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# Ingredient Opportunities for Case-Ready Beef

**Mike Baczwaski**  
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Case-ready fresh meat is the fastest growth product category in the supermarkets. Understanding the phenomenon and the role that ingredients play in the success of these products is important with respect to meat quality and consistency.

## Summary

*Case-ready beef products have grown at a tremendous rate since the early large scale introductions in the mid 1990's. Estimates exceed 9 billion pieces in the near future, up from 500 million in 1997 and 1.2 billion in 2000. The key producers of case-ready beef products are fresh-meat processors and retailer co-packers and the list continues to grow rapidly. Justification for producers and consumers includes better-in-stock at retail or less out-of-stock on a 24-hour basis, labor availability at retail level, less shrink, greater cost savings, and most importantly consumer satisfaction, consistency, tenderness, juiciness and improved food safety.*

## Discussion

There are several technologies that case-ready meats can use to improve product consistency and extend shelf life. Consistency is a goal that all

producers strive for regardless of the industry segment. Case-ready beef allows consumers to experience more consistent fresh beef in regards to color, texture and eating quality. Case-ready meat allows a shelf life of 2-5 weeks following enhancement/fabrication, compared to a 5-12 day shelf life seen with conventional shrink wrapped fresh packaging. Extending case-ready meats allows for improved processing at large, efficient, central fabrication plants close to the beef supply and fabrication. Case-ready beef is consumer ready to use with fat and bones removed. Fat and bone utilization is greater at central processing locations. Case-ready products are shipped to distribution centers for retail outlet consumer demands. Extended shelf life may be accomplished with modified atmospheres containing gases such as carbon dioxide, nitrogen and oxygen in different combinations. Marinated or enhanced products can be vacuum packaged to extend refrigerated product life. Case-ready beef also reduces in-store meat cutting, preparation and packaging which also has a huge effect on food safety due to reduced handling and improved temperature control. Anti-microbial impact results from the carbon dioxide and/or nitrogen gasses.

Case-ready beef concepts will reduce the amount of out-of-stocks at retail levels and store availability of complete product lines. Product management and inventory control is much more efficient without in-store meat cutting and

packaging. There are new thrusts for case-ready beef that include enhanced or marinated products.

Enhancement can be defined as fresh beef that is injected with a solution of water, salt, sodium phosphates and a potentially large range of natural flavors such as rosemary extract and lemon juice. The beef is usually pumped to 8-12% of original weight. A marinade typically contains the same ingredients as the enhancement solution plus flavor components such as caramel colorings and top dressings with whole and/or cracked spices and other flavors. Thus, there are a number of non-meat ingredients that have increased the opportunity for fresh and processed beef in the retail marketplace.

The functionality of the non-meat ingredient varies depending on application and contribution to flavor and appearance ranges greatly. The ingredients functionality include the role in water-holding capacity, binding through salt bridges, swelling by phosphates, and impact on overall juiciness and texture properties of the finished product. While increasing yields with the use of non-meat ingredients is economically important to the processor, maximizing their functional impact on tenderness, juiciness, textural properties and flavor is the most important factor.

The biggest non-meat ingredient used in processed beef is water. Water quality, with respect to hardness and possible

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contaminates, influences potential benefits of water. Hard water reduces the ability of certain non-meat ingredients to dissolve and reduces the solubility of phosphates, salt and other ingredients. Without proper dissolving in water, phosphates and other ingredients will precipitate and thus not go into solution. If these ingredients precipitate out, poor binding in meat proteins will occur, resulting in poor water retention during distribution and cooking. Contaminates in water, such as iron and copper, increase oxidation. Oxidation of color and flavor proteins causes a negative effect on flavor and appearance. High chlorine levels in water have been shown to have an oxidative effect on finished product by increasing lipid rancidity and loss of color stability. Water retention can be effectively controlled through adjusting pH. The isoelectric point (pI) of meat is the pH of the meat at which the net ionic charge is equal to zero. The pI for fresh post-mortem beef generally occurs about pH 5.3. At the pI, there are no free charges and the meat fibers are attracted to one another, resulting in minimal space between the fibers for water to be held. As the pH of the meat is altered away from the pI, with the use of an enhancement solution or a marinade, charges begin to free themselves causing repulsion of the meat fibers, and the free charges begin to attract water. To accomplish this alteration of pH, alkaline phosphates are generally used. The use of phosphates increases water retention in beef during processing, distribution and final cooking or reheating.

Salt is a major non-meat component of any marinade or enhancement solution. Salt is needed for the solubilization of beef myofibrillar proteins. It is also an important flavor component. Through this process small pieces of meat are bound to one another. Salt also can create a negative effect by causing a rubber-like texture when excessive protein solubilization has taken place.

In addition, subjecting beef to too much mechanical action in the presence of high salt and phosphate can be detrimental to desired texture. Typically, sodium chloride is the processor's salt of choice but in the cases where excess salt content may cause problems, alternatives

can be used. Potassium salts can be used but they tend to produce bitter or metallic aftertaste. In the case where there is a masking flavor such as with marination, these potassium salts can work well.

Other non-meat ingredients that are common in case-ready and marinated meats include the broad category of hydrocolloid gums. These gums include carageenan, konjac flour, xanthan and gellan gums. Their function is to increase water holding capacity and aid in retaining water throughout the cooking process. Gums are primarily used in beef products that are low-fat or fat-free. Lactates and acetates are antimicrobial agents that extend shelf life.

Lactates, usually sodium or potassium, are ingredients that are derived from corn or beet sugar. Lactates act as a bacteriostat by interfering with bacterial metabolism and increasing the lag phase of growth. Lactates inhibit growth of *Listeria monocytogenes*, *Staphylococcus*, *Salmonella* and *Clostridium botulinum*. By doing this, lactates decrease microbial growth and spoilage, therefore increasing shelf life. Research has shown that with the addition of lactate, fresh beef sausage shelf life can be increased from 30 to 70% and roast beef shelf life can be increased 50 to 100%. The addition of lactate in beef products acts to protect against refrigeration challenges during transportation, retail storage and handling. In case-ready beef products, temperature abuse comes in the form of retail refrigeration inconsistencies, consumer abuse after the product is purchased before home refrigeration and increased temperatures of home refrigeration units.

Sodium diacetate, a salt of acetic acid, is a biocide that reduces the initial microbial load, but has the potential for unwanted flavors and odors. Commonly a combination of lactate and diacetate allows for lower levels in the product while obtaining a combination of both bactericidal and bacteriostatic actions.

Reducing agents play a key role in case-ready meats. Such ingredients are sodium erythorbate and sodium ascorbate. While these ingredients are important in flavor, improving shelf life and keeping quality, the most important

role of reducing agents is to reduce the tendency of fresh meat color to darken and turn more brown.

Another important non-meat ingredients are the acidulation agents. Acid encapsulation has been used in products such as low-fat beef patties. Encapsulation is used because the melting temperature of the specific fat that encapsulates the acid, protects beef's color proteins from discoloration due to oxidation. These acids then are released during final cooking and preparation.

Lactic acid starter cultures, which ferment dextrose, also provide excellent acidification of products such as beef summer sausage and snack sticks but use in enhanced beef products is very limited. The most significant problems with lactic acid are the limited times and temperature at which they are effective. Tenderizers are usually proteases that are derived from plants. These tenderizers degrade muscle protein. The challenge of using plant or fungal enzymes for enhanced products is controlling the activity. Consumer uncertainty of cooking procedures will limit the use of papain, bromelin, ficin and fungal enzymes. If the tenderizer is applied and a protein denaturant level of heat is applied too early, the tenderizer is rendered ineffective and if it is applied too late, the tenderizer will cause the beef to be too soft in texture. In addition, enzymes are hard to distribute uniformly throughout beef.

Traditionally, food processors have used synthetic antioxidants developed from fats and oils such as BHA and BHT. Since it is required to declare this on the product ingredient label, they are not often used in enhanced beef products. Instead, the use of natural antioxidants in the form of herbs, spice extracts and fruit pastes have become widely adapted. Lemon juice is also being used for subtle flavor changes.

The popularity of case-ready beef products is increasing. Benefits include product convenience, consistency, and food safety.

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