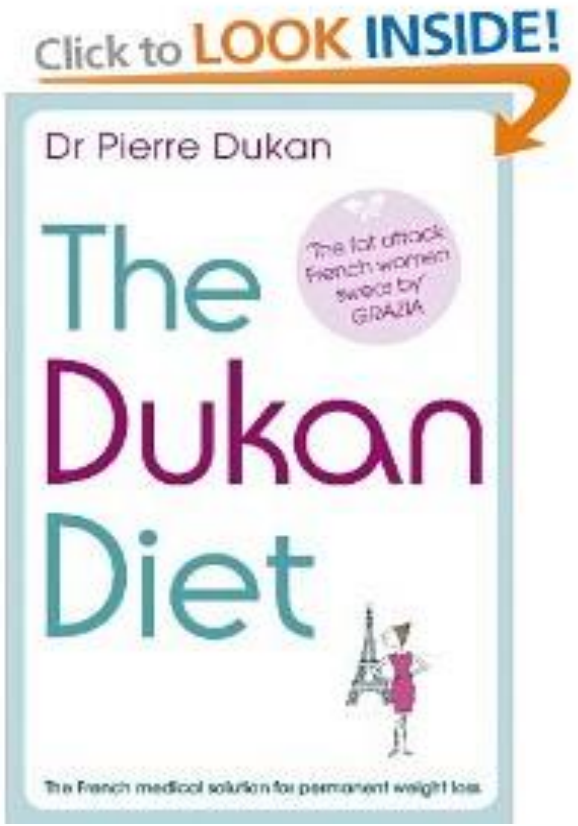
- Potential dangers could be bone mineral loss and kidney damage.
- However, loss of bone with high protein intake is not substantiated by the available data.
- Increased protein intake leads to increased solute excretion, including urea and other nitrogenous wastes, so sufficient fluid should be taken in.
- In otherwise healthy individuals, there is little evidence that high protein intake is dangerous for the kidneys.
- However, kidney damage may be an issue for individuals with already existing kidney dysfunction.

Proc Nutr Soc. **2011** May;70(2):205-14.

Conclusion

- A high protein diet is effective in producing weight loss.
- It is not associated with significant side effects
- It reduces cardiovascular risk - possibly more than other weight loosing diets

Today's popular version of the high protein diet.



"The Dukan Diet: Put your fat cells on a revolutionary weight-loss plan"

THE FOUR-STAGE DUKAN PLAN

1 ATTACK: One to ten days of eating nothing but protein (meat, fish and non-fat dairy products).

2 CRUISE: Alternate protein days with vegetable and protein days, introducing unlimited vegetables.

3 CONSOLIDATION: Every day is a protein and vegetable day, but add a piece of fruit, two slices of bread and a serving of cheese each day, plus one to two starchy meals (pasta, risotto) a week and a couple of 'celebration meals' a week when you eat whatever you like. Stay at this stage for five days for every 1lb you lost in previous phases.

4 STABILISATION: Eat what you like without guilt or restriction, but adhere to one rule: protein only on Thursdays. For ever.

www.dailymail.co.uk/health/article-1267356/The-Dukan-Diet-Put-fat-cells-revolutionary-weight-loss-plan.html