

Red meat and weight management

The prevalence of obesity in England has more than doubled in the last 25 years and by 2050 obesity is predicted to affect 60 per cent of adult men, 50 per cent of adult women and 25 per cent of children¹. Despite this rising trend and the fact that obesity cannot occur in the absence of an energy intake that is greater than energy output, the causes of obesity are not clearly understood.

It is now accepted that there are a combination of nutritional and non-nutritional factors that control food intake. Non-nutritional factors include palatability of food, portion size, sensory variety and meal patterns (e.g. snacking). The main nutritional factors are macronutrient (protein, fat and carbohydrate) composition and energy density. Several studies have compared the effects of the macronutrients, protein, carbohydrate and fat, and found that protein is the most satiating (Eisenstein 2002)².

However our understanding about appetite control and the role protein plays in this is accumulating. Numerous studies now indicate that higher protein diets, including lean red meat, are effective for weight loss and weight maintenance. Initially, the more popular, 'higher than usually recommended protein diets' were viewed with scepticism. This was in part due to the extremely low carbohydrate content (Johnstone et al 2008)³. A severe restriction of carbohydrate depletes glycogen stores producing ketosis which is not recommended (Astrup 2005)⁴.

Red Meat, Protein and Energy Intake

Red meat is a major source of protein, providing about 27-35 g/100 g of cooked beef, pork or lamb consumed. A number of studies have shown that consuming protein may reduce subsequent food or energy intake compared to carbohydrate or fat

¹ Foresight (2007)

² Eisenstein J, Roberts SB, et al. (2002). "High- protein weight-loss diets: are they safe and do they work? A review of the experimental and epidemiologic data." *Nutrition Reviews* 60(7): 189-200.

³ Johnstone AM, Horgan GW, et al. (2008). "Effects of a high-protein ketogenic diet on hunger, appetite and weight loss in obese men feeding ad libitum. ." *American Journal of Clinical Nutrition* 87: 44-55.

⁴ Arne Astrup *Am J Clin Nutr* (2005);82:1-2. Printed in USA. 2005 American Society for Clinical Nutrition. The satiating power of protein – a key to obesity prevention.

(Latner 1999, Stubbs 1999)⁵. Protein may also lengthen the time it takes for people to want to eat again, compared with carbohydrate and fat (Marmonier 2000)⁶. Increasing protein intake from 15% to 30% of energy has been shown to increase satiety and spontaneously decrease calorie intake (Weigle 2005)⁷.

Evidence suggests that in dietary practice, it may now be beneficial to replace refined carbohydrates with protein sources that are low in saturated fat, such as lean red meat (Halton and Hu 2004)⁸. Incorporating additional lean protein into a calorie-reduced moderate fat diet may improve satiety and palatability of the diet, thereby improving long-term compliance (Wilkinson 2004)⁹.

Satiety and Satiation

Satiation and satiety are part of the body's system of appetite control which has evolved to maintain a healthy weight. Satiety is the feeling of fullness that persists after eating, potentially suppressing further energy intake until hunger returns. Satiation is the process that leads to the termination of eating, which may be accompanied by a feeling of satisfaction.

Satiation affects how much is eaten at one sitting, whilst satiety influences the length of time until the next eating occasion and potentially how much is eaten then. Both satiety and satiation play a role in governing total energy intake and develop at different times during the process of eating and drinking.

Defining Higher Protein

A food is high in protein where at least 20% of the energy value of the food is provided by protein (European Parliament (2006)). Protein intakes are generally measured as a percentage of total energy.

⁵ Stubbs RJ *et al* Eur J Clin Nutr, 1999; 53 (1): 13-21.

⁶ Marmonier C *et al.* (2000); *Appetite*, 34(2): 161-8.

⁷ Weigle, D S *et al.*, (2005). A high protein diet induces sustained reductions in appetite, ad libitum caloric intake, and body weight despite compensatory changes in diurnal plasma leptin and ghrelin concentrations. *Am. J. Clin. Nutr.*, 82, 41-8

⁸ Halton T.L and F. B. Hu (2004). "The effects of high protein diets on thermogenesis, satiety and weight loss: a critical review." *Journal of the American College of Nutrition* 23(5): 373-385.

⁹ Wilkinson DL and McCargar L. *Best Practice & Clinical Gastroenterology*, 2004; 18(6): 1031-47.

In practice it is generally difficult to consume a diet containing less than 10% or greater than 35% of energy as protein. The European Union funded DiOGenes (Diet, Obesity, and Genes) study involves a long term dietary intervention trial aiming to address some of the issues on this topical subject and produce clearer science-based guidelines¹⁰.

It has been suggested that overweight and obese patients should be advised to increase their protein intakes from 10-20% to 20-30% of calories and reduce their intake of fat and carbohydrates correspondingly. If fat intake is fixed at 30% of calories, there is still room for carbohydrate to make up 40-50% of the calories. To support the diet changes, the researchers suggest replacing the following foods without reducing the intakes of fruit, vegetables and whole-grain products:

- Sugars from soft drinks with protein from low fat milk
- High-fat meats and dairy products with lower fat versions
- White bread and pasta with lean meat

Energy Density

As well as boosting protein intake to support weight management, it has been proposed that the concept of energy density is a useful alternative to counting calories. Calorie counting has been shown to be difficult to sustain owing to feelings of deprivation.

The energy density of a food represents calories per gram (or 100g) of food and determines how full we feel after eating. Lower energy density foods have been shown to make people feel fuller. Also people on lower energy density diets have been found to lose more weight than on standard low fat diets, without feeling hungrier, or restricting the total amount of food they eat (Benelam 2009)¹¹.

There are a variety of ways to reduce the energy density of the diet. For example, eating only small portions of fatty foods, increasing the water content of dishes, eating more fruits and vegetables, choosing higher-fibre foods and choosing lean sources of protein such as red meat will all contribute to reducing energy density.

¹⁰ Saris WHM, Harper A. DiOGenes: A multidisciplinary offensive focused on the obesity epidemic. *Obes Rev* 2005;6:175-6.

¹¹ Benelam B (2009). "Satiety, satiety and their effects on eating behaviour." *Nutrition Bulletin* 34(2): 126-173.

Cooking using the minimum amount of oil and including vegetables or pulses in meat recipes will help to reduce the energy density of the final dish.

A low energy density diet does not prohibit the consumption of higher energy dense foods. However, portion sizes of these should be kept small, or they should be eaten less frequently. Also, combining very low and medium energy density foods in a meal makes the food lower in energy density overall.

Categorising food by energy density

- Very low energy density foods (0-0.6kcal/gram) – eat big portions of these and use them to bulk out meals. Examples include; broccoli, carrots, mixed salad cucumber, vegetable soup, chicken noodle soup, oranges, apples, pears.
- Low energy density foods (0.6-1.5kcal/gram) – these foods make up most of what we eat and can be eaten in satisfying portions. Examples include; lean ham, boiled egg, baked potato, baked beans, banana, spaghetti Bolognese.
- Medium energy density foods (1.5-4.0kcal/gram) – these can be included in the diet, but the portion sizes should be controlled and eaten alongside lots of lower energy density foods. Examples include; lasagne, French fries, grilled steak, jam, grilled salmon, croissant.
- High energy density foods (4.0-9.0kcal/gram) – these can be included in the diet, but in small portions or eaten less frequently or swapped for lower energy density alternatives such as reduced fat spreads. Examples include; biscuits, cheese, chocolate, crisps, roasted peanuts, mayonnaise, butter, margarine, vegetable oil.

The table illustrates the protein and energy content of selected red meat cuts and dishes. Typically, when red meat is included in a recipe with other ingredients, such as vegetables, the energy density changes from medium to low.

Protein, calorie and energy density of red meat cuts

Cut	Protein/100g	Energy/calories Kcal/100g	Energy density Kcal/gram	Category
Roast beef	25.3	137	1.37	low
Minced beef	21.8	209	2.09	medium
Spaghetti Bolognese	7.8	129	1.29	low
Shepherds pie	6.0	112	1.12	low
Fillet steak	29.1	188	1.88	medium

grilled				
Stewing steak	32.0	185	1.85	medium
Beef casserole	15.1	136	1.36	low
Beef chow mein	6.7	136	1.36	low
Beef burger grilled	26.5	326	3.26	medium
Lamb chop grilled	28.3	221	2.21	medium
Lamb mince	24.4	208	2.08	medium
Moussaka	8.5	122	1.22	low
Lamb hotpot	7.2	108	1.08	low
Liver and onions	14.8	148	1.48	low
Pork fillet grilled	33.6	170	1.70	medium
Pork and apple casserole	10.9	99	0.99	low
Pork stir fry	12.1	105	1.05	low
Sweet & sour pork	13.7	135	1.35	low
Pork mince	24.4	191	1.91	medium
Back bacon grilled	23.2	287	2.87	medium
Pork sausages grilled	14.5	294	2.94	medium
Lean ham	21.2	132	1.32	low

Consuming high protein foods (from lean red meat as an example) and a lower carbohydrate diet whilst controlling energy intake has been found to facilitate weight loss and weight maintenance, when compared with consuming a diet of similar energy intake that is low in protein^{12,13}. This effect is thought to be due to the satiety-inducing effect of protein and its positive effects on lean muscle mass in humans.

Conclusion

Contrary to popular belief, lean red meat can play a positive role in weight loss and weight maintenance programmes. Lean red meat is a major source of protein which aids satiety. Some cuts of lean red meat and red meat dishes have a low energy density, which have been found to contribute to greater weight loss without creating a sensation of food deprivation.

Higher protein diets are effective for weight loss and weight maintenance as they assist with hunger management and appetite control. Overweight and obese

¹² Layman D et al . American Journal of Clinical Nutrition, 2008; 87: 1571S-1575S

¹³ Paddon-Jones,D et al. American Journal of Clinical Nutrition, 2008; 87: 1555S – 1561S.

patients should be advised to increase their protein intakes from 10-20% to 20-30% of calories and reduce their intake of fat and refined carbohydrates correspondingly. Together with an awareness of the energy density of the diet this can help improve dietary compliance.

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