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More than Beef, Pork and Chicken – The Production, Processing, and Quality Traits of Other Sources of Meat for Human Diet

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 Springer

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Preface

In modern times that a complex scenario shapes the meat market, the production and commercialization of meat from unconventional species is expected to acquire a significant share of market dominated by beef, pork, and chicken meat. Important considerations, relative to how meat is obtained from each species (for meat market purpose or at the end of a productive life for other meanings different than meat production), are also included in the discussion of meat quality. This book deals with the production, processing, and quality traits of meat obtained from other species than most conventional species.

Chapter 1. This chapter deals with the role of meat in the diet of current society. The actual consumption of meat has contradictory and complex variables associated with the need to eat meat, the co-development of human beings and society, and the consumption of protein from animal source. The recent discussion about the impact of meat in health, and controversial effect and association with health, is also presented. Unconventional meat can be one possible alternative to meet the consumers and society's current and future demands regarding sustainable production and health aspects.

Chapter 2. The discussion of the relation between consumers, brands, and legal aspects is the main objective of this chapter. The growing world population and the constant need for animal protein impose a challenging scenario. Meat quality brands are the main solution to improve the current scenario, which also favor the commercialization of meat obtained from other sources of animal protein, since a share of meat consumers are willing to pay more for quality. The current legislation about quality brands, particularly in the European Union, is also discussed.

Chapter 3. The characteristics of meat obtained from horses and donkeys are discussed in this chapter. Higher nutritional value, particularly the low-fat content, and higher proportion of health-related fatty acids are the main characteristics that support the role of equine meat as potential substitute of bovine meat. The current productive system is considered as main factor to influence equine meat quality.

Chapter 4. This chapter is dedicated to present the information regarding the quality characteristics of camel meat. The notable physiological characteristics to thrive under almost inhabitable environmental conditions observed in this species

are a major advantage for meat production from this species. The meat of camels is also revealed as similar to bovine meat in terms of nutritional values.

Chapter 5. The production of meat from bison, buffalo, and yak, as well as carcass characteristics and main aspects of meat quality is discussed in this chapter. The traditional use of such species in non-meat production-related activities (such as draught power in farms and dairy industry) is the main aspect of such animals. However, the nutritional and industrial similarities and differences to conventional bovine species favor the development of a nutritional alternative to beef.

Chapter 6. The production of goat and sheep meat is believed to increase and acquire a significant share of international meat trade in short to medium time. The main attributes related to its importance in international market are related to nutritional and sensorial properties in addition to favorable commercial characteristics observed in both goat and sheep carcasses. This chapter discusses the carcass characteristics, the meat quality attributes, and the role of goat and sheep in human diet.

Chapter 7. This chapter discusses the carcass characteristics and meat quality attributes of European rabbit and hare, guinea pig, and capybara. The combination of high prolific and short rearing time with high vitamin content and low-fat content stimulates the production of such species.

Chapter 8. The production of meat from wild boar animals is a relevant alternative to conventional pork production. In this chapter, the characteristics of wild boar meat are presented with particular emphasis to compare with conventional pig meat production. The nutritional information about wild boar meat highlights the importance of its role as alternative meat to pork.

Chapter 9. This chapter deals with the carcass traits, meat quality, and nutritional composition of deer. In addition to the historical role in European and Asian countries, this species remains as important game animal with unique sensory properties. Nutritional characteristics are also relevant aspects that support the production and consumption in the last years.

Chapter 10. The carcass and meat characteristics of pheasant, quail, and guinea fowl, along with the factors that influence such characteristics, are discussed in this chapter. These underexplored land fowl birds are important alternative source of dietary protein. The high content of vitamins, unsaturated fatty acids, amino acids, and minerals is attractive characteristic to improve the production of such species.

Chapter 11. In this chapter, the details about farming, slaughtering, and meat attributes of duck, goose, and garganey meat are presented. It discusses the main factors related how each productive stage can influence the production and quality of meat, with particular attention to duck and goose, the main waterfowls produced worldwide. The characterization of duck, goose, and garganey meat is discussed as well, which provides a detailed overview about the composition, physicochemical, textural, and sensorial attributes of such species.

Chapter 12. The chapter aims to present and discuss the aspects related to kangaroo meat productive chain. Hunting wild animals remains as main activity to obtain meat from these animals, which remains as a major challenge to productive chain. The high nutritional quality of kangaroo favors its consumption as alternative to beef.

Chapter 13. Meat from amphibians and reptiles is consumed in several countries. Once viewed an interesting alternative of dietary protein, the meat of such exotic group is also as relevant source of other nutrients. A major attention is given to amino acid, fatty acid, and mineral composition.

We hope these chapters and all the information presented and discussed will stimulate students, researchers, and professionals working with meat to develop new studies and advance the knowledge about each one of the species selected for this book.

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Chapter 2

Meat Quality, Brands and Consumer Trends



Alfredo Teixeira and Sandra Rodrigues

2.1 Introduction

During the past 20 years the consumption of meat around the world have increased considerably and the increasing world population with the projections of a continuous growth until at least 2050 reaching the 9.7 billion in 2050 (United Nations 2017) needs more nutritious protein supply and consequently an increasing demand of meat and meat products. The biggest challenge in the near future for the meat industry is facing how to produce meat in an adequate sustainable way and answer the modern consumer requirements. The events at the beginning of the century, related to animal health (foot-and-mouth disease, bovine spongiform encephalopathy, avian influenza) and, more recently the indications from the World Health Organization on the carcinogenicity of the consumption of red meat and processed meat (WHO 2015), were a milestone in a new paradigm for meat and meat products. Relations between the various actors of meat industry have changed, food security concerns have increased, meat markets have become more complex, changing the relationships between demand and supply, influencing dramatically the consumption and prices. Nowadays, in meat consumption trends are increasingly influenced by consumer perceptions of the quality and safety of meat and meat products.

The biggest meat consumption and when it comes to meat animals, there are just a handful of staple meats: beef, pork, and chicken. Despite the uncertainties resulting from the crises it is evident the growth in the production of all types of meat, with particular emphasis on pork and chicken, but also sheep and goat. Remarkable were the 42 and 75% increase in goat and sheep meat production, respectively, in the decade from 1994 to 2004, a trend that continued until 2013 (FAOSTAT 2015).

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Africa, due to its geographical and population size, stands out for the small 17 Mt produced, identifying it as a region where production and consumption are expected to grow over the next 20 years. Also, according to FAOSTAT (2015), demand for meat in developing countries, particularly sheep and goat meat, will continue to be driven by rising incomes, population growth, strengthened by trends such as urbanization and variations in food preferences and habits. Still other than sheep and goats, there are other types of meat that have taken part in recent consumption habits such as bison, elk, deer, squirrel, duck, pigeon, camels, yaks, horses, ostriches, pheasant and rabbit, among others less known, such as guinea pig and llama, vicuña and alpaca of the Andean countries or the guanaco in Chile. The utilization and subsequent consumption of these different species of animal meat vary as cultural preferences and religious beliefs are observed. In fact, much of the consumption of many of these types of meat, other than the most commonly consumed species such as beef, pork or chicken, is linked to socio-cultural aspects, traditions and religious festivities, some of which are associated with typical dishes and cuisine the countries and regions that constitute heritage and culture and the production chain are always concerned about the final bond, the consumer.

Consumers are the last link in meat chain and according to the degree of satisfaction of their consumption expectations are determined their purchasing motives. In ever-changing global market, the other links of the meat chain, producers, retailers, or processors the final and common objective to all of them is to meet the consumer's expectations. The degree of satisfaction depending on several factors is influenced by the label information and the information that is most demanded by consumers are increasingly related with food safety and nutritional value as well as quality specifications. The model of meat consumer's behavior depending on individual factors related to cultural aspects, specifications of production system, product quality information (physical, chemical, nutritional and sensorial characteristics) cooking and preparation, marketing and labelling. The future tendencies would be to identify quality aspects related with labelling information and quality brands that are likely to be of increasing interest to meat production, industry and consumers' acceptance, helping the meat sector to identify areas of focus ensuring the consumer confidence in quality of meat and meat products maintaining and enhancing the current and future consumption patterns, particularly in different meats rather than beef, pork or poultry.

This globalization of consumption and increase of quality demands by consumers carry out an increase in competitiveness, requiring more efficiency in the form of production, transformation and commercialization. On the other hand, globalization implies a production at large scale, which limits access to markets of small producers, which they are excluded from the main commercial circuits. The commitment of the meat industry of small producers with differentiated quality systems has led to an increase in quality marks with Protection of Geographical Indications (PGI), Protected Designations of Origin (PDO) and for Guaranteed Traditional Speciality (TSG) registered and recognized by the European Union. Today, these quality brands are a differentiator factor in the meat market, improving the production with revitalization of depressed areas or geographical regions, providing greater confidence to the consumer, conquering new markets, supporting and preserving an important cultural and genetic heritage.

2.2 Cultural Aspects

Meat consumption patterns could be influenced by individuals' family, friends, and traditions and consequently in the principles of the origin and designations definitions of brands. Also, beliefs and attitudes about environmental and animal welfare concerns are consistently taken in consideration on meat labelling. The importance of meat's country of origin varies from country to country as would be discussed in quality policy chapter. However, meat labelling is depending on the consumers may be willing to pay more for meat produced under animal welfare standards, organic and free-range farming, origin designation certification or any other production quality characteristic. In contrast, some consumers only purchase meat conforming with religious slaughter procedures, such as halal or kosher meats. Even though, as the countries became more industrialized, the meat side of the diet gradually became less varied, some cultural aspects allow the production of rare or exotic animal meats which, could be potential commercial interest, would be linked to culinary traditions, and many of them should be origin or geographic protected or be a traditional specialty guaranteed. In the most world developing countries there are an increasing regard over the impacts of meat production on food safety and there are some signs of consumers acceptance to pay extra for safety-labelled products, particularly regarding products from well-known brands (Enneking 2004) as PDO or IGP in Europe or the labelling COOL in New Zealand. Particularly since the beginning of twenty-first century, animal welfare is considered as a deciding factor for consumers to evaluate the ethical profile of brands, since the cost is the principal barrier to buy more products (Schröder and McEachern 2004).

Beside meat, also meat products are traditionally consumed. Hams, sausages, pâtés and others are processed meat products. Their production may be due to the need to preserve meat in times when there were no refrigerators and given their characteristics, mainly organoleptic, and quality its production has been perpetuated over time. Also, to give value to less valuable meat, to find new market niches, to innovate, to expand production, processed meat has its place in quality brands well established. There are almost 200 meat products with POD or PGI label only in Europe, as can be seen in the internet site of the, European Commission, Agriculture and Rural Development, Agriculture and Food, DOOR.

Hunting is a way to get meat to consume and is permitted all over the world given that the regulations are followed. Although there is no direct EU competence on hunting, there are various Regulations and Directives that either directly or indirectly influence on hunting. Through different EU competencies – such as the agriculture, environment, internal market, commercial policy, security & justice competencies, public & animal health and freedom – a rather extensive body of EU legal acts affecting hunting has been adopted over the past four decades:

- Birds Directive, 2009/147/EC, the first legal instrument of the European Community (the predecessor to the EU) specifically dealing with nature conservation.
- Habitats Directive, 92/43/EEC, aiming at conserving EU's most threatened natural habitats and mammal species.

- Firearms Directive, 91/477/ECC (subsequently amended by Directive 2008/51/EC), was adopted enabling controls on the possession of weapons to be carried out within the EU.
- Firearms Regulation, (EU) No 258/2012. Adopted in 2012 and aims at implementing Article 10 of the United Nations' Firearms Protocol into EU law.
- Civil Aviation Security Regulation, (EC) No 300/2008.
- Pet Regulation, (EC) No 998/2003.
- Food Hygiene Regulations – Council Regulation (EC) No 852/2004, Council Regulation (EC) No 853/2004 and Council Regulation (EC) No 854/2004 – regulate distribution and placing, all stages of the production and processing and on the market of food intended for human consumption.
- The Animal By-Products Regulation, (EC) No 1069/2009, and the Commission implementing Regulation (EU) No 142/2011, exempt from their scope ABP from wild game (meat) supplied by the hunter in small amounts to local retail establishments or final consumer supplying as well as wild game not collected after killing in agreement with good hunting practices.
- The EU Wildlife Trade Regulations – the basic Council Regulation (EC) No 338/97 and the implementing Commission Regulation (EC) No 865/2006 – directly transpose the provisions of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in the EU.
- Trapping Regulation, (EEC) No 3254/91, prohibits the use of leghold traps in the EU and the introduction into the EU of pelts and manufactured goods of certain wild animal species originating in countries which catch them by means of leghold traps or trapping methods which do not meet international humane trapping standards.
- The Seal Trade Regulation from 2009, (EC) No 1007/2009, bans the trade in seal products in the European Union.

Hunting is permitted in Europe with a license obtained from competent authority. Most popular species are game, partridge, rabbit, hare, quail and ducks.

2.3 Quality Policy

In the recent years the European Union (EU) have introduced regulation in the meat classification towards a quality policy. In 1992, according to Becker et al. (1996) the reform of the Common Agricultural Policy (CAP) took into consideration the importance of quality products and the introduction of guidelines and the main issues affecting behaviour, attitudes and acceptability of consumers, implications of new technologies on consumer conviction, improving the understanding of food choice, ethical aspects, socio-economic factors, environmental, access and availability and information and communication flow to primary producers, manufacturers, retailers and consumers. The EU has been producing and harmonizing among their members the legislation and procedures to require the PGI, PDO and for TSG

brand besides other quality labels and brands. In this sense meat labels are intended to enable the consumers to be informed about quality features, production and processing characteristics, offering the opportunity for the differentiation of meat products by producers and processors. For beef, there is a requirement in the EU to provide information about the place or country of origin since 2000 (EU No. 1760/2000). However, for other kind of meats as lamb and goat the requirement was only extended from 2011 (EU 1169/2011). These three quality logos attest to qualities and specific traditions of meat and meat products as well other foods or agricultural products, elaborated in the European Union or in other countries. The PDO and the PGI - have a specific association to the region where the product comes from, while the TSG logo shows a traditional production process. Through these logos, the consumers can identify these traditional qualities and can rely on their authenticity in terms of traditional production or regional origin. Indeed, as well as providing a useful marketing tool in the European Union (EU) and on other markets, registration under these schemes provides producers with legal protection against imitation or misuse of the product name.

An extensive list of fresh meat and meat products (cooked, salted, smoked, etc.) of beef and poultry but also sheep and goat are recorded in Agriculture and Rural Development Department of European Commission. As far as we know, the only PDO or PGI labels with other types of meat, rather than poultry, pork, beef, goat or sheep meat, are two Finland rabbit PGI (Lapin Poron Kuivaliha and Lapin Poron kylmäsavuliha) and a rabbit DOP (Lapin Poron LIHA) also from Finland. None TSG from other meats rather beef or pork is known. Anyway, the use of meat labels and packaging information on place of origin or quality information has been increasing and also other kind of labels or brands related with specific characteristics of meat products as well as breeds, production systems (organic, free range, natural pasture, etc.) or processed technologies (dry, salting, ingredients, etc.).

In Australia, the Meat Standards Australia (MSA) from Meat & Livestock Australia was developed by the Australian red meat industry to enhance the eating quality consistency of sheep and beef meat. The system is supported by 100,000 consumers and by 700,000 consumer taste tests from nine countries and takes into account all factors on eating quality from the paddock to the plate. Australia and New Zealand combine to produce more than two-thirds of the world's exports of fresh and frozen ovine and caprine meats and New Zealand occupy the top of the list. According to the processor manual of New Zealand Beef and Lamb Quality Mark Specifications (2015) the beef and lamb quality mark was launched to New Zealand consumers in 1997. The notion that "every good brand has a story behind it" has become appropriated in international meat trade (Martin 2003/04), where a cycle of animal diseases and meat safety crises has increased consumer demand for information about the origin of meat and how it is produced and handled. New Zealand invested heavily of its marketing resources to promote New Zealand lamb as a "country brand" and has applied a country-of-origin labelling (COOL) to recognize New Zealand lamb in international markets and increase consumer awareness of this lamb as a high quality imported product (Clemens and Babcock 2004).

In USA, it's the Agricultural Marketing Service (AMS) – an agency within the U.S. Department of Agriculture (USDA) – that pointed out how meat is labelled and marketed for sale. The AMS's programs contain basic standards for meat quality with regulations for the certification of terms put on steak and burger meat packaged – hormones, antibiotics and constitutes of feeding. The Food Standards and Labelling Policy Book, published by the USDA in 2005, is a guide to help manufacturers to prepare product labels that should be truthful and not confusing. All meat and meat products listed are only beef, pork and poultry. Associated to the product and label requirements the Policy Book does not guarantee against possible violations of all related trademarks, patents or copyrights. In 2015 the Food Safety and Inspection Service (FSIS) have pointed out the agency's purpose to revise the Food Standards and Labelling Policy Book. The revised Food Standards and Labelling Policy Book give updated information to use when creating new labels and when modifying existing labels for meat and poultry products.

In Canada, there are compulsory requirements for certain foodstuffs to indicate the country of origin on their labels. Country of origin labelling does not give information on the safety of a food product. All food products sold in Canada, whether produced in Canada or abroad, must have the same food safety standards. Meat products are also submitted to the labelling requirements under the Food and Drugs Act (FDA) and the Consumer Packaging and Labelling Act (CPLA). Meat and poultry products include all products that contain more than 2% poultry or meat. Examples of meat include beef, veal and bison, whereas poultry include chicken and turkey. For meat products that do not fall under a standard, the common name is the name by which the food is generally known. If a meat product, consisting of meat, meat by-products, mechanically separated meat, or a combination of these meat ingredients, come from more than one animal species, and any of these species is mentioned to the common name, then all the animal species from which the meat products are derived must be identified. A species-specific common name to indicate that a product originated from a certain species or sub species can be identified on labels and in advertising. Examples of this would include but are not limited to Angus Beef, Kobe Beef, Wagyu Beef, Muscovy Duck, Peking Duck, North American Bison and wild boar.

Proof of segregation and origin, of the animals used to create the product must be supported to a CFIA inspector upon request to substantiate the claim.

In Australia, as well as in other countries including Europe it is common the use of a free-range label (Model Codes of Practice for the Welfare of Livestock), mention of productions system (organic, natural grass fed, pasture fed, etc.), the mention of the breed (Angus, Wagyu, etc.) or religious certification (halal, kosher).

In Central and South America, there is not any brand with origin certification or protected designation. Furthermore, some beef trademarks in Central and South America, there is not any policy for meat or meat products certification or origin identification. Nevertheless, there are a lot of meat and meat products that are unique with great identity and needed be protected. Within the Ibero-American program of science and technology for development the thematic network MARCARNE (Quality Brands of Meat and Meat Products of Iberian American Products") was

established in 2016 by 10 Ibero-American countries (Argentina, Brazil, Cuba, Chile, Ecuador, Spain, Paraguay, Portugal, Mexico, Uruguay), grouping 18 public and private research and development (R & D) associations, 5 companies, 6 business associations and 2 development cooperation organizations, which aims at exchanging knowledge and enhancing cooperation, in order to define strategies for the development of quality brands for meat and meat products that can be recognized throughout the Iberian American space.

In terms of meat products or products that use meat as ingredient, the European Commission Implementing Regulation (EU) No 1337/2013 of 13 December 2013 lays down detailed guidelines for the implementation of Regulation (EU) No 1169/2011 of the European Parliament and of the Council concerning on the country of origin, place of provenance or place of rearing as well as the place of slaughter for prepacked fresh, chilled and frozen meat of poultry, swine, goats and sheep. On 17 December of the same year, the Commission assumed a report for the European Parliament and the Council concerning the compulsory indication of the country of origin or place of provenance for meat used as an ingredient and the necessity tabling a legislative proposal to supervise the labelling of origin of meat used in foods in such circumstances. The report was based on an external study with the aim to research the need for the consumer to be informed on the origin of meat ingredients and the feasibility of providing the mandatory indication of the country of origin or place of provenance, and an analysis of the costs and benefits of the introduction of such measures including the implications for trade in the internal market and for international trade. The Commission Report is accompanied by a Commission Staff Working Document “Origin labelling for meat used as an ingredient: consumers’ attitude, feasibility of possible scenarios and impacts”, which gives more accurate information on the Commission’s findings presented in the Report. Spite of the low percentage — less than 2%, according to FCEC (2009) — of other types of meat rather than beef, pork and chicken as sheep, goat, game, horse and rabbit were included in the scope of the study when used as meat ingredients covering 3 broad categories of products in which were used, including muscle, mechanically separated meat (MSM), minced meat, offal and. The categories were based on different criteria such as: cat I: meat preparations (uncooked sausages, burgers, skewers, fresh meat with spices); cat II: multi-ingredient foods (pizza, lasagna); cat III meat products (several products cooked/cured/dried/dehydrated). Both documents were presented for further discussion with the Member States and the European Parliament in view of deciding whether a legislative proposal should be tabled by the European Commission. One important evidence of the report was that consumers were strongly interested in origin labelling of meat used as an ingredient and the report from the Commission to European Parliament and the Council, according to FCEC study, was the highest interest by consumers to know the “country where meat was produced” influencing their purchase decisions. So, consumers are very concerned in origin labelling of “meat used as an ingredient”. In terms of labelling the report evaluates three frames:

- Frame 1 – Conserve the origin labelling on a voluntary basis;
- Frame 2 – Incorporate mandatory origin labelling based on (a) EU/non-EU or (b) EU/third country indication;
- Frame 3 – Incorporate mandatory origin labelling indicating the specific Member State or third country.

The European Commission did not indicate any preferred option and led to European Parliament and EU Member States the possibility to discuss all options including the tabling of a legislative proposal to regulate the origin of meat used as an ingredient in foods. On 20 May 2015, the Commission adopted two reports for the European Parliament and the Council:

- Concerning to the mandatory indication of the country of origin or place of provenance for milk, milk used as an ingredient in dairy products and types of meat other than beef, swine, poultry, sheep and goat meat (DG AGRICULTURE competence);
- Concerning to unprocessed foods, single ingredient products and ingredients that accounted for over 50% of a food. Study on the mandatory indication of country of origin or place of provenance of unprocessed foods, single ingredient products and ingredients that accounted for more than 50% of a food: Final Report (European Commission 2018; Study on the mandatory indication 2015).

2.4 Future Trends (Conclusions)

Meat industry, independently of the of meat specie, is suffering great pressure from many economic and social sectors. Particularly from consumers who are becoming increasingly concerned with their environment protection and with the impact of meat industry in public health has come the most important challenges for meat brands. Faced with crisis such as BSE, dioxins, foot-and-mouth disease or horse meat masquerading as beef and others the immediate response from consumers was to reduce the consumption of red meat and processed meat causing a huge negative impact in meat industry. On the other hand, consumer demand for natural and organic meat is expanding in developed societies and the meat industry is expanding its appeal to conventional consumers. Also, there has been growing demand for meat and meat products raised to higher animal welfare standards and we are witnessing also a growing demand for meat raised to higher standards of well-being. There is a huge consumer increase in interest of grass-fed meat, associated to a “regenerative agriculture” with agriculture practices promoting the soil quality and returns CO₂ to the ground. In addition, ethical concerns are increasingly pushing consumers to consume more than chicken or pork. In this scenario from change and challenge comes the opportunity and understanding consumer trends is the key for promoting new meat brands. In near future, it will be more and more important to look at meat consumer lifestyle trends at different levels to get the whole vision and define new strategies to meat brands policy particularly to meat brands besides beef, pork and chicken. Consumers are increasingly

scrutinizing meat brand values and personalities on a more emotional level to ensure they align with their own values. It will be the industry's challenge to find this path.

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