What’s your beef?

Red meat in the diet

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Outline

• Types of red meat
• Consumption patterns
• Red meat as part of the diet
• Nutrient content of red meat
• Health aspects of red meat in the diet
• Sustainability issues
• Summary
Types of meat

Meat = The muscles from animals, poultry and game.

CARCASS – beef, veal, lamb, mutton and pork

POULTRY – chicken and turkey

PROCESSED MEAT – meat that has been preserved in anyway other than freezing (e.g. salting, smoking, heating) ham, bacon, tinned meat and salami

GAME – venison, pheasant and rabbit

Offal = The organs (e.g. liver and kidney)
Consumption patterns - Global

• Wide variation globally
• Globally, men tend to have higher total and red meat intakes than women
• In Europe intakes were lowest in Greece (55g/day in men and 31g/day in women) and highest in Spain (127g/day in men and 67g/day in women)
Consumption patterns - UK

- Average daily intake in UK:
  - 96g men
  - 57g women

- Total meat consumption (red + white) in males and females in all age groups has increased over the last decade (NDNS data)

Source: Defra 2010
How much meat should we eat?

A portion of meat = 80g (roughly the size of a pack of cards)

The World Cancer Research Fund (WCRF) recommends no more than 500g per week, (around 6 portions)
Nutrient content of 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
What is the main macronutrient we gain from meat?

1. Fat
2. Protein
3. Carbohydrate
Energy content of meat

Energy provided of meat is variable

Meat contains

- virtually no carbohydrate
- principally protein - 17kJ/4kcal per g
- variable fat - 37kJ/9kcal per g (↑ fat content=↑ energy)

‘Total meat’ - 18% of total energy intake in adults
‘Red meat’ – 12% of total energy intake in adults

(NDNS 2008/09 data)
Protein content of meat

• Primarily for growth, maintenance and repair of the body

• Also provides energy

• Protein is made up of lots of amino acids, 8 of which are essential, as the body cannot make them.

• Protein from animal meats contain the full range of essential amino acids required from diet.
Protein content of meat

• Lean meat contains a higher proportion of protein
• Red meat contains on average
  – 20-24g of protein per 100g (raw)
  – 27-35g of protein per 100g (cooked)
• When meat is cooked water content ↓ and nutrients become more concentrated so protein ↑

• In most developed countries average protein intakes for all age groups are above requirements
• Reference Nutrient Intake for adults: 55g/day (men), 45g/day (women)
• The average daily intake of protein in the UK is 88g for men and 64g for women which is more than sufficient
Fat

- Richest source of energy and should be consumed in moderation
- But – fat provides fat soluble vitamins and essential fatty acids
- 3 main types of fat in meat
  - Intermuscular fat (between the muscles)
  - Intramuscular fat (‘marbling’ within the muscles)
  - Subcutaneous fat (visible fat below the skin)
- Fat content varies widely in red meat depending on the cut and whether fat has been trimmed off.
- Lean meat generally has between 5 and 10% fat
- Type of fat important, rather than total amount of fat
Fatty acid composition

• Different fatty acids have different effects on blood cholesterol and risk of heart disease
• In meat, the fatty acid composition is dependent on whether the species is ruminant
• Ruminant animals e.g. beef, lamb usually contain a higher level of saturated fatty acids, Non-ruminant meat e.g. pork usually has a higher unsaturated fatty acid content
• Trimming the fat off will also reduce the SFA content
Which meat generally contains the most saturated fatty acids?

1. Beef
2. Pork
3. Lamb
Fatty acid composition

Typical fatty acid composition % of g/100g of different types of red meat (lean only, cooked)

Source: MAFF, 1995
Changes in the fat content of red meat

• Advances in food processing technologies, breeding programmes, changes in animal feeds and modern butchery techniques have led to a ↓ in fat content of carcass meat
• In the UK, fat content has been ↓ by >30% for pork, 15% for beef, and 10% for lamb over past 15 years

• Current research on reducing total fat and improving the fatty acid composition of red meat
• To increase proportion of MUFA and PUFA (Long chain n-3 fatty acids).
# Nutritional variation in red meat

<table>
<thead>
<tr>
<th>Nutrient (per 100g)</th>
<th>UK lean Beef</th>
<th>UK lean Lamb</th>
<th>UK lean Pork</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (kJ)</td>
<td>542</td>
<td>639</td>
<td>519</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>22.5</td>
<td>20.2</td>
<td>21.8</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>4.3</td>
<td>8.0</td>
<td>4.0</td>
</tr>
<tr>
<td>SFA (g)</td>
<td>1.7</td>
<td>3.5</td>
<td>1.4</td>
</tr>
<tr>
<td>MUFA (g)</td>
<td>1.9</td>
<td>3.1</td>
<td>1.5</td>
</tr>
<tr>
<td>PUFA (g)</td>
<td>0.2</td>
<td>0.5</td>
<td>0.7</td>
</tr>
</tbody>
</table>
Micronutrient composition of meat

Meat contains a range of micronutrients (vitamins and minerals)

According to EU legislation:

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”
# Micronutrient composition of meat

<table>
<thead>
<tr>
<th>Nutrient per 100g</th>
<th>Beef</th>
<th>Lamb</th>
<th>Pork</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin B1 (thiamin)</td>
<td>-</td>
<td>-</td>
<td>Rich source</td>
</tr>
<tr>
<td>Vitamin B2 (riboflavin)</td>
<td>Source</td>
<td>-</td>
<td>Source</td>
</tr>
<tr>
<td>Vitamin B3 (niacin)</td>
<td>Rich source</td>
<td>Rich source</td>
<td>Rich source</td>
</tr>
<tr>
<td>Iron</td>
<td>Source</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Zinc</td>
<td>Rich source</td>
<td>Rich source</td>
<td>Source</td>
</tr>
<tr>
<td>Selenium</td>
<td>-</td>
<td>-</td>
<td>Source</td>
</tr>
<tr>
<td>Potassium</td>
<td>Source</td>
<td>Source</td>
<td>Source</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>Source</td>
<td>Source</td>
<td>Source</td>
</tr>
</tbody>
</table>

> 15% of the RDA per 100g = *Source*; > 30% of the RDA per 100g = *Rich source*
Processed meats and meat products

• In general processed meats and meat products are more likely to contain a higher content of sodium than lean meat.

• Sodium enhances & modifies the flavour, physical properties and helps preserve the food product.

• However they can provide extra nutrients not typically found in meat (carbohydrate, fibre).
Possible nutrient deficiency of non meat eaters

- Minerals from meat have a much higher bioavailability than those from plant sources.

- Zinc in meat is very bioavailable, so non meat eaters need to eat much more zinc to achieve the same levels.

- Iron in meat is predominantly haem-Iron.

  This is much easier for the body to absorb than the non-haem iron found in plant sources.
What % of girls aged 11-18y have iron intakes below the LRNI?

1. 12-24% = Children aged 1.5 to 3.5 years

2. 44-48%

3. 25-40% = Women aged 19 to 49 years
Possible nutrient deficiency of non meat eaters

Non meat eaters are at a higher risk of deficiency in:

Vitamin $\text{B}_{12}$, Vitamin D, Iron and Zinc

Meat and animal products are the only foods that naturally provide Vitamin B12

Vitamin D deficiency is increasing in the UK as people are staying out of the sun to avoid skin cancer. This has increased the importance of meat as a source of vitamin D
Health aspects of red meat in the diet
Red meat and cancer

The most studied cancer in relation to red and processed meat intake is colorectal cancer.

Other cancer sites that have been investigated in relation to meat include stomach, lung, pancreas, oesophagus, endometrium and breast.

Colorectal cancer: possible link between intake of meat (especially processed meats) and increased risk of colorectal cancer

Other cancer sites: inconclusive
Red meat and Cardiovascular disease

• Red meat contains saturated fatty acids, a high intake of which can increase risk of CVD

• Red meat contains other fatty acids (PUFAs and MUFAs) and important micronutrients that may decrease risk of CVD

• Lean red meat can be promoted as part of a healthy diet for CVD prevention
Red meat and obesity

• Vegetarians tend to weigh less than non-vegetarians.

• This may be due to various dietary and lifestyle factors as vegetarians generally adopt healthier behaviours.

• Higher protein meals and diets may make you feel fuller for longer than those with lower protein content.

• Moderate intakes of lean red meat can form part of a healthy diet along with plenty of starchy carbohydrates and fruit & veg, which will promote weight loss and maintenance of a healthy weight.
Meat and sustainability

- Increasing pressure on global livestock sector to increase production & productivity to meet rising demand of growing population
- Agriculture sector is worlds largest user of natural resources (land & water)
- Methane emissions by cattle – reduced by animal’s diet

A complex issue!!

Social, economic & environmental issues to consider along with nutritional contribution of red meat to a healthy diet
Summary

Meat is a good source of protein
Meat and meat products can make an important contribution to nutrient intakes in the diet
Some of these nutrients are more bioavailable in meat sources than other foods
Non–meat eaters are at an increased risk of some micronutrient deficiencies, so need to ensure they compensate for this in their diet
One portion of meat is around the size of a pack of cards
Most healthy balanced diets will include lean meat in moderate amounts, together with starchy carbohydrates (including whole grain foods), plenty of fruit and vegetables, and moderate amounts of milk and dairy foods
Future eSeminars

• * Monday 28 February - 4.00pm - 4.30pm, *The role of sugar in food* presented by Dr. Julian M. Cooper

• * Thursday 17 February - 12.30pm - 1.00pm, *Omega 3 Fatty Acids and Heart Disease - Just another fishy story?* presented by Professor Parveen Yaqoob

• * Wednesday 16 March 2011 - 12:30pm - 1:00pm, *Diet and the immune system* presented by Professor Philip C. Calder