Nutrition and Climate Change: Major issues confronting the meat industry

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PREFACE

Meat consumption is increasing around the world and meat contributes importantly to most people's daily requirements of protein, iron and other essential nutrients. Yet global meat production is presently facing two serious challenges. The first is the criticism that meat consumption is unhealthy, because of its contribution to saturated fat intake and the second is the allegation that meat production contributes disproportionately to greenhouse gas emissions and global warming.

This book, the proceedings of the recent Langford Food Industry Conference, presents the latest information on meat's role in nutrition and human health and examines the arguments surrounding the effects of meat production on the environment. It shows how animal science is developing new production systems which will improve the healthiness of meat and reduce greenhouse gas emissions, including organic meat production. The case for ruminant and other meats as sources of *n*-3 fatty acids in the human diet is presented. Factors affecting the demand for meat are discussed along with the challenges facing legislators on climate change issues. The final chapter considers the increasing importance of world trade in meat and the need for meat industries around the world to work more closely together on nutrition and climate change issues.

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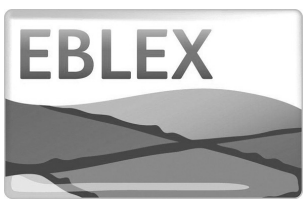

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NUTRITIONAL ASPECTS OF RED MEAT IN THE DIET

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Abstract

This paper provides a summary of the nutritional content of red meat in the diet. Meat and meat products can make an important contribution to nutrient intakes in the diet. Red meat contains high biological value protein and important micronutrients, all of which are essential for good health throughout life. Red meat provides a number of vitamins and minerals including iron, zinc, selenium, phosphorus, potassium, vitamin D and B vitamins. Meat also contains a range of fats. Meat is a source of fat and saturated fat, and processed meats are more likely to have a higher content of sodium than lean meat. However, meat also contains the essential omega-3 (*n*-3) and omega-6 (*n*-6) polyunsaturated fatty acids. In recent years animal husbandry techniques have been modified to produce meat with a more favourable fatty acid profile and modern butchery techniques and advances in food processing technologies have led to a reduction in the fat content of carcase meat. The composition of different types of meat varies widely. For example, lean red meat is low in total fat, saturated fat and salt, whereas untrimmed meat is higher in both total fat and saturated fat. 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. The Food Standards Agency's 'Eatwell Plate' shows how much of the overall diet should come from each food group.

Introduction

There is a wide variety of meat consumed throughout Europe reflecting the different consumer habits and attitudes.

- Carcass meat (beef and veal, lamb and mutton, and pork)
- Poultry (chicken, turkey)

Table 1. Comparison of selected nutrients in beef, lamb and pork (per 100 g) according to food composition databases from selected countries

	UK	*Denmark*	*Finland*	*Italy*	*Australia*	*USA*
Beef, lean, raw						
Energy (kJ)	542	647	639	455	528	526
Protein (g)	22.5	21.1	19.3	21.6	23.0	21.0
Fat (g)	4.3	7.8	8.4	2.4	3.6	4.0
SFA (g)	1.7	3.3	4.0	0.8	1.5	1.4
MUFA (g)	1.9	3.7	1.9	0.8	1.6	1.6
PUFA (g)	0.2	0.3	0.4	0.5	0.35	0.2
Niacin (mg)	9.7	10.0	10.4	5.1	4.1	6.2
Thiamin (mg)	0.1	0.05	0.09	0.11	0.04	0.08
Vitamin B_{12} (µg)	2.0	1.4	1.4	2.0	1.1	1.5
Iron (mg)	2.7	2.1	2.5	1.6	2.0	1.8
Zinc (mg)	4.1	4.8	4.0	3.8	4.2	3.9
Selenium (µg)	7.0	6.8	15.1	5.6	12.0	26.0
Sodium (mg)	63.0	65.0	51.5	43.0	49.0	54.0
Potassium (mg)	350.0	325.0	317.0	334.0	360.0	323.0
Lamb (leg), lean, raw						
Energy (kJ)	639	704	767	510	628	536
Protein (g)	20.2	20.1	19.0	20.0	22.0	20.6
Fat (g)	8.0	9.8	12.0	4.6	7.0	4.5
SFA (g)	3.5	4.5	4.2	2.2	2.0	1.6
MUFA (g)	3.1	3.6	3.4	1.7	2.7	1.8
PUFA (g)	0.5	0.8	0.4	0.2	1.0	0.4
Niacin (mg)	5.4	7.5	8.4	4.9	5.6	6.2
Thiamin (mg)	0.1	0.2	0.2	0.1	0.1	0.1
Vitamin B_{12} (µg)	2.0	1.2	1.2	2.0	1.0	2.7
Iron (mg)	1.4	1.5	1.9	2.0	2.0	1.8
Zinc (mg)	3.3	3.4	2.3	3.1	4.0	3.8
Selenium (µg)	4.0	1.4	13.5	18.0	13.8	23.5
Sodium (mg)	70.0	66.0	58.0	100.0	63.0	62.0
Potassium (mg)	330.0	218.0	240.0	350.0	325.0	289.0
Pork, lean, raw						
Energy (kJ)	519	784	669	658	461	602.0
Protein (g)	21.8	20.0	20.6	21.3	23.5	21.2
Fat (g)	4.0	12.0	8.6	8.0	1.7	5.9
SFA (g)	1.4	4.8	3.2	3.7	0.6	2.0
MUFA (g)	1.5	5.4	3.4	2.5	0.7	2.7
PUFA (g)	0.7	0.9	1.0	1.5	0.3	0.6
Niacin (mg)	6.9	7.3	8.9	3.0	9.5	4.8
Thiamin (mg)	1.0	0.8	1.0	0.8	1.0	1.0
Vitamin B^{12} (µg)	1.0	0.7	0.6	1.0	0.3	0.7

meat products (including poultry) contribute 40% and 37% of average daily protein intakes in men and women respectively aged 19-64 years (NDNS, 2008/9 data).

Fat and fatty acids

Fat provides the richest dietary source of energy and also supplies essential nutrients such as fat-soluble vitamins and essential fatty acids, but should be consumed in moderation to prevent excessive weight gain. Fat also provides palatability and flavour to foods. There is growing evidence that it is the type of fat rather than the total amount of fat, which is particularly important for cardiovascular disease (Stanner, 2005). It is well recognised that different fatty acids have different effects on blood cholesterol levels and risk of heart disease, some beneficial and some adverse.

Fat in meat is present as intermuscular fat (between the muscles), intramuscular fat (or marbling *i.e.* within the muscles) and subcutaneous fat (below the skin). The fat content of red meat varies widely, depending on the type of red meat, the cut and the degree of trimming (Higgs, 2000). In some countries, meat with a low fat content is classified as 'lean meat'. Although there is no international definition of lean meat, lean meat generally has between 5 and 10% fat (Williamson *et al.*, 2005).

Recommendations on the percentage of food energy provided by the various types of fatty acids, and the current average intakes in adults in the UK are provided in Table 4 below.

Table 4. Recommendations and intakes of different fatty acids in the UK diet

Fat	*Recommendations (% Food Energy)*	*Men*		*Women*	
		2000/01	*2008/09*	*2000/01*	*2008/09*
Total fat	35	35.5	35.5	34.7	34.7
Saturates	11	13.3	13.0	13.2	12.6
Monounsaturates	13	12.0	12.8	11.4	12.3
n-6 polyunsaturates	Minimum 1%	5.3	5.2	5.3	5.3
n-3 polyunsaturates	Minimum 0.2%	1.0	1.1	1.0	1.1
Trans fat	<2	1.2	0.8	1.1	0.8

Source: Henderson *et al.* (2003); SACN 2007a; Bates *et al.* (2010)

A number of other Government initiatives have had a direct impact on red and more particularly processed meat. The Salt Reduction Programme and more recently the Saturated Fat Campaign have urged the meat industry to reformulate red meat dishes and processed meat products. Nutrient standards and nutrient specifications in public sector catering settings, such as schools, care homes and hospitals have also driven industry reformulation programmes.

In this challenging climate the International Meat Secretariat (IMS) set up the Human Nutrition and Health Committee (HNHC) comprised of nutritionists working for the meat industry around the world. Nutrition and health issues are not viewed as a competitive issue and so working in collaboration ensures that industry defence against negative publicity can be co-ordinated and consistent messages based on sound science can be reinforced globally.

Introduction

The ongoing promotion of red and processed meat as part of a healthy balanced diet is continually being challenged by negative media coverage. Recent tracking figures suggest that pork has attracted the most negative publicity and lamb the least (Figure 1).

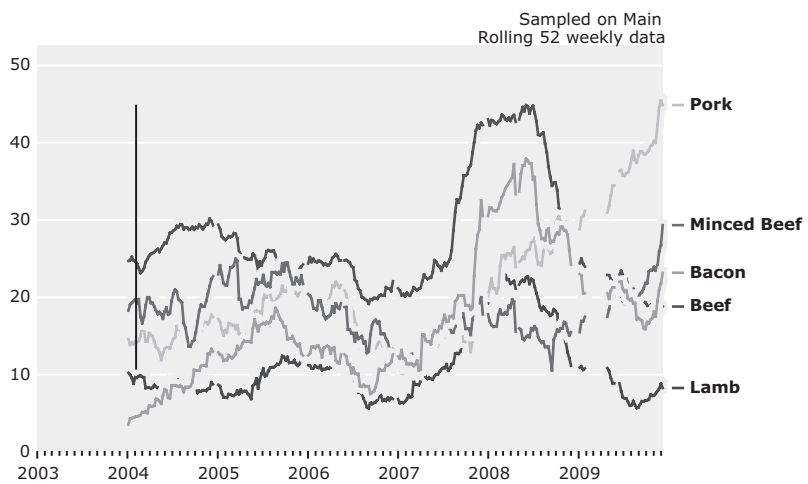

Figure 1. PR coverage - % of negative comments.

of someone's diet - such as eating meat - to prove it has caused obesity. Furthermore, higher protein diets have gained popularity as a successful approach to weight loss and maintenance.

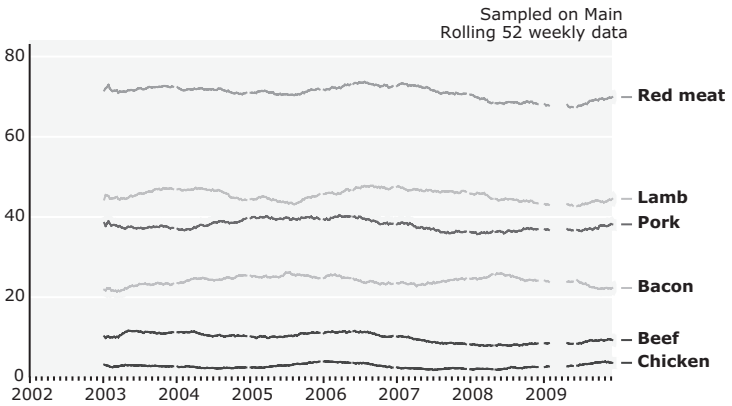

Figure 3. Image of meat as too fatty (% of respondents).

Recently there has also been an interest in the glycaemic index (GI) of foods. The GI is a measure of the way the body breaks down carbohydrates and the effect this has on blood glucose levels. Foods with a low GI are encouraged as these have a beneficial effect on managing blood glucose levels and satiation, which is particularly important in diabetes and obesity management (Brand-Miller *et al.*, 2003). As red meat has a GI of zero, it can reduce the overall GI in a meal when combined with other foods with a higher GI.

Both satiation and satiety are part of the body's appetite control system and are involved in limiting energy intake. Satiation is the process that causes us to stop eating; satiety is the feeling of fullness that persists after eating, suppressing further consumption and both are important in determining total energy intake.

The BNF (Benelam, 2009) recently reviewed the science in this field and concluded that overall, the characteristic of a food or drink that appears to have the most impact on satiety is its energy density. That is the amount of energy it contains per unit weight (kJ/g, kcal/g). When energy density is controlled, the macronutrient composition of foods does not appear to have a major impact on satiety. However, in practice, high-fat foods tend to have a higher energy density than high-protein or high–carbohydrate foods,