Red meat and diabetes

Diabetes is a condition where the body's ability to produce or respond to the hormone insulin is impaired. This results in abnormal levels of glucose (sugars) in the blood as well as changes to how fats and carbohydrates are handled by the body. People with diabetes have a greater risk of heart disease as a consequence.

There are two types of diabetes; type 1 which has a genetic and/or infectious component and tends to be diagnosed in children and younger adults; and type 2 which is typically seen in middle aged adults and is strongly related to obesity and inactivity. Around nine in ten cases of diabetes in the UK are type 2[1].

Diabetes is a life-long condition which is managed with drugs, diet and lifestyle in order to maintain blood glucose levels within normal limits. It's estimated that 4.5 million people in the UK are living with diabetes[2].

Is there a link with red meat?

Several observational studies have identified a statistical link (called an association) between high red meat consumption and development of type 2 diabetes. However, in other studies, no associations have been found, creating a lack of consistency in the evidence.

A systematic review published in 2015[3] reported on a total of 23 studies which explored links between red meat and type 2 diabetes. While most studies found a statistical association with high intakes of processed meats, the link with fresh red meat was absent[4] or much weaker, especially when body weight was taken into account. Associations tended to be seen when red meat consumption exceeded 600g per week, which is well above UK government recommendations for red and processed meat (no more than 500g per week[5]) as well as current average intakes in the UK (476g per week in adults[6]).

[1] http://www.nhs.uk/Conditions/Diabetes-type2/Pages/Causes.aspx
[2] https://www.diabetes.org.uk/Documents/Position%20statements/DiabetesUK_Facts_Stats_Oct16.pdf
[3] Derbyshire & Ruxton (2015) Nutrition & Food Science 45: 524-541.
[4] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2885952/
[5] https://www.gov.uk/government/publications/sacn-iron-and-health-report
[6] Bates, B et al. (2016) National Diet and Nutrition Survey, years 5-6. London: PHE/FSA.

Association is not cause

Statistical associations simply mean that one factor is associated with another, but it doesn't tell us anything about <u>cause</u>. For example, studies show that people who watch a lot of TV are more likely to have a heart attack[7] but clearly TV viewing doesn't actually cause this to happen. Instead, it is more likely that regular TV viewers are less physically active and have unhealthy diets. In the same way, statistical associations between red meat and type 2 diabetes could simply mean that high meat consumers tend to have other lifestyle characteristics that impact on diabetes risk, such as being smokers and overweight, or having less healthy diets that are low in plant foods and high in sugary drinks.

In the same way, consumers who avoid meat often have other characteristics that lower diabetes risk, such as high vegetable intakes, avoidance of alcohol and smoking, and higher physical activity levels. This is relevant to the research on meat and diabetes since several studies have focussed on vegetarians, or Seventh Day Adventists who follow a strict lifestyle for religious reasons.

What do we mean by risk?

The statistical risks reported in studies need some explanation as, while they look rather alarming, they represent <u>relative</u>, not absolute, risk.

As reported in the Harvard magazine in 2012[8], eating red meat every day was associated with an 18% (1.18) increase in type 2 diabetes risk in American adults, while eating processed meat daily (e.g. bacon, hot dog) was associated with a 51% risk (1.51). So, what does this mean?

The average 10-year risk of getting type 2 diabetes is around 10%[9]. So, an 18% <u>relative</u> increase would alter this figure to 11.8% over 10 years, i.e. a boost of 1.8% in <u>absolute</u> risk. This is a very small contribution compared with obesity which has a relative risk of 500% (5.00) and would boost absolute risk of diabetes by 50%. Even lower socio-economic status represents a relative risk of 40% (1.40) which would boost absolute risk of diabetes by 4%[10].

[7] https://www.theguardian.com/science/2010/jan/11/watching-television-increases-death-heart-disease

[8] http://harvardmagazine.com/2012/01/a-diabetes-link-to-meat

[9] http://harvardmagazine.com/2012/01/a-diabetes-link-to-meat

[10] www.gov.uk/government/uploads/system/uploads/attachment_data/file/338934/Adult_obesity_and_type_2_diabetes_.pdf

So, even with daily red meat consumption, the theoretical risk is tiny compared with obesity, family history of the condition, and social deprivation. Indeed, as a Diabetes UK position statement notes[11]: "*Obesity is the most potent risk factor for type 2 diabetes. It accounts for 80–85% of the overall risk of developing type 2 diabetes and underlies the current global spread of the condition*".

Why would red meat influence diabetes risk?

This is where the argument that red meat causes type 2 diabetes falls down. Scientists have not been able to agree on any mechanism to explain why eating a lot of red meat would affect the body's ability to handle carbohydrates. Theories have included saturated fat, inflammation, iron, cholesterol and animal protein[12]. Yet, no firm evidence supporting any of these has been put forward. Indeed, a trial where 60 participants ate more than 200g of red meat daily for 8 weeks (more than double the UK recommendation) found <u>no impact</u> on inflammatory markers[13]. Until more concrete evidence on mechanisms is made available, the statistical link between red meat and type 2 diabetes, as reported in observational studies, should be viewed as speculative.

Intervention studies on red meat and diabetes risk

Randomised controlled trials are the gold standard of studies and a few have looked at the issue of red meat and diabetes.

In a study of 43 adults[14], half with impaired glucose tolerance (pre-diabetes), a meal containing red meat produced a similar glucose and insulin response after three hours compared with a meal based on dairy foods, when carbohydrate content was kept constant. This shows that meat and dairy meals behave in a similar way in the short-term.

A longer study in 47 overweight adults[15] found that four weeks on a *low* red meat/high dairy diet <u>reduced</u> insulin sensitivity (i.e. increased diabetes risk) compared with a *high* red meat/low dairy diet. The authors were surprised as this conflicted with observational studies which had shown an advantage for the low meat/high dairy diet. The whey protein in dairy foods may have been to blame, while the red meats chosen were lean and, thus relatively

[11] https://www.diabetes.org.uk/Documents/Position%20statements/DiabetesUK_Facts_Stats_Oct16.pdf
[12] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3942738/
[13] https://www.ncbi.nlm.nih.gov/pubmed/17237312
[14] https://www.ncbi.nlm.nih.gov/pubmed/26675776
[15] http://ajcn.nutrition.org/content/101/6/1173.long#F2

low in fat. This study also showed no differences in C-reactive protein between the diets indicating no impact on inflammation from following a high meat diet. Again, this finding is in contrast to theories blaming red meat for inflammation.

A trial in 59 obese adults with type 2 diabetes[16] revealed similar metabolic effects when participants followed a meat-free diet high in cereal fibre and coffee versus a high red meat diet (>150g per day) which was low in fibre and coffee-free. This was contrary to the expectations of the researchers who expected the meat-free diet to perform better. Participants on both diets lost body fat and slightly improved insulin sensitivity, thus improving their condition. A marker of inflammation improved only on the meat-free diet.

In conclusion

Observational studies linking red meat and type 2 diabetes make an easy headline and seem to suggest an alarming risk when red meat is consumed regularly. However, firm evidence on mechanisms is lacking and associations are often made null when body weight is accounted for. This suggests that high red meat consumption is acting as a marker for an unhealthy lifestyle rather than representing a cause of the condition. Such a view is backed up by randomised controlled trials which show no negative impact of red meat intake on markers of glucose control (blood glucose, insulin) as well as body weight and inflammation, even when the intakes of red meat are well above recommended amounts.

It is therefore highly unlikely that red meat *per se* has any clinical impact on risk of type 2 diabetes, or management of the condition. People who enjoy eating red meat can safely continue to do so, and should be advised to choose lean cuts as these are lower in fat, saturated fat and calories. Maintaining a healthy body weight remains the single most important factor in the fight against type 2 diabetes.

Please visit www.meatandhealth.com for more information.

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[16] https://www.ncbi.nlm.nih.gov/pubmed/25425219