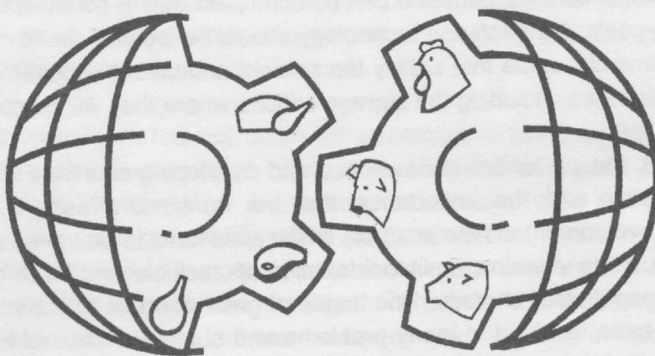


Opening Lecture

How meat diversifies meals

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Opening Lecture

HOW MEAT DIVERSIFIES MEALS

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Food production faces different challenges which range from satisfying the basic needs of the people in different parts of the world, to meeting more or less complex demands related to sensory characteristics of food or short preparation time. In addition, in this race to meet the requirements, the raw materials and the different types of products must compete to develop offers that are attractive to consumers. The wide assortment of vegetables and pasta make them strong competitors and, in some cases, has allowed them to displace other types of products such as meat. Some companies have been very active in the development of products containing poultry meat and pork and, as a result, these meats have gained positions that were previously held by beef.

Consumers now demand a wide and complex variety of foodstuffs, and it is expected that some trends will increase. For example, in the next fifteen years, the requirements in developed countries will be based on composition and quality: food products with optimum sensory characteristics but that at the same time are "light" (to fight obesity), nutritious (nutraceuticals), safe (risk populations) and ethically produced (animal welfare), in addition to being produced in an environmentally friendly manner (avoiding pollution). In the next ten to fifteen years, developed countries will also probably face important structural changes in the composition of their population as a result of an increase in the number of families with few members (36% in the E.U., 28% in Japan) (Lahidji, 1998), single parents, working women (in France and other countries the E.U. and the U.S.A. today, over 75% of the women between 25 and 40 years of age work away from their home) (Gordon, 1998), or senior citizens, which would also condition their food requirements: cooked or ready to eat meals, eating out more frequently or, as a result of their different type of activity, different or even special nutritional requirements. To avoid metabolic diseases, consumers seek foodstuffs that do not contain or contain low levels of substances that are related to diseases such as saturated fats. Some countries have severe obesity problems and require food with fewer calories; in 1997, the U.S. Department of Human Health Service reported that 35% of the adults in the U.S.A. were obese (Gordon, 1998). We could therefore say that there is a preference for products with one or more special characteristics. In summary, in developed countries research and technology must be focused on developing meat products with good organoleptic properties, containing special or specific nutrients to meet the consumers' needs that can be stored as necessary, based on the time, activity and place where the products will be consumed.

Turning to the future demand in developing countries, we could say that several factors such as the inflow of people into the cities, their higher purchasing capacity, the reduction in production costs and the opening up of markets could lead to a higher consumption of meat. This improvement in the economic conditions of developing countries should not be generalised. For a high percentage of the world population, food will still be subject to, and conditioned by, the country's economic situation. Unemployment, we hope, will not exacerbate this situation. A word now about the five most important deficiency diseases listed by the FAO: anaemia, kwashiorkor, goitre, marasmus and xerophthalmia. The first two are closely related to economic development and can be controlled by the consumption of meat and meat products (FAO, 1995). To achieve these goals, research and technology should be focused on developing meat products based on raw materials with a lower commercial value that satisfy the nutrient and calorie requirements, and are designed to meet the cultural practices of the consumers, including the storage options where they will be consumed.

In spite of the differences, the similarities in developed and developing countries will not evolve at the same pace. New forms of selling will appear and the importance that the consumers assign to the nutritional and dietary characteristics will lead to the development of new products which shall have to be varied and include a sufficient quantity of the necessary substances such as vitamins, aminoacids, minerals, soluble and insoluble fibres, etc. In addition, food safety we could say, is a "non-negotiable" characteristic that is of great concern to consumers, and we should note that meat and meat products have been involved in many problems and outbreaks caused by hormones, bacteria (such as *Listeria*, *Salmonella*, *E. coli*), and other agents such as the one that cause Bovine Spongiform Encephalopathy (BSE).

The contribution of meat to this scenario, that is the topic which brings us here today, lies in its components that serve to meet the above mentioned requirements. Frequent consumption of meat guarantees a supply of the necessary high digestibility proteins (96% to 98%) with a good balance of aminoacids, and a sufficient quantity of vitamins of the B complex, and vitamin E that human beings require. Meat is also a natural source of high bioavailability iron. Despite the general belief, fat is a fundamental nutrient that not only supplies essential linoleic and linolenic acids but also carries and absorbs the fat soluble vitamins A, D, E and K. Fat is more efficiently metabolised than carbohydrates, contributes more

gy, and is very important for deficient populations. In addition, extensive research in this field has shown that not all is news: certain animal fats have a potential anticarcinogenic effect with conjugated linoleic acid (CLA), benefits a good balance between omega-3 and omega-6 fatty acids, and stearic acid does not increase cholesterol levels (Fritzsche, 1998). However, the polyunsaturated / saturated ratio in ruminant animal fat is below the desirable range between 1.0-0.4. Therefore a well-balanced diet and avoiding risk factors (sedentary activities, smoking, controlling diseases) are suitable recommendations for everyone, until research findings settle all the controversies between the good and bad effects of fat consumption. This issue should be followed closely because of consumer concerns. A recent survey conducted in the U.S.A., indicated that 81% and 72% of the people were concerned about fats and cholesterol, respectively. (CAST, 1999).

These demands and the characteristics of meat have many similarities. Food products especially developed for people with medium or high purchasing power should meet the nutritional, safety, and stability requirements, in addition to others, or else they will not be viable. Based on the above we see that meat, and specifically beef, is particularly attractive to consumers because of its organoleptic characteristics. Included in ready-prepared meals or servings it allows diversification and supplies the necessary proteins, vitamins and minerals with a controlled energy intake and is very satisfying. We could therefore conclude that a moderate consumption of beef is beneficial to keep healthy and that excess or low consumption must be discouraged.

So far, we have considered how to meet the needs and demands and, without resorting to history and thus ignoring the difficulty of forecasting in fields of knowledge, we could now imagine possible solutions. R&D shall play a fundamental role in adapting or developing enabling technology. The commercial uncertainties in the farming sector could lead to a reduction of the private sector's investment in R&D to 0.5% or less in developing countries and to 2% in developed countries (Lahidji, 1998). In spite of this, some examples could be the development of food products for special populations such as low calorie foods, organic or natural products, in which meat can be an important ingredient as its production and production systems meet these requirements. Functional food could also be included in this group and, although it is a relatively new category, estimates indicate that sales in the U.S.A. could reach US\$ 17.6 billion by the year 2005. (Sloan, 2000).

Another category that should be mentioned is health food. In a recent survey conducted in the U.S.A., 88% of the people responded they were greatly concerned about their health. (Sloan, 2000). Health food targets middle or high income individuals, and could be based on meat cuts that are processed with high quality systems such as "sous vide", or vacuum-style cooking that can be stored either chilled or frozen, and warmed in a microwave oven. The technological systems that must be analysed involve tenderness, processing of bone-in cuts, interstitial fat (marbling), packaging films, shelf life, yield after cooking, salt quantities, and appropriate pasteurisation temperature.

A greater variety of snacks will be produced to satisfy different requirements, functions and activities. Meat offers interesting potential for this type of product, and the possibility of innovation. At present, in this category potato chips is one of the main products but beef jerky, different species and flavoured meat, could be an option. Additives, flavours and packaging transfer processes are key to these developments, but as the composition of these products does not present safety and safety problems, these aspects would not be an obstacle.

Catering seems to be another area which has not taken full advantage of the benefits of the meat, and currently is mainly on vegetables and pasta. Catering for food courts and cafeterias is a good opportunity for some meat products. For example, inclusion of non-traditional or lower commercial value cuts in the food would allow more diversification. The key lies in achieving good palatability, short preparation time and a reasonable price. Controlled quantities could be considered at a later stage. Additives, yield after cooking, an analysis of the relationship between the components (macromolecules), packaging and off-flavour management, will be the most important areas that require analysis. In this category we could also include meat that can be served cold, included in cold cuts, as an ingredient in sandwiches, or with cold sauces. From the technological point of view, these products should be processed for chilled, frozen or even ambient temperature storage, and support different technologies, such as warming in a microwave oven. Processing should be based on the consumers' demands which require preserving the organoleptic and nutritional characteristics; this requires less severe treatments. Although this will undoubtedly benefit most of the properties of food products, it could be a challenge for food safety. Microbiological hazards involving meat, have already been mentioned. The production and processing systems must develop microbial control methods. More research in new technologies - be it chemical or physical methods such as high pressure to enhance enzyme properties and modify substrates - is required. Food safety is basically a responsibility of the State, and the authorities face and will face even greater pressure in the future.

to enact laws that protect consumers. Poor legislation will lead to a lack of confidence in consumers and in technologies and, on the other hand, excessively high costs and lack of interest in research and development. The law must be quickly adapted to the changes in technology and the markets. The responsibility of R&D is to provide scientific basis for these laws. Much diagnosis has been made, and now we need proposals. Consumers will only have confidence if actions, to avoid outbreaks, are in place. Examples can already be found in Denmark and Sweden where the market offer guaranteed *Salmonella*-free products, or The Netherlands where hormone-free products are available, among others (Gordon, 1998).

The technological improvements that allow industrialisation in the primary meat producing sector are another important issue. In recent years we have witnessed the decline in meat prices with economic, social and political consequences and which had been badly affected farmers (PCJP, 1997). A significant part of the market believes that meat is a commodity and, as such, it is sensitive to prices, does not allow differentiation, and its price must be based on the packing industry's costs (Katz, 1999). With this developed source of proteins (Delgado, 1999), the Scientific Technology Sector should be the cause of the progress through scientific revolution (Kuhn, 1996), that develop food uses of food products based on real food sources that meet the requirements of high purchasing power consumers, bring these proteins to the poor (in some regions, 10% to 15% of the population does not meet the minimum daily intake requirements, as defined by FAO), develop processes that take advantage of the lower value meat cuts to optimise commercial benefits, and increase the development and use of by-products (FAO, 1995). This would encourage the primary sector to maintain its production level which, in turn, could increase with the new findings in genetics, animal health, administration of nutrients, etc. and, in addition, foster research and development which otherwise could be seriously threatened.

We live in a time that is not perfect, as everything in which man is involved, but we are witnesses and, if we desire, can be protagonists of the profound changes that will come about in the agrifood business in the next ten years.

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