1. Origins of the Meat Industry

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Learning objectives

On completion of this topic you should be able to:

- describe the evolution of meat processing from hunting to industrialisation
- summarise the development of meat trading
- identify some of the factors regarding changes in meat consumption from pre-history to the industrial age

Key terms and concepts

Hunting, nomadic herding, neolithic farming, history of processing, slaughter houses, abattoirs, meat consumption, trade.

1.1 Introduction

This topic provides a definition of 'meat' and background information on the history of the production, consumption and trade in meat.

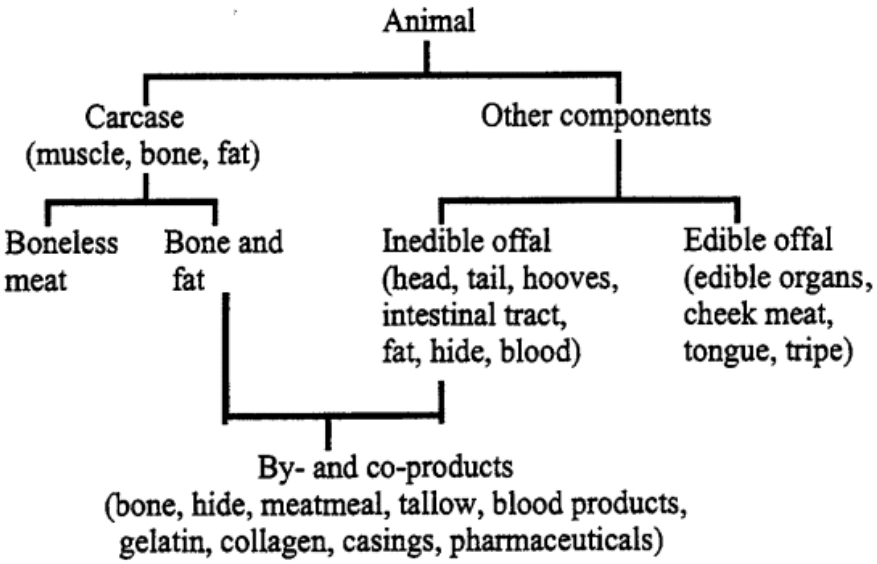
Figure 1.1 A cave painting of a mammoth. Source: Blowhard (2005).

Early man hunted wild animals for meat. Domestication of meat animals followed. The species utilised for meat varied, based on availability of different animals in different regions. Originally slaughter of animals would have been for personal consumption by the hunter, farmer, tribe or village. Gradually a trade in meat developed, leading to specialisation. This section provides a definition of 'meat' and background information on the history of the production, trade and consumption in meat.

Definition of meat

Meat is the flesh of animals used as food (Lawrie 1991). It is mainly the skeletal musculature but also includes organs such as liver, kidney and brains. Non-skeletal muscle components that are eaten are termed edible offal.

Figure 1.2 The breakdown of animal components into edible and non-edible components. Source: Thompson, (2005).



1.2 History of production

Hunting

There is evidence in fossil records dating back some five million years of humans, or human ancestors, eating meat. It is believed that eating meat increased pressure for the development of stone tools that were used for skinning and breaking down animals. There is evidence of *planned* hunting from over half a million years ago.

Figure 1.3 Depiction of hunters. Source: Hi+lo modern (2005).

The earliest record of *Homo sapiens* is about 250,000 years ago in Europe. These people would have been very competent hunters of large animals, including the mammoth and extinct forms of elephants. The Neanderthal people were prominent in Europe from about 100,000 years ago and their tool technology had advanced considerably from that of their predecessors, *Homo erectus*. With the appearance of the Cro-Magnon people about 40,000 years ago, the whole process of human development gathered pace. These people developed more sophisticated tools and weapons including the bow and arrow which improved their effectiveness as hunters. They also developed art in the form of bone carving, clay modelling and cave paintings.

These early populations of Europe would have had to withstand cold weather to survive on the edge of the ice sheet that covered half of Europe during successive ice ages. The use of the skins of their prey for clothing and increased reliance on meat as the main component of their diet would have contributed to their survival. These facts apply similarly to the Eskimos and Lapps of today with up to 80% of their energy requirements coming from meat. Animal fat would have been a very important component of the diet and it has been a major dietary factor through the ages until recent years.

Nomadic herding and Neolithic farming

There is evidence of reindeer being herded by men using dogs during the most recent ice age, some 20,000 years ago, ending about 11,000 years ago. At that time, some hunter-gatherer communities started farming in the Middle East and China and at the beginning of this, the Neolithic farming era, domestication of animals occurred.

Many of the first farmers were pastoralists, often leading a nomadic existence, moving with their herds or flocks seeking new pastures. Many nomadic or semi-nomadic herdsman cultures still exist today (e.g. in Mongolia, the Middle East and Africa). The preparation of these, the original pastoralists, for their role as stockmen was their experience as hunters. The animals that were domesticated were some of the same species that were the main prey of the hunter-gatherers at the end of the ice age.

The move to a mixed style of farming, with crop growing as well as animal husbandry, meant that populations became more static and were able to produce considerably more food than hunter-gatherer communities. The effect of these changes has been estimated to be a 20-fold increase in population. Reasons for this increase were the rise in the proportion of live births, largely because of the change from a nomadic existence, and the increase in life expectancy resulting from the sustained supply of food. Along with farming, there was the development of methods of storing food including fodder for livestock. Grain was stored in some form of silo such as a clay-lined pit. Pottery production also commenced and this provided containers for storage and transport of food.

Animals used as food

Many species of animals have been, and are being, used as food. However it is important to note that there are many species that are used in specific parts of the world that are never eaten in others. The species originally domesticated in particular areas were those endemic to that area and ecosystem, e.g. horses, camels, cattle and goats on the grasslands of central Asia. Pigs are suited to a wide range of environments. The llama and alpaca of the South American highlands, the yak of Central Asia and the reindeer of the cold north remained within specific ecological zones, whereas the donkey of northern Africa, and cattle, horses and sheep became widespread.

The proportion of animal species used for food for humans is exceedingly small in comparison to the total number of species. Some, like fish and the many game species, generally are not domestic animals and are harvested from wild populations. Among the 50 or so domestic species, pigs, cattle, chickens and sheep provide most of the meat consumed in the world.

Cattle

The fossil record shows the existence of cattle in the early Pliocene era, some 60 million years ago. These cattle have been named *Bos planiforms* and they were possibly the progenitor of *Bos primegenius*, the urus or auroch. These aurochs were humpless cattle that gave rise to longhorned, shorthorned and polled breeds and ultimately to current types of European cattle (*Bos taurus*). The last representative of the aurochs died in Poland in 1627 (Zeuner 1963).

There was considerable variation in these cattle, but the bulls commonly had large horns and a dark coat with a white stripe along the back. Aurochs probably disappeared from Britain 10,000 years ago during the ice age, but were common on continental Europe up to the 8th century AD.

The earliest domesticated type of cattle was probably the Celtic or Marsh Ox (*Bos brachyceros*) which was an offshoot from the main species. These were small in size with short horns, a long forehead and fine limbs and probably gave rise to present day breeds native to Britain, Ireland and Jersey. On the continent, the Friesian breed retained more of the characteristics of the aurochs. European breeds were taken to Britain by human invaders from the continent (Anglos and Saxons, Jutes).

Bos indicus cattle originated in India and comprise the humped varieties of cattle. Bos indicus are extinct as a species, but many humped breeds are native to India, Africa, Burma and Java. Domestication of cattle was well under way following the establishment of settled agriculture about 5,000 BC. *Bos indicus* were in Mesopotamia (now Iraq) by 4,000 BC and longhorned cattle were in Egypt at about the same time. Cattle were used not only for meat, but for dairy products, hides, and blood. They were also extensively used as draught animals.

Figure 1.4 An example of Longhorn cattle which are descendants of the early *Bos Taurus* breeds which descended from aurochs. Source: Fowler (2005).

Sheep

Domesticated sheep belong to the group *Ovis aries* and appear to have originated in western Asia. They were domesticated more than 7,000 years ago probably with the aid of dogs. This occurred at about the time settled agriculture was beginning. By about 3,000 BC several domestic breeds of sheep were well established in Mesopotamia and Egypt. The domestication of sheep was to provide meat, milk and clothing. The Soay is an example of a very old breed type which is surviving today in the Hebridean Islands of Britain.

Figure 1.5 Soay sheep, an ancient breed found in Scotland. Source: Anonymous (2005).

Pigs

European pigs are the descendants of wild pigs, *Sus scrofa*. Pigs were domesticated after the development of settled agriculture, for both food and sport. They could not be herded like sheep, cattle, goats and camels, and so were not a species used by nomadic herdsman. They were and are, however, a popular species for hunting. Pigs were important for meat during Greco-Roman times when hams were salted and smoked, and sausages were manufactured. British pigs were crossed with Chinese pigs (*Sus vittatus*) and pigs from Europe in the 19th century and this led to the modern British breeds.

1.3 History of processing

Small slaughter houses

Traditionally, animals were individually processed at a farm or village level, equivalent to our 'farm kills'. With the rise of towns in medieval times, there was a need to process larger numbers of animals and the division of labour and specialisation developed. Farmer and butcher met at the cattle market, with slaughter being done in small slaughter-places by the butchers. Each butcher may have had a 'slaughter room' right next to his own stall, or the meat was sold at meat markets and in 'meat halls'. The butcher and the wholesaler were usually the same person in this case. Louis-Sébastien Mercier (1790) cited in Viandes and Haddad (1998) described the scene in France: "Blood streaming through the streets coagulating under your feet, your shoes turning red. Strolling along, one can't help being struck by the continuous upsurge of plaintive cries. A steer is thrown to the ground and fastened with ropes. A heavy hammer crashes down on its skull and a hefty knife thrust deeply into its throat…" There were no sewers and the remains were piled up on the street leaving behind a stench of nauseating smells and fat was melted down on the spot (Viandes and Haddad 1998). This occurred well into the 19th century.

Rules for the age and weight of slaughter animals were progressively introduced in European cities by local authorities. Unsound meat was sold to the poor at low prices at special locations. As recently as the beginning of the 19th century most larger cities lacked public slaughterhouses - the situation with respect to meat markets and slaughter-places remained much the same as it was in the 16th century. As town populations grew, environmental problems occurred with small slaughter houses because of the need to process larger numbers of animals.

Abattoirs

One of the earliest public abattoirs was erected in France at Amiens in 1300 and Belgium had meat inspection regulations in 1333. The modern form of the public abattoir originated in France with five being built in Paris between 1807 and 1818. Others followed in all larger French towns. The reason for this development was to reduce the environmental pressure from numerous small slaughter-places spread throughout towns and cities. However, home slaughtering remained common in the countryside. This situation inevitably led to widespread dispersion of private slaughtering places.

Large private abattoirs, specialising in meat exports, were developed from 1860 onwards in North and South America, Australia and New Zealand. These were more cost-efficient than public works and quicker to incorporate new technology. In the USA, Cincinnati became the early centre for the meat industry and by the middle of the 19th century was known as 'Porkopolis'. Chicago took over in the 1860's and became the city having the world's largest meat-packing industry.

The first steps towards the modern large-scale slaughter process were taken with pig slaughter in Chicago in the 1870's with the establishment of a 'disassembly' line that included the mechanised scalding, dehairing and scraping of pigs. This led to division of labour (specialisation) which was generally introduced to the industry in Europe early in the 20th century.

The introduction of slaughter-lines also occurred at this time. Prior to this each butcher or team carried out the complete slaughter and dressing of any one animal. Meat inspection gradually became more effective and hygiene standards improved markedly. Animal welfare became an issue at the end of the 19th century. Stunning equipment and restrainers were introduced between 1900 and 1920.

1.4 History of the trade in meat

Wholesale

The creation of centralised slaughtering facilities marked the beginning of the wholesale butcher trade. At that time, two very distinct activities, wholesaling and retailing, came into being. It also enabled the meat trade to develop into an industry supplying a commodity to more than just the local region.

International trade

The modern international trade in meat and livestock dates from the 1840's, but trade was over short distances for technological reasons. In the 19th century, Britain was the major export market especially following the removal of customs barriers in 1842. Most of the supply was in the form of live animals in Europe. Until 1870 the only type of meat to reach the British market in significant quantities was salted pigmeat from the USA. There was a small trade in European fresh beef and pork carried by ship from Hamburg to London.

Between 1874 and 1880, large quantities of fresh chilled beef were exported from the USA to Britain. The first shipment of frozen meat arrived in Europe from Buenos Aires in Argentina in 1877 and the first from Australia and New Zealand in 1880. However, by the 1890's, almost all livestock from Europe was prohibited from import into Britain for animal health reasons. The development of refrigeration made possible world trade in meat and reduced the need for live cattle imports. Meat prices began to decline in real terms after about 1880.

The British market for meat remained open for imports until the war of 1914–18. The major flow of meat into Britain from that time until after World War II was from Australia and New Zealand. After that the USA became the world's largest importer of beef.

The meat industry in the UK: 1800 – 1900

1800

Changes from the type of meat industry that had existed through the medieval period were gathering momentum during the 1700's and the foundation for major industry changes was well in place by the year 1800.

Social change

Very significant social and population changes took place in the 1700's largely because of the industrial revolution. This, combined with further land enclosures in England and the clearance of the highlands in Scotland, resulted in people from rural areas moving to the swelling industrial towns. In 1700, the population of London was 600,000 but by 1800 it was over 1,000,000 and Liverpool, the second most populous city in England, was approaching a population of 90,000.

Changes in demand

The effect was an overall increase in the demand for meat, and the meat supplies needed by these growing centres of population could not be met locally. The result was much more national trading activity and all areas of the country had an incentive to increase livestock production. The rise in the demand for meat increased the value of the flesh of each slaughtered animal with a shift in emphasis to the production of animals specifically for meat for food. In contrast, medieval animal production had been biased towards the production of wool from sheep and the potential of cattle as plough animals. Robert Bakewell is revered as the main instigator of the stock improvement that was to continue through the 1800's and into the 20th century. He established a breeding and selection method for the improvement of livestock that many people were to follow. He died in 1795.

Changes in husbandry

The year 1760 was when English farmers started to use oilcake for fattening cattle. This improved stock feeding, especially during winter. The weight of cattle increased steadily through the 1600's and 1700's. The average weight of cattle bought for English naval stores in 1547 was estimated to have been about 4 cwt (203 kgs). In contrast, the average weight of cattle at Smithfield markets in 1795 was 800 lbs (363 kgs). Throughout this period, although importation of livestock for breeding and stock improvement was occurring (e.g. Chinese pigs and Dutch cattle), there was a ban on the importation of foreign livestock for slaughter. This meant that Britain had to be self sufficient in meat supplies.

Figure 1.6 The Smithfield markets in the 1850's which were the earliest market to supply London. They survive today after a major upgrade in the last decade.
Source: Corporation of London (2005).

1900

Population increase and demand

In 1900 the population of the UK was about 35 million with the population of London more than four million and that of the Greater London area exceeding 6,000,000. There was a very large increase in the demand for meat. Up until 1842 all meat was home-country produced but by the end of the century 40% of meat was imported. By 1900, Britain was the focus of the international meat trade, because of the demand of a rising population and an increasing per capita consumption of meat. British farmers were unable to meet these extra demands.

The market has recently (in last 20 years) undergone a £70 million refurbishment to equip it for the future and enable it to comply with modern hygiene standards. The ancient meat market has been transformed into the most modern in Europe, possibly even the world. The process of change at Smithfield has not been restricted to the buildings alone, but has extended to the whole environment and working practices that had hardly changed in 130 years. The result has been the creation of a thoroughly modern temperature controlled environment inside a magnificent Grade II listed Victorian building.

Meat trade

The rapid growth of the livestock industry in the USA and Canada produced a surplus of cattle and sheep, some of which were shipped live to Britain commencing in the 1870's. Imports also came from Europe and these reached a peak in 1880.

Ultimately, technology improved and this led to the importation of meat in chilled and frozen form. The first cargo of chilled meat was shipped from New York to Glasgow in 1875. Chilling in the ships was initially achieved by large quantities of ice which held the temperature at 1–3^{o}C. By the late 1890's, the annual import of chilled beef from North America had reached 80,000 tons.

In the mid 1800's it was already clear that there was a large potential market in Britain and that this could be supplied by the vast numbers of surplus cattle and sheep that existed in Australia, New Zealand and South America. At the time, these surplus animals could only be utilised for their skins and tallow. There were obvious opportunities for anyone who could find a way of getting this meat to the UK.

1.5 History of consumption

Pre-industrial meat consumption

The nutritional behaviour of early humans had been adapted to nature (hunter-gatherer) but gradually changed because of social changes and lifestyle developments - it became more standardised. Systematic production of food followed the introduction of settled agriculture 10-15,000 years ago. Systematic agriculture and food production intensified between 800 BC and 500 AD but the old 'tribal' habits of hunting and gathering remained in many areas. During this period, the consumption of cereals was predominant with meat being a more minor part of the diet. Consumption was also affected by food taboos which caused aversions and preferences.

Religious constraints

Historically, religious rules have affected animal choice, the type of meat eaten and avoidance of meat eating. For example:

- blood and some other organs were considered to be the residence of the soul and could not be consumed;
- Jews and Muslims are prohibited from eating pork, partly for public health reasons;
- Buddhists refrain from meat consumption because of their belief in reincarnation;
- Hindus generally do not eat beef or veal
- in 732 Pope Gregory III decreed that horse meat should not be consumed by Christians; and
- the early Christian church condemned the consumption of blood, raw meat, horses, dogs, goats and 'encased sausages containing blood and fat'.

This still affects consumption patterns today, although many of these constraints no longer apply. For instance horse meat is commonly eaten in many European countries, as are sausages containing blood and fat. Goat is a common part of the diet in many countries, including those in Europe.

Species availability

The species and amount of meat consumed also depended on availability. For instance, inhabitants of cold arid areas such as northern Scandinavia got about 80% of their dietary needs from reindeer meat and co-products (e.g. milk), whereas in fertile regions in Asia most dietary intake would be plant foods, with meat from small animals such as poultry, guinea pigs or dogs forming a small part of the diet.

In most societies, animal protein from flesh was valued more highly than dairy products or vegetable foods. The rich ate a wide range of meats including beef, veal, mutton, pork, deer, rabbits, geese and chicken and many other species. From the 16th to the 19th centuries, more offals were used than today. Numerous recipes included brains, lungs, stomachs, intestines, udders, snouts, shanks, ear, skin, blood and tails. In Europe, dogs and cats were consumed during crises (e.g. periods of war).

Changes in European meat consumption over time

Medieval times

There is little quantitative information about meat consumption in medieval times (Middle Ages - from the end of the Roman Empire to the 15th century). Famines, typhoid epidemics and plague caused reductions of one third to a half in the populations of European cities in the 14th century. Following this there was an increase in per capita meat consumption, possibly to as high as 100 kg/year.

1600 to 1800

Later there was a decline in consumption because of the reduced availability of grazing land. From the 16th century to the early 20th century, the way of life of a pre-industrial society predominated. Such a lifestyle can still be seen today in some developing countries. It is characterised by frequent food shortages and famines. Meat consumption in Europe was approx. 20–35 kg per capita, with individual consumption levels a function of income. Many people lived on vegetable foods and lacked animal protein, essential amino acids and vitamins, and animal fat. This together with unhygienic drinking water, were factors in a high mortality rate.

1900 onward

During the 19th century the majority of the European population became dependent on potatoes which had replaced the age-old dietary dependence on cereals. From 1850 onwards, systematic attempts were made to improve the diet of working class people especially by supplying animal protein. The keeping of pigs, rabbits and poultry was encouraged. Consumption of horse meat was promoted, but the aversion against this could not be overcome.

Traditionally, sensory aspects like appearance and eating quality also played a role in the inclusion of meat in the diet. Large regional differences existed but historical information is not easy to interpret. Because of the great variety of feeds used for home-slaughtered stock, especially pigs, there may have been a wider range of flavours in the meat than there is today. Meat with a high fat content was generally preferred. Mass consumption can be considered to have commenced at about this time.

As income rises two factors apply:

- the percentage of income spent on food falls; and
- the consumption of high-protein animal-based foods increases.

Urbanisation resulted in increased demand for meat. Industrialisation allowed the development of the modern food industry and food prices fell. Modern 'Western' consumption patterns are characterised by a greater variety of foods, more processed foods, more convenience foods and a decrease in seasonal effects on food availability. Meat has now become a common food and some societies have reached the situation of over-consumption of animal protein and (excess) fat may be a factor that impacts on health.

Readings

There are no readings for this topic.

Activities

Available on WebCT

Multi-Choice Questions

Submit answers via WebCT

Useful Web Links

Available on WebCT

Assignment Questions

Choose ONE question from ONE of the topics as your assignment. Short answer questions appear on WebCT. Submit your answer via WebCt

Summary

Summary Slides are available on CD

- Hunting gave the impetus for higher levels of technology in producing weapons and tools, plus the ability to organise and coordinate as hunting groups
- The skills and attitude of the hunter were useful in the domestication of larger animals
- Cattle, sheep, chicken and pigs are the major meat producing species
- What was eaten in different regions or cultures depended on availability
- Ancient food taboos are reflected in cultural consumption patterns today
- Large public slaughterhouses were not introduced until the 19th century
- The move from slaughter 'on the spot' by retail butchers to mass slaughterings in public works meant the beginning of the wholesale meat trade
- Fresh meat was traded only locally until refrigeration was developed
- Industrialisation in the UK led to an overall increase in meat consumption, increased livestock production for meat, and increased national meat trading
- Mass meat consumption started about 1850
- Modern international trade in meat dates from the 1840's

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Glossary of terms

Auroch	Large recently extinct longhorned European wild ox; considered one of the ancestors of domestic cattle
Aversion	Intense dislike
Nomadic	The culture of continuously herding animals to wherever forage was abundant
Offal	Non-carcase parts of a butchered animal. Can be further subdivided into edible or inedible offal
Retail	The sale of goods or commodities in small quantities directly to consumers
Tallow	Animal fat
Wholesale	The sale of goods in quantity for resale purposes, (i.e. goods sold in bulk to retailers for resale)