



FIVE A WEEK

How much red meat should we be eating?



Contents:

Page

Foreword: Portion distortion and mixed messages	4
Section 1: Alarming insights on consumer confusion	6
Section 2: Processed explained	8
Section 3: Why red meat matters	10
Section 4: Hands up for portion proficiency	16
Section 5: Mind the nutrient gaps	19
Last word	20

Introducing MAP

The Meat Advisory Panel (MAP) is a group of independent scientists and health professionals tasked to provide objective and evidence-based information about red meat and its role as part of a healthy, balanced diet. MAP is funded by an educational grant from the Agriculture and Horticulture Development Board (AHDB). The members of MAP are:



DR CARRIE RUXTON BSC, PHD.
Dietitian



PROFESSOR ROBERT PICKARD BSC, PHD, CBIOL, FSB, RNUTR.
Scientist



MR ROGER LEICESTER OBE, FRCS.
Bowel cancer specialist



DR GILL JENKINS BM, DRCOG, DFFP, BA.
Practising GP



DR EMMA DERBYSHIRE BSC, PHD.
Public Health Nutritionist

www.meatmatters.redmeatinfo.com

Foreword: Portion distortion and mixed messages

CONSUMER confusion around the benefits of red meat could be affecting the nation's health and driving an epidemic of iron deficiency, backed up by the government's own research on diet.¹

As a result, experts, myself included, are now calling for clarity with a “**five-a-week**” of red meat message which states the nutritional benefits of red meat and provides simple strategies to help consumers become savvier on appropriate portion sizes.

The call for ‘five-a-week’ of red meat was born out of problems caused by the one-size-fits-all message to ‘eat less red meat’, promoted in the official Eatwell Guide.²

Contrary to claims that we eat too much red and processed meat, the National Diet and Nutrition Survey³ (NDNS) confirms that the average adult intake is just 65 grams a day — which is well within the recommended maximum of 70 grams (cooked weight) the government has been advocating since 2010.

This is also comfortably inside the World Cancer Research Fund (WCRF) advice to eat no more than 500g of cooked red meat a week⁴ and nowhere near the 90g a day which the Scientific Advisory Committee on Nutrition⁵ has flagged as too high.

What is particularly interesting is **the NDNS⁶ data reveal that, in fact, some groups are putting their health at risk because they do not eat enough iron-rich foods, such as red meat.**

The NDNS data shows that intakes of iron are particularly low for women and teenage girls, who are at high risk of iron deficiency and low iron stores, and would benefit from eating more iron-rich red meat. Given declining red meat intakes, it is not surprising that a widespread lack of iron continues to be a concern.⁷ The ‘five-a-week of red meat’ advice is therefore a much needed, digestible message.

For example, more than a quarter (27%) of women aged 19 to 64 and almost half (48%) of girls aged 11 to 18 are not getting enough of this essential mineral.⁸ Mixed messages on healthy eating, particularly on whether to cut down on red meat, appears to drive these inadequate intakes.

The number of women failing to achieve the minimum intake of iron recommended for good health has leapt by 17% in just two years and, over the same period, their consumption of iron-rich red meat has dropped by 13%.⁹ On average, girls aged 11 to 18 now eat just 56g of red meat a day, and women aged 19 to 64 consume an average of 47g a day.

The contradictory information available makes it hard for people to make the right dietary choices.

In fact, research for the Meat Advisory Panel shows that consumers put as much weight on dietary advice from unqualified celebrity chefs, bloggers and wellness gurus as they do from dietitians and government campaigns.¹⁰

We know, however, that red meat is the richest and most readily absorbed source of iron and zinc in the British diet and a significant provider of protein. It delivers useful amounts of B-vitamins, vitamin D, zinc, selenium and other important nutrients and can also be useful for weight management as it has a high protein content.

This report provides a much needed rethink on current health messaging and offers simple strategies to enable consumers to become portion proficient and provides evidence-based advice to cut through the confusion around the potential risks, and proven benefits of red meat.

**Dr Emma Derbyshire,
Meat Advisory Panel (MAP)**



**Red meat
is the richest
and most readily
absorbed source of
iron and zinc in the
British diet and a
significant provider
of protein**

Section 1: Alarming insights on consumer confusion

What constitutes a healthy diet? It's a simple enough question, but a recent survey of 2,000 adults for the Meat Advisory Panel, found that although half (49%) say they try to stick to a healthy, balanced diet, 'healthy' has a host of different interpretations.


Seven out of ten adults (70%) think it's 'eating lots of fresh fruit and vegetables' and a similar number say it means 'ensuring you have a good mix of nutrients in the diet'. Almost half (46%) believe it's all about 'having a balance between healthy and less healthy foods' and two out of five (43%) put the emphasis on portion control.

Perhaps not surprisingly, just over half (53%) of those questioned wished they understood more about nutrition. Simple, authoritative advice is clearly needed.

Red meat is undeniably a good source of protein and iron, and provides useful amounts of a number of other nutrients. Yet a third of vegans (33%) and a similar number of vegetarians (30%) mistakenly believe it has NO health benefits. A quarter of pescetarians, who eat fish but not meat, are also unaware of the nutritional benefits of red meat.

Three out of five people who included red meat in their diets recognised it as a source of iron, but only one in five vegans (20%) acknowledged this.

Almost a third of women (30%) would not include beef, pork or lamb if they were making a 'healthy' meal for themselves — despite the fact that the NDNS shows that around a similar proportion (27%) have inadequate body stores of iron and would benefit from eating more red meat.



Almost a third of women would not include beef, pork or lamb if they were making a 'healthy' meal for themselves

Lack of iron can lead to tiredness, poor concentration, palpitations, breathlessness and other problems,¹¹ yet more than a quarter of the women (27%) surveyed have reduced their intakes because of misplaced health concerns, even though **two out of five (40%) underestimated how much they could eat.**¹²

In all, half the adults surveyed (51%) had no idea how much is 'too much' when it comes to red meat and only 6% of those questioned — a mere one in 17 people — knew that the government's recommended maximum intake of red meat is 70g a day (cooked weight).

Yet, despite this widespread lack of awareness, one in four people questioned (24%) reported they have omitted or cut back on red meat in their diet, and almost a third (29%) thought they should be eating less red meat.

And meat is not the only food which consumers are restricting. A quarter of those surveyed (23%) thought they should reduce their intake of dairy products, a similar number (26%) thought they should reduce their intake of potatoes while one in ten (10%) wanted to cut down on egg consumption.



“It’s clear that consumers are confused, and it is very worrying that so many seem to be cutting back on perfectly healthy foods”

Professor Robert Pickard

Curiously, vegetarians were most likely to want to reduce their intakes of dairy foods and eggs, despite the fact that both are rich sources of protein and, unlike any vegetable source, provide all the amino acids needed by the human body.¹³

Professor Robert Pickard, from MAP, says: **“It’s clear that consumers are confused, and it is very worrying that so many seem to be cutting back on perfectly healthy foods, such as red meat, dairy products and carbohydrates in the mistaken belief that excluding or rationing entire food groups is good for their health.”**

Section 2: Processed explained

The Meat Advisory Panel survey exposed glaring gaps in consumers' understanding of what is considered red meat and what counts as processed. And that's a worry as experts agree that the potential risks of eating a diet high in red meat (i.e. more than 90g per day) are much lower than those associated with processed meats.¹⁴

Red meat includes beef, lamb, pork, veal, venison and goat, while processed meat refers to any meat which has been preserved by smoking, curing, salting or adding preservatives. This includes smoked or cured sausages (not fresh), ham, bacon, salami and pâtés.¹⁵

But the survey found that almost half those questioned classified bacon (47%) and ham (43%) as fresh red meat when they are in fact processed meats, while just over half (52%) did not realise pork is considered a red meat and 46% made the same error with veal.

Beef was the meat most widely recognised (88%) as red, but not when it comes in a bun. Although burgers and mince are classified as fresh red meat as they are not smoked, preserved or cured, four out of five consumers wrongly thought they were processed meats.¹⁶

Professor Robert Pickard: **"There is a huge difference when looking across the range of processed meats. How can you possibly compare a budget banger, which is probably high in fat and bulked up with all sorts of starch and additives, with high quality products like parma ham or prosciutto?"**

WHAT'S THE RISK?

In 2015, The International Agency for Research on Cancer (IARC) warned that eating 50g of processed meat a day increases the risk of bowel cancer by 18% — but Professor Sir David Spiegelhalter, Professor of the Public Understanding of Risk at Cambridge University says the magnitude of risk needs to be put into perspective.

He explains: **"Around six in every 100 people would be expected to get bowel cancer in their lifetime. If all 100 people ate a three rasher bacon sandwich every single day of their lives, then according to this report we would expect that 18% more would get bowel cancer, which is a rise from six cases to seven cases. However, according to the National Diet and Nutrition Survey (NDNS), the average red and processed meat intake in adults is 71 grams (86 grams in men and 56 grams in women)¹⁷.**

"So that's just one extra case of bowel cancer in all those 100 lifetime bacon eaters."¹⁸



Section 3:

Why red meat matters

Red meat is a nutrient dense food¹⁹, providing an important source of protein, iron and other vital nutrients in the UK diet. Yet some population groups are falling short of the recommended minimum intakes of several of these key nutrients and this goes in hand with worrying gaps in the nation's nutrition knowledge. Here is a summary of the key nutrients that red meat and red meat products provide whilst highlighting the knowledge gap.

Packed with protein

Protein is essential for growth and tissue repair,²⁰ and red meat provides more than THREE times the protein per gram as vegetable sources. Depending on the cut, red meat will deliver an average of 27 to 35gs of protein per 100g,²¹ while beans and lentils provide just 9g per 100g.^{22,23}

Red meat protein also contains useful amounts of each of the **nine amino acids we need for good health** as do a variety of vegetarian sources to ensure adequate intakes.²⁴ The MAP research reveals however that:

- Only three out of five adults identify red meat as a source of protein
- Awareness is particularly low among vegans (49%) and vegetarians (52%).

Protein is particularly important for anyone who works out as it's essential for building and maintaining muscle. If intense workouts are coupled with inadequate intakes of protein it can lead to catabolism, a negative spiral of unpleasant side effects characterised by fatigue, joint and muscle pain, and disturbed sleep.²⁵

As we get older, a plentiful supply of protein combined with resistance training can help head off muscle wasting, known as sarcopenia, which occurs naturally with age.



VITAMIN D-LIGHT

We synthesise most of the vitamin D in our bodies from sunshine, but from October to March the sun is at the wrong angle for this process to occur.

As a result, lack of vitamin D is the most common nutrient deficiency in the UK, with one in five adults (19%) having blood concentrations below 25nmol/L²⁶ — which the Scientific Advisory Committee on Nutrition recognises as the threshold for deficiency based on bone health. This has led to a population-wide dietary recommendation of 10 micrograms of vitamin D daily.

However experts believe this falls well short of the amounts needed for general health, and the European Food Safety Authority recently set a blood level of 50nmol/L as optimal for health and a dietary recommendation of 15 micrograms per day.²⁷

Red meat is one of the few natural dietary sources of vitamin D, however research shows a lack of understanding:

- Only 7% of those surveyed knew that red meat is a source of vitamin D
- Awareness was highest in meat eaters (8%) and lowest among vegans (3%) and vegetarians (5%)

Vitamin D promotes calcium absorption, so it's essential for strong bones, but it has also been shown to support immune function and reduce inflammation and risk of falls in elderly people.²⁸ There is emerging evidence that it protects against bowel, prostate and breast cancers, type 2 diabetes, high blood pressure and multiple sclerosis.²⁹

IRON OUT

After vitamin D, the most common nutrient deficiency in the UK is iron, which is essential for energy. **Red meat is by far the most useful source of iron in the UK diet**, providing a fifth of our intake — more than adults and teenagers get from breakfast cereals, which are routinely fortified with iron.³⁰

Yet only half (53%) the adults surveyed by MAP recognised the role of iron in supporting energy:

- **Women, who have the highest need for iron, were more knowledgeable than men (57% vs 49%)**
- **Awareness was worst among vegans at 20% compared to 58% of red meat eaters.**

How to B good

Red meat provides a number of B vitamins, which are important for blood and the nervous system and are needed to release energy from carbohydrates.

One of the most important is **vitamin B12**, which is found only in animal-based foods such as red meat, fish, eggs and dairy products, and some foods made with microbes.^{31,32} It is crucial for the production of blood cells, so shortfalls can lead to a type of anaemia.

B vitamins play a part in heart health via the regulation of homocysteine, a blood metabolite that has been linked to cardiovascular disease.³³ Low levels of vitamin B12 are also associated with Alzheimer's disease, breast cancer, blocked arteries and depression.³⁴ What's more, on average, just under a third of our intake comes from red meat and red meat products.³⁵ Vegans, who are most likely to be deficient in vitamin B12, were the least likely to identify red meat as a source with 14% compared to 30% of pescatarians and 22% of vegetarians, who are also at risk.

Red meat is an important provider of other B vitamins. Around 20% of the average UK intake of **vitamin B1**, also known as thiamin, thiamin, comes from red meat, especially pork.³⁶

Riboflavin, or **vitamin B2**, is found in red meat as well and is needed for growth and helps maintain the integrity of mucous membranes, skin, eyes and nervous system.

- **The latest NDNS data shows that adults get 16% of their riboflavin intake from red meat and red meat products³⁷**
- **However the MAP survey found only 13% of**

adults acknowledged red meat as a source of riboflavin

- **Pescatarians were the most likely to know red meat provides riboflavin (19%) while awareness was lowest among vegans (8%) and vegetarians (10%).**

It's estimated that beef, lamb and pork provide 34% of our intake of **vitamin B3**.³⁸ This vitamin is proven to lower cholesterol and appears to protect against dementia.³⁹ Lamb and pork also provide pantothenic acid, also known as **vitamin B5**, which helps release energy from food.^{40,41} It also supports digestive health and regulates cholesterol.⁴²


Last but not least, red meat delivers around 20% of our average intake of **vitamin B6**. This vitamin is involved in protein metabolism and production of the oxygen transporter, haemoglobin,⁴³ as well as mood enhancing chemical messengers including serotonin and norepinephrine.⁴⁴ Clinical trials confirm that it benefits women with premenstrual syndrome.⁴⁵

A-WAY TO MAINTAIN IMMUNITY AND HEALTH

Vitamin A, also known as retinol, is important for immune function, vision and reproduction.⁴⁶ It also supports cell growth and is critical for maintenance of the heart, lungs, kidneys and other organs.⁴⁷

Red meat and red meat products provide 14% of average adult intakes, but only 12% of consumers surveyed identified red meat as a source. The poll also revealed wide variations in knowledge, with three times as many vegans than red-meat-eaters (11% vs 31%) acknowledging red meat as a source of vitamin A.





**Red meat
also provides
potassium which
is needed for
growth, building
muscle and
supporting
normal blood
pressure**

Minerals and red meat

As well as iron, there are several other mineral benefits in red meat and red meat products:

ZINC LINK

Zinc is important for normal development of several natural killer (NK) cells and cytokines which are at the frontline of the immune system, promoting healing and playing a role in processing carbohydrates, fat and protein in food.^{48,49}

Whilst fish is often first to come to mind for zinc, red meat is a much bigger provider in the UK diet because so few people choose to eat fish. On average, adults get just 4% of their intake from fish and fish dishes, compared to 17% from red meat and red meat products.

PHOSPHORUS FOR US

Next to calcium, which is found in small amounts in red meat, it is phosphorus which is the most abundant mineral in the human body. Like calcium, it's important for healthy bones and teeth.⁵⁰ It helps filter waste from the kidneys, supports energy storage, makes DNA and RNA and helps the body balance and access other vitamins and minerals.

Beef, pork and lamb are a source of **potassium** which is needed for growth,

building muscle and supporting normal blood pressure. Potassium plays a part in the function of all nerve cells as does copper, which in combination with iron, helps formulation of red blood cells.

All types of red meat provide **magnesium**, which helps regulate the contraction and relaxation of muscles as well as **selenium**, which protects against oxidative damage and supports the immune system.⁵¹

Pork provides selenium, a trace element which is important for immune function, reproduction and the prevention of cell damage.⁵² Its role in DNA repair and cell death have led to suggestions that it may help prevent cancer, and there is an association between low levels of selenium and a higher risk of some tumours. However, trials using supplements have yielded conflicting results.⁵³

Once again, the MAP consumer survey found patchy awareness of the minerals that red meat can provide:

- **Only one in eight (12%) could name red meat as a source of magnesium**
- **Just 10% realised it provides potassium**
- **And a mere 5% were aware it could provide selenium.**

Section 4: Hands up for portion proficiency

Although meeting the recommended 5-a-day portions of fruit and vegetables continues to be a challenge, there is no doubt that the guidelines have created universal awareness.

Now experts are proposing a parallel strategy to improve awareness of the important role that red meat can play as part of a healthy diet and provide consumers with much needed guidance on appropriate portion sizes.

Independent dietitian and a member of MAP, Dr Carrie Ruxton says: **“It’s clear that many consumers don’t have a clue when it comes to the government’s recommendations on intakes of red meat and well-meaning warnings about the potential risks of eating very large amounts are now contributing to nutrient deficiencies in some at-risk groups.**

“The new Eatwell Guide has added to the problem with a simplistic topline message to ‘eat less red meat’ which flies in the face of the facts. Average intakes are well within the recommendation of up to 70g per day and the ongoing problem of iron insufficiency in young children, girls and women suggests that some groups should be eating more red meat, not less. Instead, the ‘eat less’ message should be targeted at those groups eating more than 90g a day, such as men.”

Just over half the consumers (51%) questioned for the MAP survey admitted they did not know how much red meat government guidelines recommend, and of those who thought they knew the amount, nine out of ten (89%) were wrong.⁵⁴

Consumers were far more likely to underestimate the amount of red meat that can be eaten — 85%⁵⁵ compared to 15% who nominated amounts above the recommended 70g a day. Women, who are most in need of some of the nutrients red meat provides, were the most likely to opt for amounts below the guidelines.

Curiously, in some cases, consumers who were confident they were familiar with the guidelines were also the most likely to be wrong. Two out of three vegans thought they knew the recommended intake, but only 3% gave the correct answer.⁵⁶ By contrast, 11% of consumers who included red meat in their diet, gave the right answer, as did 12% of those who ate meat, but not red meat.

As public health nutritionist Dr Emma Derbyshire warned in an evidence review published in the journal *Complete Nutrition*: “Encouraging all population groups to ‘Eat less red and processed meat,’ as the current Eatwell

Guide does, is not helpful and places UK women at further risk of iron insufficiency and iron deficiency anaemia.”⁵⁷

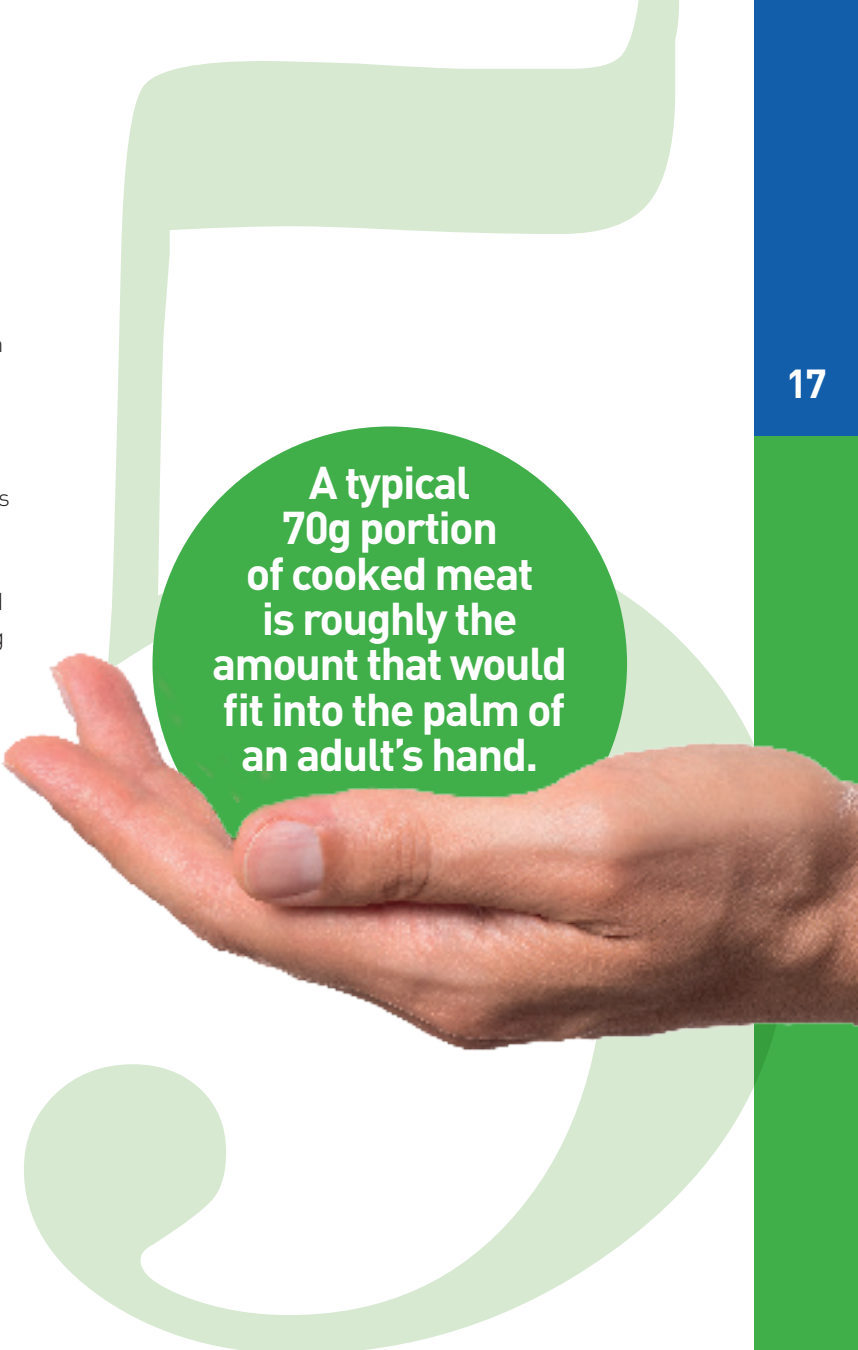
Gauging ‘how much’ we can eat is confounded by the differing weights of cooked and raw meats — the WCRF estimates 500g of cooked meat is the equivalent of around 700g to 750g of raw meat,⁵⁸ making the government’s recommended 70g of cooked meat the equivalent of around 90g of raw meat.

Uncertainties about whether or not to include bones in the weights, the thickness of the cut and different ways meat is packaged only adds to the confusion.


That’s why you literally have to hand it to the experts behind the proposed five-a-week advice because a typical 70g portion of cooked meat is roughly the amount that would fit into the palm of an adult’s hand.

Dr Carrie Ruxton says: **“Very few people have the time or inclination to weigh out foods, so it’s far more useful to provide consumers with clear visual cues rather than vague and often meaningless ‘more’ or ‘less’ message.”**

Dr Derbyshire adds: **“When it comes to cuts of varying thickness, another way to gauge appropriate portions is to think in terms of the size of a deck of cards.”**

A photograph of a hand holding a green circle. The hand is positioned at the bottom right, with fingers slightly curled. The green circle is centered in the upper middle of the page. The background features a large, light green, stylized graphic element that resembles a speech bubble or a large letter 'G'.

**A typical
70g portion
of cooked meat
is roughly the
amount that would
fit into the palm of
an adult’s hand.**



70% of teenage girls were deficient in iodine and a further 18% had very low levels⁶¹

Section 5: Mind the nutrient gaps

A number of experts have criticised recent changes to the Eatwell Guide, the government's guide to the mix of foods recommended for a healthy balanced diet, and there is certainly cause for concern.

Supporting information with the original Eatwell Plate gave meat and fish as the first protein options in healthy eating messaging,⁵⁹ and both featured prominently in the official visual representation of the plate. However, the latest guide puts beans and pulses ahead of meat and the accompanying graphic includes more examples of plant proteins. This was to encourage people to eat more fibre and achieve the new challenging recommendation of 30g of fibre a day. However, it could have unintended consequences for iron intakes.

As red meat is the most readily absorbed source of iron in our diet, the shift is at odds with the epidemic levels of iron deficiency which are being seen among girls and women. Catherine Collins, of the British Dietetic Association, describes the substitution of some animal proteins for plant proteins without factoring in protein quality as a “valid criticism”.

The original plate advised that 15% of our diet should come from milk or dairy foods, but the latest version cuts this by half and includes dairy ‘alternatives’ — despite the fact that some alternatives have much lower levels of calcium.⁶⁰

Milk and dairy foods are also a good source of iodine, which is essential for thyroid function and pregnancy. A study which measured iodine levels in 737 teenage girls from nine UK cities found that 70% were deficient in iodine and a further 18% had very low levels.⁶¹

Professor Robert Pickard says: **“It is very unfortunate that the new Eatwell Guide does not address these clear and present risks of dietary deficiency for vulnerable groups in our population.**

“The evidence is clear, red meat and milk both provide important nutrients which millions of people are lacking in their diet. We should be encouraging increased intakes, not muddling messages on what constitutes a healthy balanced diet.”

Last word

In a post-truth world, where consumers are just as likely to take dietary advice from celebrities and social media stars as they are from government experts, it's perhaps no wonder that risk of nutrient deficiencies now go hand in hand with the demonisation of particular food groups.


Consumers are right to be concerned about eating very large quantities of red and processed meat (stated as above 90g a day by SACN), but the reality is the vast majority of people are not eating anywhere near the amounts which appear to be problematic, and many women and children are eating very little red meat.

And while it's true that four in ten men, according to Government experts, are eating in excess of the recommended amount, it's women who are heeding the 'eat less red meat' message and potentially putting their health at risk as a result.

Dr Carrie Ruxton says: **"A healthy diet is all about balance, and advice on healthy eating should focus on getting the right balance between known benefits and potential risks. There is no such thing as a 'bad' food, but there is no doubt that excluding entire food groups from the diet is a major risk for nutrient adequacy.**

"A diet built around five-a-week servings of red meat, and simple visual aids on appropriate portion sizes, is now desperately needed to counter the myth and misinformation which is driving unbalanced diets and risk of iron deficiency."

Dr Emma Derbyshire adds: **"A five-a-week red meat message, combined with easy to remember 'hands on' advice on portion sizes, will provide consumers with the sensible, evidence-based advice they so clearly need. Lastly, red meat is a key part of the human diet and it should be a regular component of everyone's diet."**



"Advice on healthy eating should focus on getting the right balance between known benefits and potential risks"

Dr Carrie Ruxton



References

1. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/551352/NDNS_Y5_6_UK_Main_Text.pdf
2. <http://www.nhs.uk/Livewell/Goodfood/Pages/the-eatwell-guide.aspx>
3. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/551352/NDNS_Y5_6_UK_Main_Text.pdf
4. <http://wcrf-uk.org/uk/preventing-cancer/ways-reduce-cancer-risk/red-and-processed-meat-and-cancer-prevention>
5. www.sacn.gov.uk/pdfs/sacn_iron_and_health_report_web.pdf
6. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/551352/NDNS_Y5_6_UK_Main_Text.pdf
7. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/551352/NDNS_Y5_6_UK_Main_Text.pdf 5.7
8. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/551352/NDNS_Y5_6_UK_Main_Text.pdf
9. 47g in 2016 to 54g in 2014. NDNS_Y5_6_Trend_Tables_Final_Tables_only_040816 PDF provided, table 7.5
10. OnePoll survey of 2,000 adults aged 18 to 65 conducted in November 2016
11. <http://www.nhs.uk/Conditions/Anaemia-iron-deficiency-/Pages/Introduction.aspx>
12. Q 17, total of 30g - 60g answers
13. <https://www.hsph.harvard.edu/nutritionsource/what-should-you-eat/protein/>
14. https://www.iarc.fr/en/media-centre/pr/2015/pdfs/pr240_E.pdf
15. <http://www.nhs.uk/Livewell/Goodfood/Pages/red-meat.aspx>
16. <http://scienceblog.cancerresearchuk.org/2015/10/26/processed-meat-and-cancer-what-you-need-to-know/>
17. Scientific Advisory Committee on Nutrition (2010) Iron and health www.sacn.gov.uk/pdfs/sacn_iron_and_health_report_web.pdf
18. <http://www.sciencemediacentre.org/xpert-reaction-to-iarc-classification-of-processed-meat-as-carcinogenic-to-humans-group-1-and-red-meat-as-probably-carcinogenic-to-humans-group-2a/>
19. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/551352/NDNS_Y5_6_UK_Main_Text.pdf
20. <http://www.nhs.uk/Livewell/Goodfood/Pages/Healthyeating.aspx>
21. <http://meatandhealth.redmeatinfo.com/healthy-eating-the-seven-ages-of-man/red-meat-and-nutrition.aspx>
22. <https://ndb.nal.usda.gov/ndb/foods/show/4767?manu=&fgcd=&ds=>
23. <https://ndb.nal.usda.gov/ndb/foods/show/2999?manu=&fgcd=&ds=>
24. <https://medlineplus.gov/ency/article/002222.htm>
25. Complete Nutrition; November 2015; Ruxton C and Cobb R. Benefits of protein for sport and exercise
26. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/551352/NDNS_Y5_6_UK_Main_Text.pdf
27. <http://www.sciencemediacentre.org/expert-reaction-to-new-sacn-recommendations-on-vitamin-d/>
28. <https://ods.od.nih.gov/factsheets/VitaminD-HealthProfessional/>
29. <https://ods.od.nih.gov/factsheets/VitaminD-HealthProfessional/>
30. <https://ods.od.nih.gov/factsheets/VitaminA-HealthProfessional/table> 6.13c
31. <http://meatandhealth.redmeatinfo.com/healthy-eating-the-seven-ages-of-man/red-meat-and-health-factsheets/red-meat-and-b-vitamins.aspx>
32. <http://www.nhs.uk/Livewell/Vegetarianhealth/Pages/Vegetarianhealthqanda.aspx#B12>
33. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4326479/>
34. <http://www.mayoclinic.org/drugs-supplements/vitamin-b12/evidence/hrb-20060243>

35. <http://meatandhealth.redmeatinfo.com/healthy-eating-the-seven-ages-of-man/red-meat-and-health-factsheets/red-meat-and-b-vitamins.aspx>
36. <http://meatandhealth.redmeatinfo.com/healthy-eating-the-seven-ages-of-man/red-meat-and-health-factsheets/red-meat-and-b-vitamins.aspx>
37. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/551352/NDNS_Y5_6_UK_Main_Text.pdf
38. <http://meatandhealth.redmeatinfo.com/healthy-eating-the-seven-ages-of-man/red-meat-and-health-factsheets/red-meat-and-b-vitamins.aspx>
39. <https://medlineplus.gov/druginfo/natural/924.html>
40. <https://medlineplus.gov/druginfo/natural/853.html>
41. <http://www.nhs.uk/Conditions/vitamins-minerals/Pages/Vitamin-B.aspx#pantothenic>
42. <http://umm.edu/health/medical/altmed/supplement/vitamin-b5-pantothenic-acid>
43. <http://meatandhealth.redmeatinfo.com/healthy-eating-the-seven-ages-of-man/red-meat-and-health-factsheets/red-meat-and-b-vitamins.aspx>
44. <http://www.mayoclinic.org/drugs-supplements/vitamin-b6/background/hrb-20058788>
45. <http://ebm.bmj.com/content/4/6/182.full>
46. <http://www.nhs.uk/Conditions/vitamins-minerals/Pages/Vitamin-A.aspx>
47. <https://ods.od.nih.gov/factsheets/VitaminA-HealthProfessional/>
48. <http://www.nhs.uk/Conditions/vitamins-minerals/Pages/Other-vitamins-minerals.aspx#zinc>
49. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2277319/>
50. https://en.wikipedia.org/wiki/Composition_of_the_human_body
51. <http://meatandhealth.redmeatinfo.com/healthy-eating-the-seven-ages-of-man/essential-nutrients.aspx>
52. <http://www.nhs.uk/Conditions/vitamins-minerals/Pages/Other-vitamins-minerals.aspx#selenium>
53. <https://ods.od.nih.gov/factsheets/Selenium-HealthProfessional/>
54. 873 out of 983 responses
55. 744 out of 873 responses
56. 11 out of 339
57. Derbyshire E; Red meat — becoming portion savvy, CN Vol.16 No.5 November 2016
58. Derbyshire E; Red meat — becoming portion savvy, CN Vol.16 No.5 November 2016
59. <http://collections.europarchive.org/tna/20100927130941/http://food.gov.uk/healthiereating/eatwellplate/guidelines>
60. <https://www.iofbonehealth.org/osteoporosis-musculoskeletal-disorders/osteoporosis/prevention/calcium/calcium-content-common-foods>
61. Vanderpump M Lazarus J Smyth P Burns R Eggo M Han, T et al. Assessment of the UK iodine status: a national survey. Endocrine Abstracts. Presented at the Society for Endocrinology BES 2011: 11 April 2011-14 April 2011



FIVE A WEEK

How much red meat should we be eating?

