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Effect of pulsed electric field processing on the functional properties of bovine milk

Thermal pasteurization ensures safety and enhances the shelf life of milk. Exposure to heat can modify labile milk components and alter the functional properties of milk proteins. This has driven the development of non-thermal food preservation techniques such as pulsed electric field (PEF) processing, primarily for the inactivation of spoilage microorganisms. Milk components, in particular fat and protein, affect the functionality, yield and quality of dairy products, requiring a clear understanding of the structural and chemical changes occurring due to PEF processing. On page 87, Pankaj Sharma and co-workers review current knowledge of the impact of PEF treatment on the functional properties of milk, namely, the physicochemical changes of milk components, changes in technological properties, shelf life, and sensory and nutritional properties. PEF treatment in combination with other hurdles (such as heat) has the potential to increase the preservation of milk while retaining sensory attributes. Intense PEF treatment conditions (electric field intensity, treatment temperature and square wave pulses), higher flow rates, and the mode of operation (batch or continuous) can induce changes to proteins that may affect the functional properties of milk; however, these changes after PEF treatment are often less compared to thermal treatments. Variability in equipment design and differences in treatment conditions and medium used will impact upon functional properties. Further studies on PEF-treated whole milk should be considered to provide more understanding of the changes that take place in more complex dairy products containing fat. The mechanism of volatile compound formation and partitioning between the fat and aqueous phases in PEF-treated milk is not well studied. This will have an impact on the flavor of dairy products. The direct equivalence of PEF processing to thermal pasteurization of milk with defined quality assurance indices is necessary before up scaling and commercialization. Preservation of the integrity of labile milk components and associated functional properties can be addressed by stepwise intermediate cooling between PEF treatment zones. Uniform pumping systems with minimized generation of shear forces should be implemented to reduce the impact of shear-induced structural changes. Mathematical models, similar to those developed for microorganism count reductions and enzyme inactivation, need to be developed as tools to predict the effect of PEF treatment on the structural changes of the MFGM. These structural changes will have a profound impact upon the development of texture and flavor in dairy products.

Analytical techniques for the elucidation of wheat bran constituents and their structural features

Wheat bran is a by-product of white flour production available in abundance. It consists of nutritionally and technologically valuable constituents, above all around 50% of dietary fiber. Numerous applications ranging from functional dietary fiber to fine chemicals are currently being developed in order to valorize wheat bran beyond animal feed. This shift in utilization necessitates an adequate set of analytical tools. On page 102, Stefan Böhmdorfer and co-workers review the analysis of wheat bran constituents in general and dietary fiber in particular with a focus on instrumental methods. The analysis of non-carbohydrate constituents of wheat bran is largely dominated by standardized AOAC methods and therefore leaves little demand for discussion. On top of that, the focus of this work is on the analysis of wheat bran carbohydrates. The authors present non-carbohydrates together with the respective analytical method and a reference, preferably a standardized method. Where no standardized method was available, suitable literature citations are given. The multitude of analytical techniques available makes for a handy toolbox in the analysis of wheat bran. Of course, acquisition costs for analytical instruments are often the limiting factor, but since many instruments essentially generate the same information and only differ in their drawbacks and advantages, a sound selection is sufficient to describe wheat bran in large parts. Even though the starting material has already been thoroughly characterized, structural analysis is far from being concluded. Advances in processing and ensuing health-related issues as well as physicochemical changes, especially regarding dietary fiber, can be expected to make structural analysis even more indispensable. With sample workup mostly being cumbersome and coherent information having to be put together manually from fragments collected in different analyses, there is still plenty of room to advance state-of-the-art technology in both instrumental capabilities and data evaluation. It is, however, rather unlikely that these techniques will be incorporated into official AOAC methods in the near future, since they are largely tailored to a specific matrix whereas AOAC methods are required to be more widely applicable. Either way, the strict divide between market-oriented quantification of dietary fiber according to AOAC methods and research-oriented structural elucidation, as it stands now, will have to give.

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Functional foods against metabolic syndrome

Metabolic syndrome is a condition of at least three of the cardiovascular risk factors: obesity, excessive visceral fat storage, dyslipidemia, hypertension and hyperglycaemia or Type 2 diabetes. It is a state of insulin resistance, oxidative stress and chronic inflammation. Cardiovascular disease is the highest cause of death globally. Certain dietary components and over 800 plants help prevent or moderate metabolic syndrome by assisting the body homeostasis mechanisms. On page 114, Suhaila Mohamed reviews the most current studies on foods that help fight metabolic syndrome and the scientific evidences to support their use. This includes functional fats, digestive enzymes inhibitors, various beverages, different fruits, specific vegetables, grains, legumes, herbs and spices that can reduce cardiovascular disease risk, through several cellular mechanisms. Plant polyphenols have antioxidant, vasodilatory, anti-inflammatory, antifibrosis and antiapoptosis properties that activate prosurvival cellular pathways. They mediate by modulating metabolic intermediates, microRNAs, sirtuins and reperfusion injury salvage kinases and survivor activating factor enhancement pathways. The polyphenols effect blood vessels, endothelial cells and increase the vasoprotective factors including nitric oxide (NO) and endothelium-derived hyperpolarizing factor, to reduce vascular oxidative stress and hypertension. Regular dietary polyphenols consumptions are negatively related to cardiovascular and degenerative disease risk in epidemiological studies. Non-pharmacologic therapies against metabolic syndrome include good optimal nutrition, ideal body weight maintenance, exercise programs and scientifically proven dietary supplements. Polyphenols like flavonoids, resveratrol, quercetin, epi-gallocathechin-3-gallate and curcumin, help retard elevated fat storage, blood pressure, blood glucose, lipid levels, hemoglobin-A1c and insulin resistance in mammals. Oxidative stress induces mitochondrial increase and arrest preadipocytes proliferation. Preconditioning preadipocytes with some dietary polyphenols totally or partially protects them against mitochondrial changes, obesity-associated diabetes and cardiovascular diseases. Polyphenols present in green tea, grape seeds, orange and grapefruit combat adipogenesis at the molecular level and also induce lipolysis.

Measuring sensory and marketing influences on consumers' choices among food and beverage product brands

Advance in food science depends on measuring the factors in human perception that influence eaters' activities with branded products. Assessed samples must include at least two levels of a sensed material characteristic (e.g. sucrose) or conceptual marketing attribute (e.g. "low fat"), minimally confounded by other features. Each feature needs to be measured for its effect on the individual's objective achievement of choosing among the samples for a familiar context of use. These influences interact, consciously and unconsciously. This theory of how a mind works has generated a wide range of scientifically illuminating and commercially practical examples, illustrated in this review. On page 129, David Booth reviews the fundamental requirements of psychological food science, and a variety of examples are given of the calibration of two or more factors in human perception and choice of a food. It is fairly straightforward to measure the influence of any sensed characteristic or conceptual attribute of an item of food on a person's perception of the item and on the act of accepting or rejecting it in the context of use. The measurements rely on the basic mental mechanism of discriminating between the level of a feature of the present situation and its peak level in a norm learnt from past situations. The trained or untrained assessor's response to a test is proportional to these conscious or unconscious disparities between the present and the past, as they are configured in the personal norm. Hence, when the levels of any sensory or symbolic factor have been monitored across the test samples, an assessor's peak point of that factor in the personal ideal or a familiar target product or brand follows directly from the observations, together with tolerance for disparities from "just right". Aggregation of peak points and discriminative tolerances across a representative panel gives an equally direct estimate of the market for each variant of the product in the uses that are simulated by the testing. All acquisition and analysis of human data needs to include peak-referenced responses and hypothesis-testing designs. Because everybody's mind operates in this way, such questions and answers are easier to operate on malls, over the internet or in the laboratory than tick boxes on series of vague and puzzling phrases, or unnecessarily difficult tasks such as ranking, voting or identifying the odd one out. Sufficient for most purposes are two precise anchor phrases, such as "just right" and "just wrong" (with "worse" beyond), on an array of otherwise unlabeled boxes, or of integers from a zero on one of the two anchor phrases. What matters for the science, technology and marketing are the causal relations of those scores to the peak points and limits of tolerance for each of the factors that are varied among sets of realistic food samples. Statistical modeling of response numbers cannot mea- sure optimum levels of the real factors that are under the control of production and marketing. Indeed, sensory profiling scores are not even necessary to measure the effects of sensed factors on consumers' choices. Attitude models, like/dislike

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