Nutrition update

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Outline

Hydration

Satiety

Red meat in the diet

Hydration

Nutrition Bulletin

REVIEW

Hydration and health: a review

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Summary

Water is essential for life and maintaining optimal levels of hydration is important for humans to function well. Water makes up a large proportion of our body weight (60% on average), distributed between the intracellular (inside cells) and extracellular (water in the blood and in between cells) compartments. Water is the major component of body fluids, such as blood, synovial fluid (fluid in the joints), saliva and urine, which perform vital functions in the body. The concentration of solutes (osmolality) in body fluids is closely controlled, and even very small changes in osmolality trigger a physiological response; either to increase body water by reducing urinary output and stimulating thirst; or to excrete excess water as urine. Generally, body water is maintained within narrow limits. However, if water losses are not sufficiently replaced, dehydration occurs. Extreme dehydration is very serious and can be fatal. More mild dehydration (about 2% loss of body weight) can result in headaches, fatigue and reduced physical and mental performance. It is also possible to consume too much water and in rare cases this can result in hyponatraemia (low levels of sodium in the blood).

We can get water from almost all drinks and from some foods in the diet. Food provides about 20% on average and this could vary widely depending on the types of food chosen. We also get water from all the drinks we consume, with the exception of stronger alcoholic drinks like wines and spirits. All these can contribute to dietary water, but also have other effects on health both positive and negative. The major concerns with regards to beverages are their energy content and their effect on dental health. With obesity levels continuing to increase it is important for many in the population to control their energy intake, and drinks as well as foods must be considered for their energy content. With regards to dental health, there are two concerns; dental caries and dental erosion. Dental caries are caused by a reduction in pH due to bacterial fermentation of carbohydrates, and so the frequency of consumption of drinks containing sugars is a concern for risk of caries. Dental erosion occurs at a lower pH and is caused by the consumption of acidic foods and drinks, in particular, citrus juices and soft drinks containing acids.

Individual water needs vary widely depending on many factors including body size and composition, the environment and levels of physical activity. Thus it is very difficult to make generic recommendations about the amount of water to consume. The FSA currently recommends drinking about 1.2 litres per day (about 6–8 glasses).

Keywords: Beverages, dehydration, fluid, hydration, water

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Review of:

-physiology of hydration

-health effects of different water sources

-current data and recommendations on fluid intake

Published March 2010 in Nutrition Bulletin (free online issue):

www.blackwellpublishing.com/nbu

Why do we need water?

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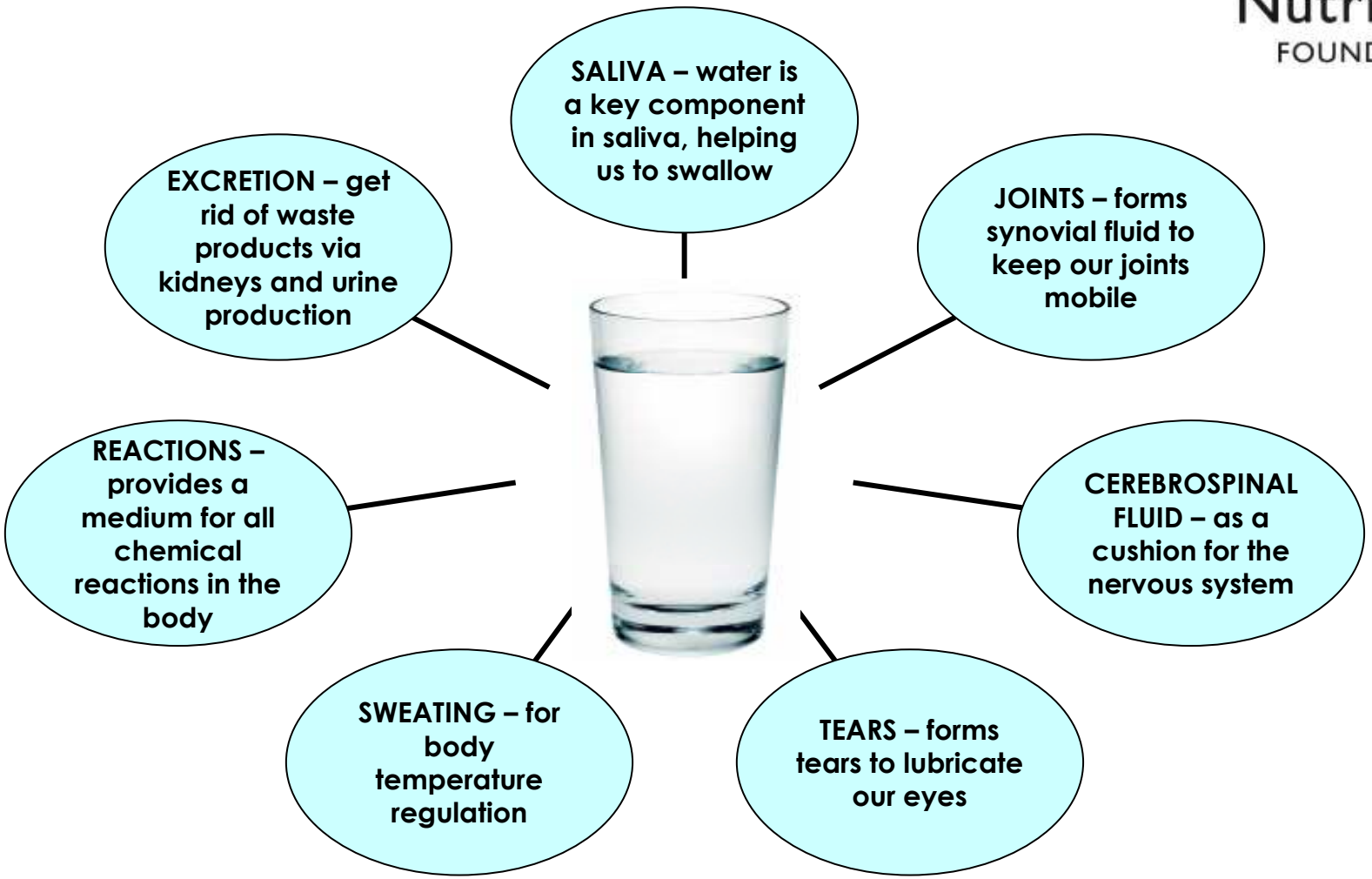

Drink plenty

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- Even mild dehydration (1-2%) can lead to headaches, irritability and loss of concentration. This is the level at which thirst is triggered.

- The recommendation is to drink 6-8 glasses/day (1.2 litres) to prevent dehydration.

- People need to drink more when the weather is hot or when they have been active.

Some people need to drink more

- Children
- Lactating women
- Older adults

What is the most popular drink in the UK?

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Tea ...	536 ml/person/day
Coffee …	744 ml/person/day
Tap water …	333 ml/person/day
Bottle water …	229 ml/person/day
Soft drinks …	211 ml ‘regular’ & 240ml low calorie/person/day
Fruit juice …	106 ml/person/day
Alcoholic drinks …	425 ml/person/day

Sources of water

- All fluid from food and non-alcoholic drinks count.

Hydration and health conference (2010)

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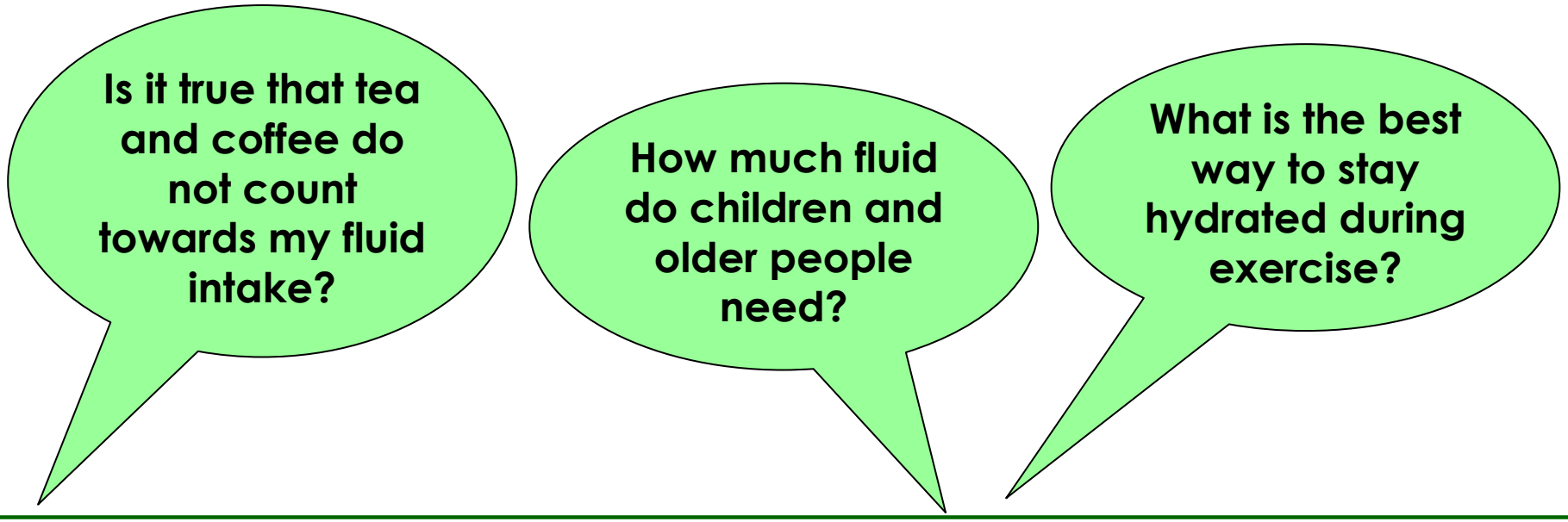
Presentation slides and interview clips available on BNF website:

www.nutrition.org.uk/bnfevents/pastevents/



Supporting resources

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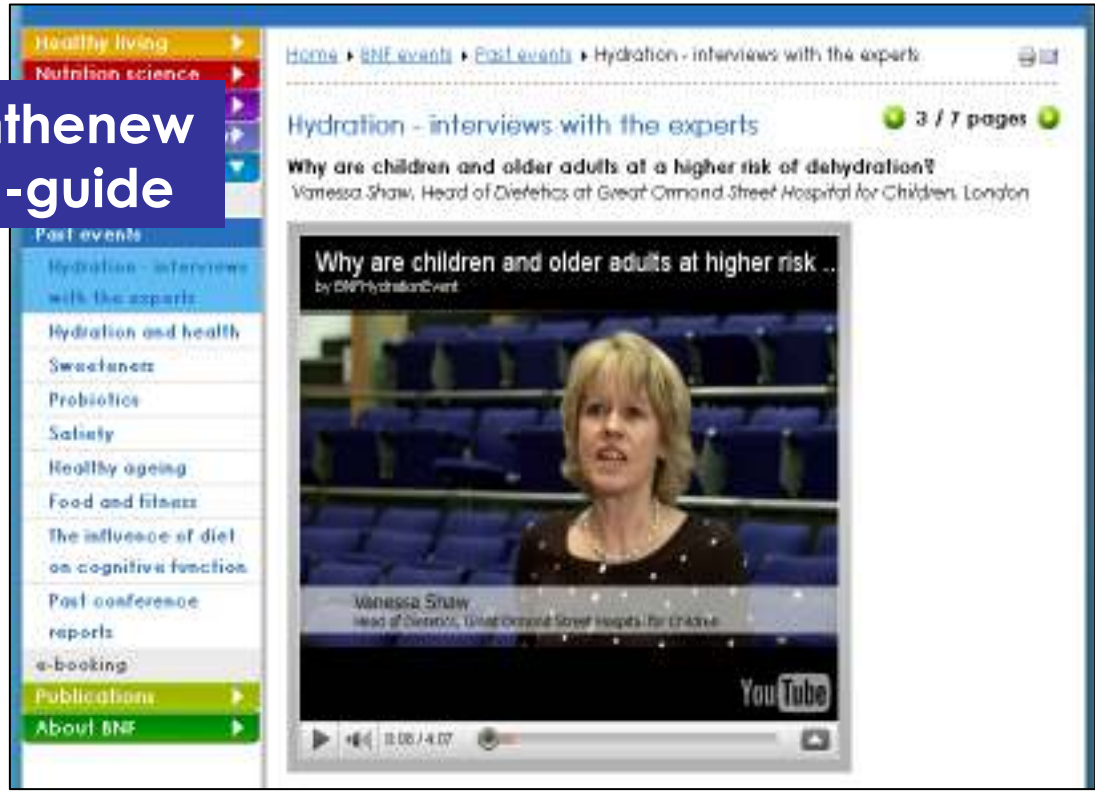
www.nutrition.org.uk/nutritioninthenews/hydration/healthy-hydration-guide

www.foodafactoflife.org.uk
> other > resources > posters

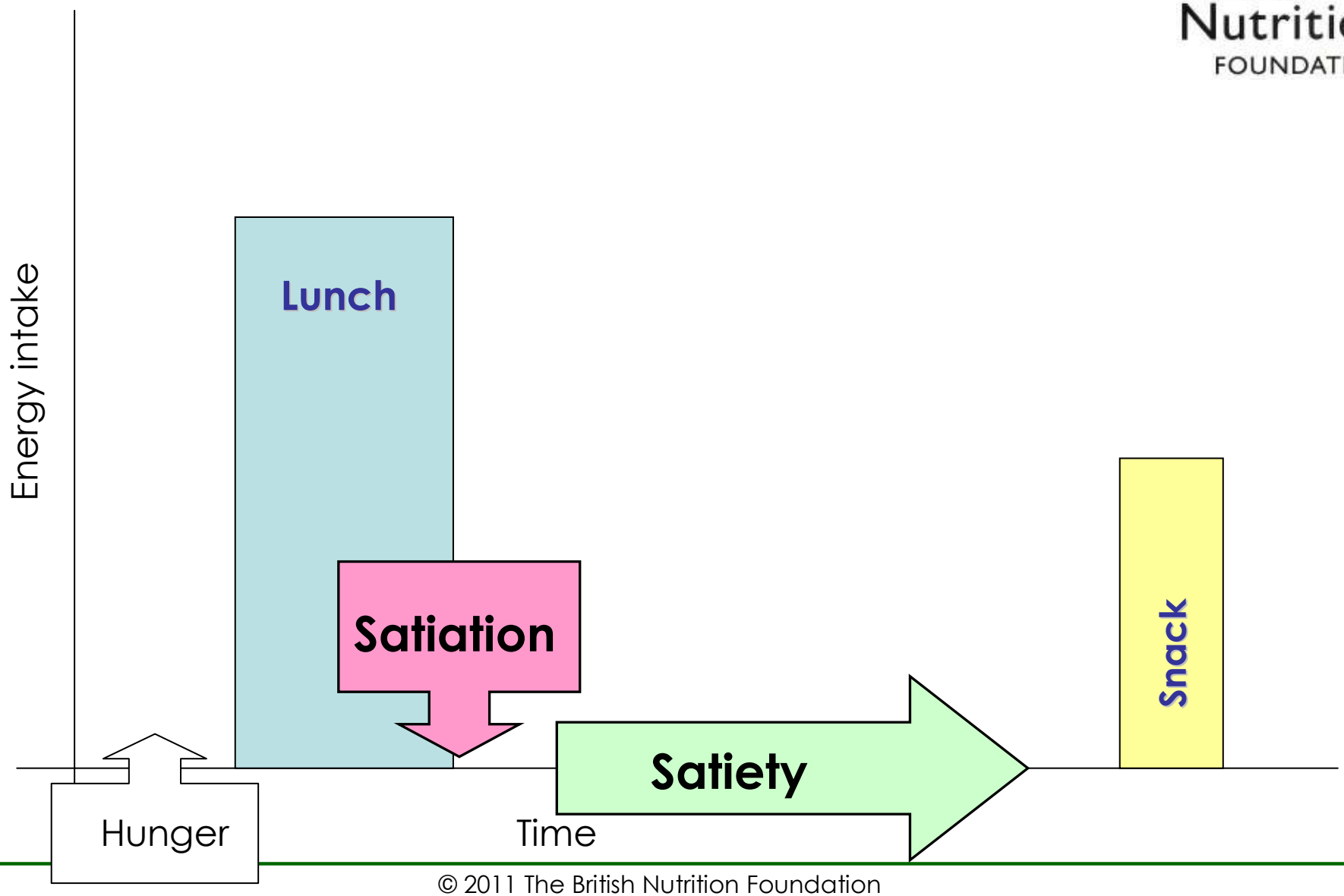


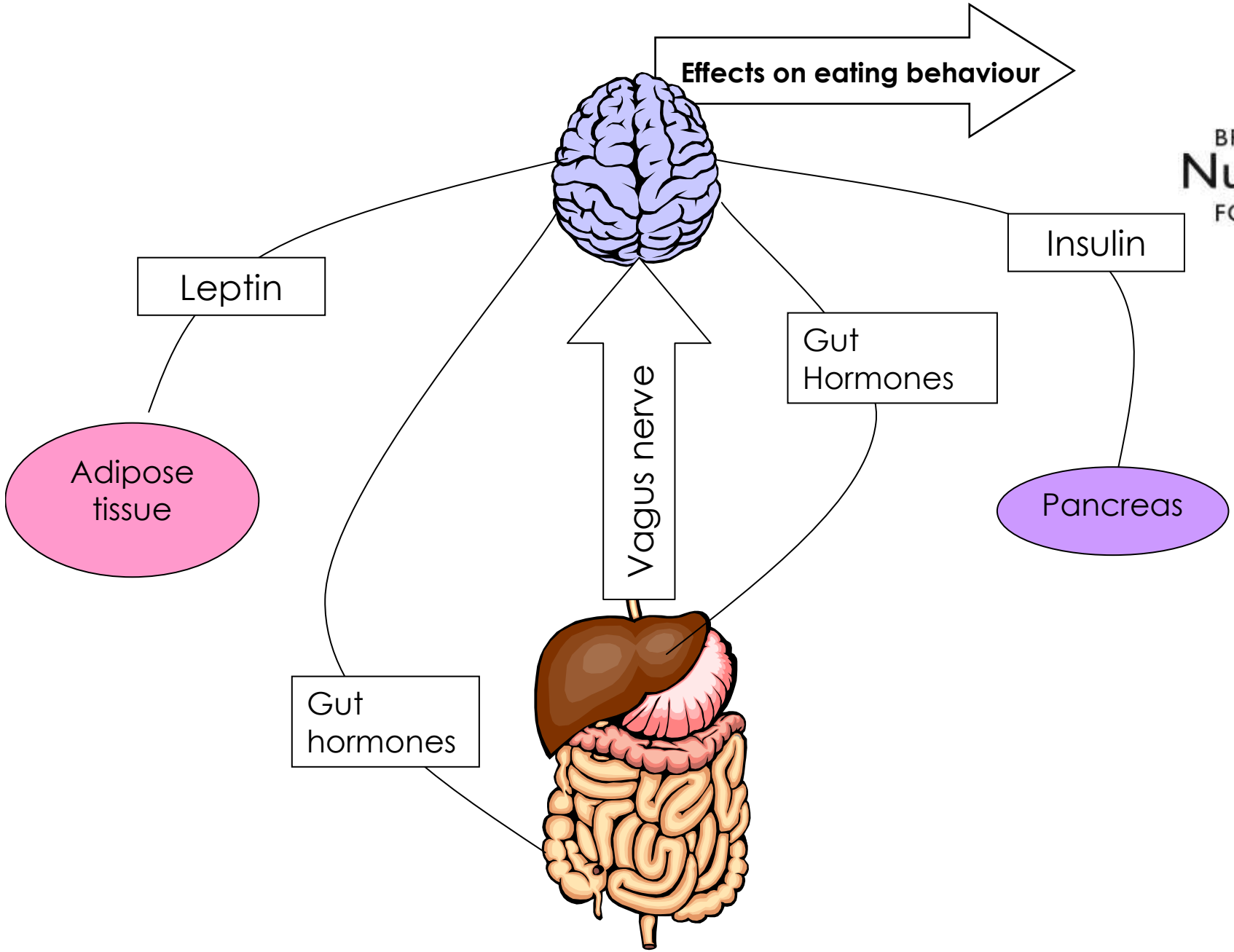
www.nutrition.org.uk/bnfevents/pastevents/

Satiety

- What is satiety?
- How is it measured?
- Can foods/food components affect satiety?
  - Fibre
  - Protein
  - Energy density
- Behavioural effects
- Satiety and weight control

What is satiety?





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Effect of foods and drinks on satiation and satiety…

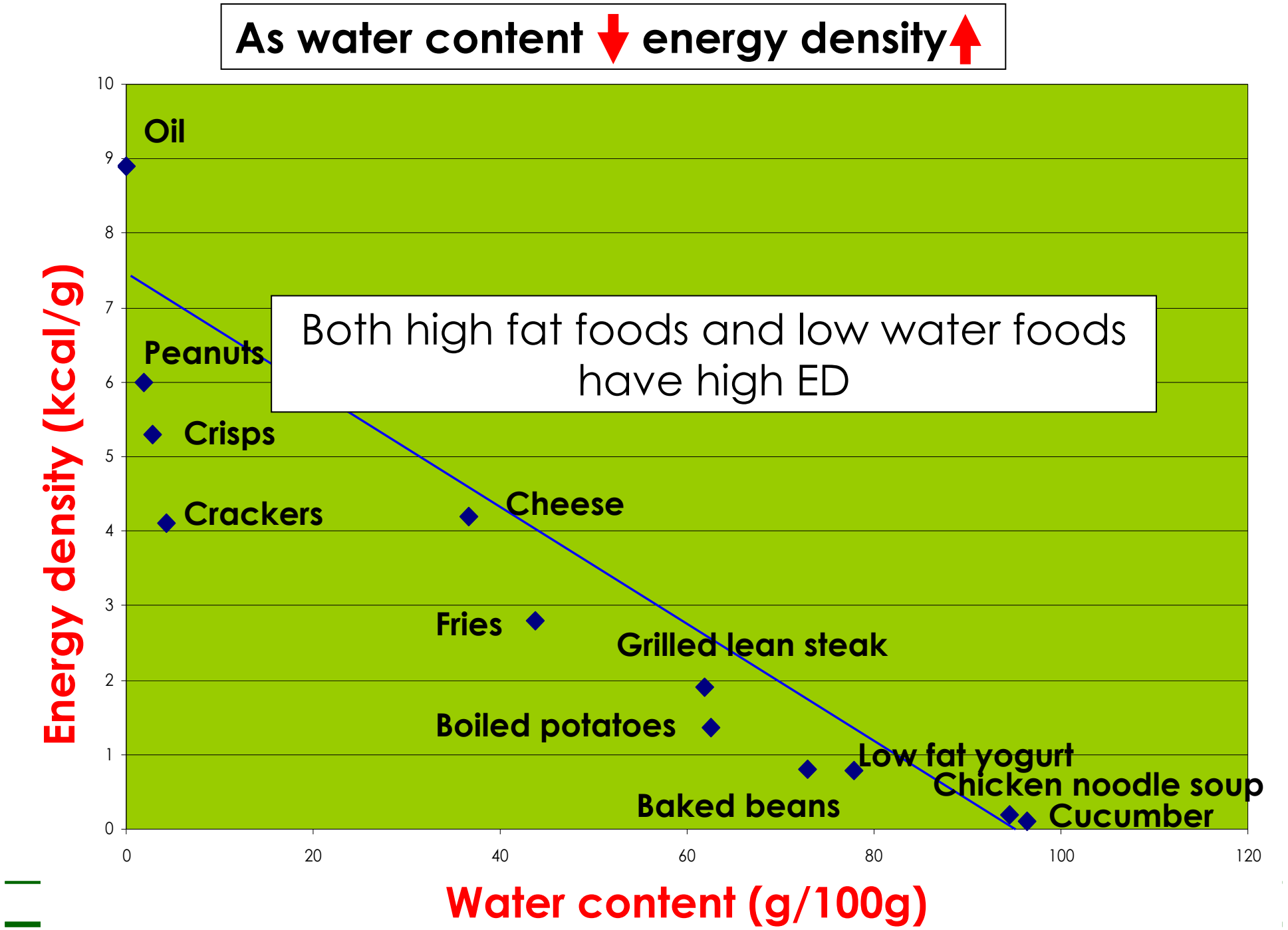
Anything we eat/drink can affect satiety.

- Protein – often enhances satiety.
- Fibre – particular types enhance satiety.
- Liquids – depends on mode of consumption.
- **Energy density – major factor in determining satiating effect of foods.**

Energy density

$$\text{Energy density} = \frac{\text{Energy (kcal or kJ)}}{\text{Weight (g)}}$$

- Affected by the amount of:
  - water;
  - fat;
  - dietary fibre.


As water content ↓ energy density ↑
Energy density (kcal/g)
Water content (g/100g)
Both high fat foods and low water foods have high ED
Oil
Peanuts
Crisps
Crackers
Cheese
Fries
Grilled lean steak
Boiled potatoes
Low fat yogurt
Chicken noodle soup
Baked beans
Cucumber
0
1
2
3
4
5
6
7
8
9
10
0
20
40
60
80
100
120

Energy density

A B

200g 400g

Both portions of macaroni and cheese contain 330kcals.

B has a lower energy density.

B contains wholewheat pasta, skimmed milk and low-fat cheese. It also uses less butter and cheese and boosts its volume with vegetables, such as, spinach and tomatoes.

Other examples

525kcal Main courses

Spaghetti Bolognese with whole-wheat spaghetti, added vegetables and lean mince	Spaghetti Bolognese with standard mince, bacon and cheese
	
Energy Density 0.8kcal/g	Energy Density 1.9kcal/g

215kcal Desserts

Mixed berries with low fat yoghurt granola and honey	Strawberries and cream
	
Energy Density 0.7kcal/g	Energy Density 1.6kcal/g

Food for a day: same energy content – different energy density

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Energy density = 2.3

Energy density = 0.52

The lower the energy density, the bigger the portion (Rolls 2009)

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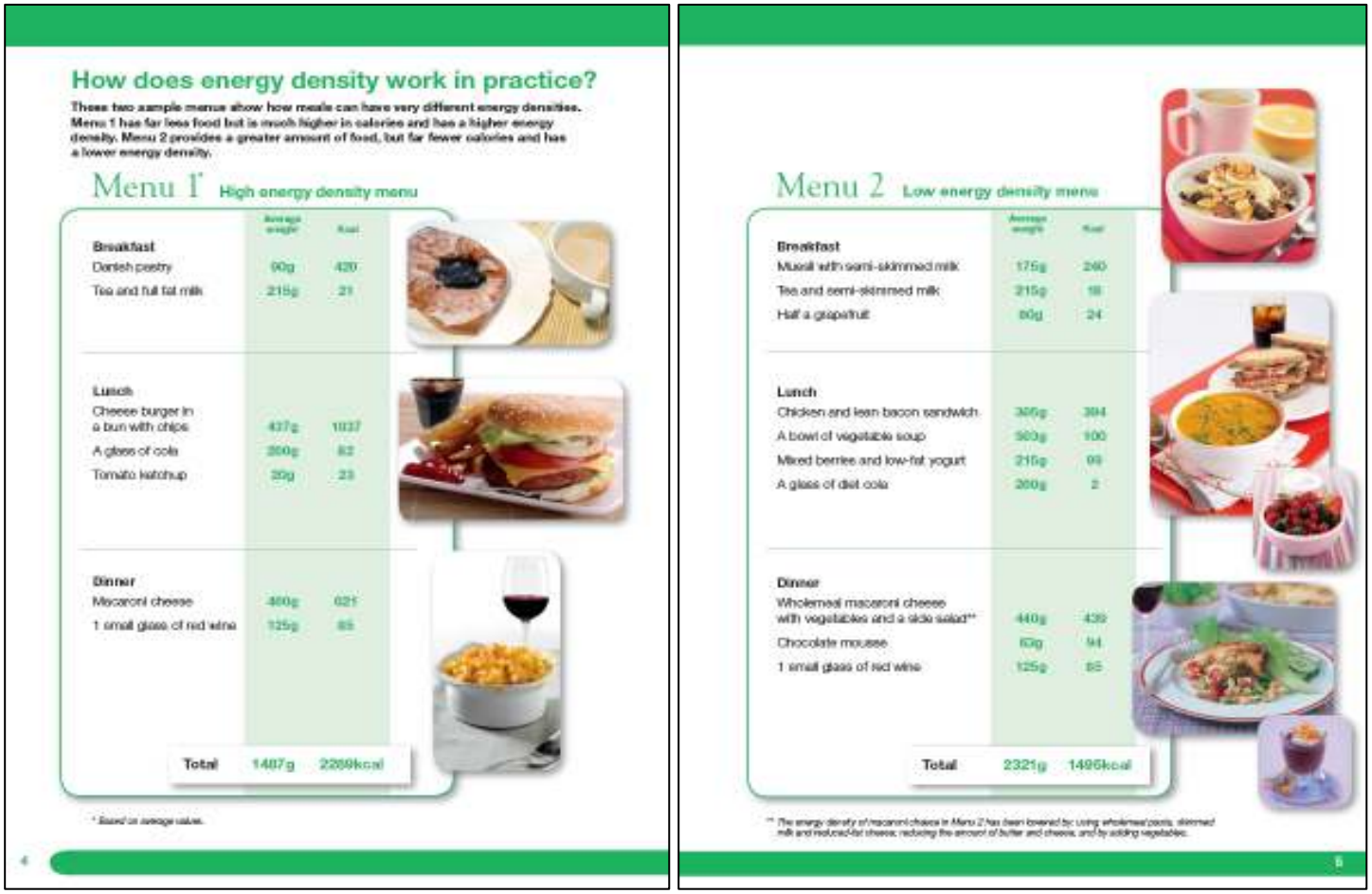
www.nutrition.org.uk/nutritioninthenews/fuller/feed-yourself-fuller-chart

Eat more, lose weight leaflet

www.nutrition.org.uk/nutritioninthenews/fuller/eat-more-lose-weight

Eat more, lose weight leaflet



How does energy density work in practice?

These two sample menus show how meals can have very different energy densities. Menu 1 has far less food but is much higher in calories and has a higher energy density. Menu 2 provides a greater amount of food, but far fewer calories and has a lower energy density.

Menu 1* High energy density menu

	Average weight	Kcal
Breakfast		
Danish pastry	90g	420
Tea and full fat milk	215g	21
Lunch		
Cheese burger in a bun with chips	437g	1037
A glass of cola	200g	82
Tomato ketchup	20g	23
Dinner		
Macaroni cheese	460g	621
1 small glass of red wine	125g	85
Total	1487g	2269kcal

* Based on average values.

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Menu 2 Low energy density menu

	Average weight	Kcal
Breakfast		
Muesli with semi-skimmed milk	175g	240
Tea and semi-skimmed milk	215g	18
Half a grapefruit	80g	24
Lunch		
Chicken and lean bacon sandwich	305g	384
A bowl of vegetable soup	503g	100
Mixed berries and low-fat yogurt	215g	99
A glass of diet cola	200g	2
Dinner		
Wholemeal macaroni cheese with vegetables and a side salad**	440g	439
Chocolate mousse	60g	94
1 small glass of red wine	125g	85
Total	2321g	1495kcal

** The energy density of macaroni cheese in Menu 2 has been lowered by: using wholemeal pasta, skimmed milk and reduced-fat cheese, reducing the amount of butter and cheese, and by adding vegetables.

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Energy density: 1.54kcal/g 0.64kcal/g

Energy density explained

Podcast

Part 1: www.youtube.com/watch?v=22jpeCD3He4

Part 2: www.youtube.com/watch?v=NGf6R1Ncsqc

Red meat in the diet

- Consumption
- Nutritional content
- Effects of red meat on health and chronic disease
- Sustainability issues

How much red meat should we eat?

- Report "*Iron and Health*" (SACN 2010) led to new guidance on eating red and processed meat from the Department of Health (Feb 2011).
- Adults who eat >90g red and processed meat a day should reduce their intake to 70g a day on average.
- 42% men and 12% women consume >90g a day (NDNS 2000/01).

Nutritional content of red meat

- High biological value protein.
- Important micronutrients essential for good health.
- Most healthy, balanced diets will include lean meat.

Meat, fish, eggs, beans and other non-dairy sources of protein

Energy content of red meat

- Energy provided in meat is variable.

- Meat from all sources contributes to 18% of total energy intake and red meat contributes to 12% of total energy intake (NDNS 2008/09).

- Meat contains:
  - virtually no carbohydrate;
  - principally protein: 17kJ (4kcal) per gram;
  - variable fat: 37kJ (9kcal) per gram.

Macronutrient content of red meat

Energy, fat and protein content of lean and untrimmed cuts of red meat (per 100g)

Meat (barbecued or grilled)	Energy (kcal)	Fat (g)	Protein (g)
Rump steak – lean	176	5.7	31.2
Rump steak – lean and fat	**203**	**9.4**	29.5
Leg joint of lamb – lean	210	9.6	30.8
Leg joint of lamb – lean and fat	**236**	**13.0**	29.7
Loin chops of pork – lean	186	6.8	31.1
Loin chops of pork – lean and fat	**255**	**15.8**	28.3

Source: Chan et al., 1995

Macronutrient intakes vs. recommendations

As % of food energy	Recommendations	Men		Women	
		Previous survey	2008/09	Previous survey	2008/09
Total fat	35%	35.5%	35.5%	34.7%	34.7%
Saturates (SFAs)	11%	13.3%	13.0%	13.2%	12.6%
Monounsaturates (MUFAs)	13%	12.0%	12.8%	11.4%	12.3%
n-6 polyunsaturates (PUFAs)	Minimum 1%	5.3%	5.2%	5.3%	5.3%
n-3 polyunsaturates (PUFAs)	Minimum 0.2%	1.0%	1.1%	1.0%	1.1%
Trans fat	Less than 2%	1.2%	0.8%	1.1%	0.8%

Source: National Diet and Nutrition Survey 2010

Fat content of red meat

- Fat supplies a rich source of energy and essential nutrients, e.g. fat-soluble vitamins and essential fatty acids.
- Fatty acid composition of red meat depends on whether or not the species is ruminant.
- Lean red meat contains similar proportions of MUFAs to SFAs.
- Lean meat is relatively higher in PUFA and lower in SFA compared with untrimmed meat.
- Trimming fat off meat will help lower the proportion of SFA as visible fat is higher in SFA.

Saturated Fatty Acids in red meat

Main SFAs present are:

- palmitic acid (C16:0) } Shown to ↑ cholesterol levels
- stearic acid (C18:0) } No effect on cholesterol levels

- Minor amounts of
  - myristic acid (C14:0)
  - lauric acid (C12:0)

  } Shown to ↑ cholesterol levels more potently than C16:0

Monounsaturated Fatty Acids (MUFAs) in red meat

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- Lean beef has similar proportions of SFAs and MUFAs.
- Main MUFA present is oleic acid (C18:1).
- About 30-40% of fat in meat is composed of MUFAs.

Polyunsaturated Fatty Acids (PUFAs) in red meat

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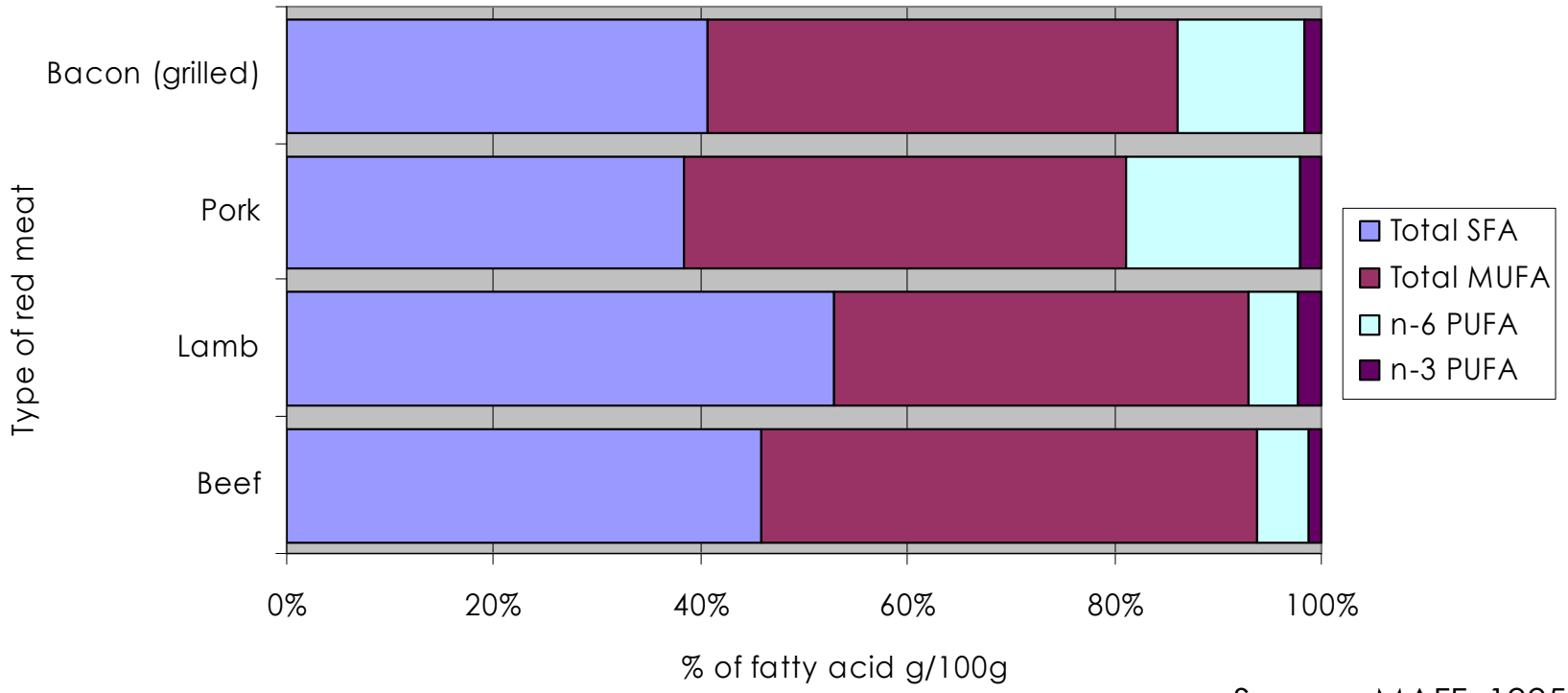
- The main PUFAs in red meat are the essential fatty acids linoleic (*n*-6) and alpha-linolenic acid (*n*-3)
- Intakes of *n*-6 are within recommended ranges, but intakes of *n*-3 could be improved.
- Ingested *n*-3 → long chain PUFAs (EPA and DHA).
- Intakes of long chain PUFAs have been associated with decreased risk of atherosclerosis, heart attack, cancer etc.
- Meat makes an important contribution to long chain *n*-3 for those who eat little or no oily fish.
- Meat & meat products (incl. poultry) provide 18% of *n*-6 PUFAs & 17% of total *n*-3 PUFAs (NDNS 2000/01).

Typical fatty acid composition (lean only, cooked)

Meat from the ruminant species, such as cows and sheep, contain proportionately more SFAs compared with other types of red meat.



Source: MAFF, 1995

Changes in fat content of red meat

- Advances in food processing technologies, breeding programmes, changes in animal feeds and modern butchery techniques have led to a decrease in fat content of carcase meat.
- Ongoing research on reducing total fat and improving the fatty acid composition of red meat.
- Oil seeds (linseed/rapeseed) in feed can increase the proportion of PUFAS (long chain n-3 fatty acids).
- Grass-fed ruminants have higher levels of PUFAS.

Micronutrient composition of meat

- Meat contains a range of micronutrients (vitamins and minerals).
- According to EU legislation Regulation (EC) No.1924/2006:

* when a serving (100g/100ml) provides 15% of the EU Recommended Daily Allowance (RDA) it can be considered "a source of".

* foods contributing 30% of the EU RDA, can be classed as "a rich source of".

Micronutrient composition of meat

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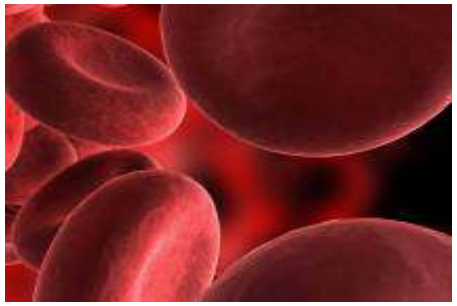
Nutrient per 100g	Beef	Lamb	Pork	Calf liver
Vitamin A				Rich source
Vitamin B_1			Rich source	Rich source
Vitamin B_2	Source		Source	Rich source
Vitamin B_3	Rich source	Rich source	Rich source	Rich source
Vitamin B_{12}	Rich source	Rich source	Rich source	Rich source
Iron	Source			
Zinc	Rich source	Rich source	Source	Rich source
Selenium			Source	Rich source
Potassium	Source	Source	Source	Source
Phosphorus	Source	Source	Source	Rich source

≥ 15% of the RDA per 100g = *Source;* ≥ 30% of the RDA per 100g = *Rich source*

Minerals in red meat



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- High bioavailability.
- Iron - important as an oxygen carrier in blood and myoglobin in muscle. Also required for many metabolic processes.
- Zinc - essential for cell division, growth and repair. Also necessary for normal reproductive development, healthy immune system, healing wounds.
- Red meats provides 12% iron for men and 9% for women.
- Red meats provides 32% zinc for men and 27% women.
- Low iron and zinc intakes in teenage girls.

Vitamins in red meat

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Meat and animal products are the only foods that naturally provide Vitamin B_{12}.

Low status vitamin D is increasing in the UK.

Oily fish is main source (only 27% population eat oily fish) therefore meat is important source.

Meat – a summary

- Meat and meat products can make an important contribution to nutrient intakes in the diet.

- Within the context of a healthy, varied diet lean red meat contributes protein, long chain *n*-3 fatty acids, and micronutrients such as iron, zinc, selenium and vitamin D and vitamins B_3 and vitamin B_{12}).

- Some of these nutrients are more bio-available in meat than alternative food sources, and some have been identified by SACN as being in short supply in the diets of some sections of the population (SACN 2008).

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For further information, visit:

www.nutrition.org.uk
www.foodafactoflife.org.uk