Clean labelling: Can packaging play a role?

Carol Zweep

Clean labelling is a popular trend in the food industry. Consumers are seeking "natural" foods that are free of chemicals. Packaging techniques can provide solutions to maintain food quality as well as satisfy the movement to reduce or eliminate preservatives and additives.

Modified atmosphere packaging is an established method of extending shelf life. This technique substitutes air in the package with another gas mixture (usually carbon dioxide and nitrogen). Carbon dioxide functions as both a bacteriostatic and fungistatic that hinders growth of certain aerobic organisms. Nitrogen is added to the gas mixture as an inert filler. Modified atmosphere packaging can deter microbial growth for commodities such as meat and poultry, ready-to-eat chilled foods and baked goods, without the use of preservatives. Elimination of entrapped air along with use of a good barrier package and adequate headspace is essential for effective application of this technique.

Changing the environment within a package can also deter microbial growth. Packets of oxygen scavenger material (such as ascorbic acid, photo-sensitive dyes and iron powder) can be inserted into packages to maintain a low oxygen level within the package and prevent the growth of aerobic bacteria and moulds.

Antimicrobial packaging can be used to suppress the growth of microorganisms by extending the lag period and to decrease counts by reducing growth rate. Agents can be incorporated into the packaging material, or coated/adsorbed onto packaging surfaces or placed within sachets, pads or labels. Antimicrobial systems can work by direct contact with the food surface or they can emit volatile compounds into the headspace surrounding the food.

Rosemary essential oil

Natural antimicrobials have attracted a great deal of attention recently from the food industry. Extensive research is being done on natural compounds such as bacteriocins, enzymes and plant extracts incorporated into packaging. Bacteriocins contain peptide-based antimicrobial compounds synthesized by bacteria that have bactericidal activity against other related species. Nisin is a bacteriocin found in raw milk and fermented foods and has a broad range of antimicrobial activity. Nisin has been used as a natural food preservative globally in products from canned foods to dairy products.

Enzymes are used in food processing, but a novel application is the immobilization of enzymes in packaging materials for antimicrobial purposes. Lysozyme is a naturally occurring enzyme produced by humans and many animals that can act as an antimicrobial by damaging the cell wall of bacterial cells.

Plant extracts and essential oils have strong antimicrobial properties since they contain a high amount of phenolic compounds. These materials have been incorporated into packaging materials or in coatings. Examples include grapefruit seed extract, grape seed extract, green tea extract and essential oils of rosemary, oregano, clove and cinnamon. Since essential oils are volatile, have low solubility in water and are susceptible to oxidation, research is now underway to improve the biological activities by encapsulating the essential oils.

Allyl isothiocyanate is an example of a plant extract incorporated into label film and it is commercially available in Japan (for example, Wasaouro by Mitsubishi-Kagaku Foods Corporation). Allyl isothiocyanate is a strong antimicrobial compound extracted from mustard and horseradish (wasabi) and is released into the package headspace upon exposure to high moisture from food such as cakes, breads and ready-to-eat meals.

The popularity of antimicrobial packaging systems is expected to grow due to the potential benefits of providing safe quality foods without the addition of chemical preservatives in the food. There are concerns of migration and degradation of compounds, effects on sensorial properties and development of antimicrobial resistance. Cost and consumer acceptance are additional factors. More studies and regulations are required to ensure the effectiveness and safety of antimicrobial packaging.

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