



Sensory impact of milk and its derivatives: reasons and causes

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The topic in the header was recently addressed by B. Martin et al. in two papers published in 2005 with the following titles: "Effect of grass feeding on milk, cheese and meat sensory properties" and "How do the nature of forages and pasture diversity influence the sensory quality of dairy livestock products?". The first of two aforementioned papers appeared in "Options Méditerranéennes" and the other in Animal Science (British Society on Animal Science).

The topic was taken up in 2013 by M. Yayota et al. (Faculty of Applied Biological Sciences, Gifu University) with a paper published in the Journal of Dairy Science titled "Milk composition and flavor under different feeding systems."

The proliferation of studies on the influence of animal nutrition on the sensory qualities of milk and its derivatives is not only a consequence of the growing interest of researchers in shedding light on the bio-metabolic mechanisms but also addresses a current marketing need. In other words, a number of researchers argue that much of the "lack of interest" in milk and its derivatives, which is spreading today even through its exclusion from diet, dictated by fringe nutritionists who are oblivious to the damage caused, is also the result of the poor typicality of the sensory qualities of dairy products. Dwindling interest in a food depends greatly on the scarcity of sensory input and, in particular, on the scarce "repeatability" of sensory characteristics that identify a given product in the market. Ultimately, in the case of milk derivatives, there is all too often a lack of a real standards in terms of palatability: today, in the vast majority of cases, people buy milk, butter and especially cheeses, convinced that "one is worth the other."

Food science will have to recover the values that can be achieved through a closer union between analytical research and production technology, where production means not only the technologies applied but also the conditions in which the raw material is produced (in the case of milk and its derivatives, this means the type of forage and pasture). This is the aim of the Brazzale Science Center, to be pursued through the scientific qualification of raw materials, applying advanced analytics, as well as of the finished product in terms of compliance with sensory standards achievable through



authoritative expertise in the field of the Chemistry and Technology of Flavors, with a view to focusing the utmost attention on safeguarding the “naturalness” of flavors.

Since research and development are based on the study of biotechnology, which in the case of milk, includes the production conditions of milk, we would like to provide general information on the aspects related to what are called "different feeding systems."

Among the factors that affect the quality of milk production, the type of diet is considered a predominant characteristic. There is now a long track record of studies on the proven relationship existing between the aromatic fraction of milk and diet-related factors and on the identification of natural organic molecules, which have either positive or negative sensorial responses. These analytical studies have been crucial in determining the "reasons" behind better palatability, as well as in identifying the causes of lower sensory acceptability. The study of the composition of the aromatic pattern, for milk and its derivatives, is already a consolidated project of ongoing adaptation of the analytical potential that the Brazzale Science Center has, with the specialized contribution of the Food and Environment Analytical Research Laboratories at the University of Milan. At present, the link between milk aroma ingredients and diet-related factors are becoming increasingly important in order to demonstrate, with scientific rigor, the indication of the milk production area (and therefore of the feeding of the productive livestock). A great deal of attention is already being paid to this, e.g., in Japan, with the aim of protecting quality based on science and not on paper-based systems, and of enhancing regional economic resources.

It should be borne in mind that sensory qualities are not only contingent, for milk and its derivatives, on the resources, which consist in the nature of fodder and animal feed in general, but also on the nature of the soil, specific climatic conditions, and what is called "climatic zone." In fact, an area can be characterized not only by its geographical position, but also by a complex set of “social, economic and environmental” factors that until now have not been sufficiently considered: areas available for grazing, typical features of the botanical diversity of pasture and forage, storage conditions and times of forage, and the "analytical" situation of pasture and forage.

While the sensory qualities for the acceptability of milk and its derivatives are a result of the characteristics of the microclimate and of the “zone” (location of pasture and fodder production in the geographical context), in particular, the fatty matter of milk and the type of constituent fatty acids



play a fundamental role, as already pointed out by S. Chen et al. in an authoritative scientific journal such as the "Journal of Agriculture and Food Chemistry", with a paper titled "*Physical and sensory properties of dairy products from cows with various milk fatty acid compositions*" published in 2004. The Brazzale Science Center is following in the footsteps of these research efforts and will produce research and development aimed in particular at the nutritionally validated study of the fatty fraction of milk through, for example, the characterization of triglycerides. In fact, it is known that the size of the fatty acid molecule and the position of fatty acids in the molecule of triacylglycerols affects the melting point of fats and hence the texture and gustatory impact of milk. The texture of cheeses, whose aromatic impact depends on the degree of fatty acid unsaturation (presence of double bonds), is modified as well.

The degree of fatty acid unsaturation, which is always considered superficially and in an approximated manner as a nutritionally positive indicator, is instead responsible for the tendency to oxidate and the rate at which this occurs, as already highlighted in 1981 by E.L. Thomas with a paper on "*Trends in milk flavors*" in the Journal of Dairy Science: defects and abnormal odors in the production of derivatives are due to the structure of the unsaturated compounds of triglycerides. The possibility of changing the aromatic profile of milk and its derivatives to achieve positive acceptability even in the case of an excess of unsaturated fatty acids is the result of skilful processing technology. In this regard, R&D projects will tend to adopt advanced analytical techniques aimed at guiding the proper feeding of productive livestock, as well as the advanced analytical characterization of fodder composition.

Ultimately, the qualitative properties, rather than the higher production yield, of the raw material, are the key features linked to the region of production, which remains unequivocally the basis for qualitative characterization in terms of sensory acceptability: there are those who today, unfortunately, in spite of basic rules of human nutrition, pursue flavor acceptability at the expense of nutritional intake.

Unfortunately, as a response to growing demand, production value chains based solely on conventional agrifood models have been established. These production and distribution models use mass distribution channels that intensify production systems solely in quantitative terms. The



Brazzale Science Center's scientific activity does not follow the mainstream of production systems that do not scientifically pursue ethically "useful" innovation.