



UA meat scientist John Marchello and doctoral student Mhenni Ben Abdallah are developing ways to keep meat fresh without the use of chemical preservatives.
Ken Matesich photos



Beef Faces Multiple Marketing Challenges

Beef producers' efforts to expand their markets are often hampered by consumer pickiness.

By Susan McGinley

BEEF PRODUCERS AIMING TO PRESERVE A PLACE IN THE MEAT case — and on consumers' tables — must satisfy a very picky public. It's not enough to battle image problems with leaner, healthier cuts of meat. Researchers say they must also meet demanding aesthetic criteria, as well.

Consumers look for beef with a bright cherry-red color and a fat content of less than 30 percent, says University of Arizona meat scientist John Marchello. They also expect convenient and contaminant-free packaging.

And when it comes to beef, grocery shoppers won't accept the shortcuts, such as freezing, that other meat producers commonly use to preserve quality.

This creates a formidable challenge for people like Marchello, whose work is part of a Western regional project designed to improve beef marketing strategies. The goal of the project is to help cattlegrowers reverse the steady decline in U.S. beef consumption in recent years, attributed to concerns about dietary fat and cholesterol and aggressive competition from the pork and poultry industries.

The program identifies the changes in meat consumption patterns, targets national and international markets, and develops the technology to provide beef products determined to be the most marketable. Marchello's particular mission is to develop beef packaging methods which retain the bright red color of freshly slaughtered meat and increase its shelf-life without adding preservatives.

"Freezing works the best, but consumer surveys show that people don't want a frozen product," Marchello says. "People will buy frozen poultry and pork, but for some reason they reject frozen beef." The challenge is to retain the color of beef while discouraging spoilage.

The pigment myoglobin gives the beef muscle its basic red color. In the presence of oxygen it changes to oxymyoglobin, giving the high cherry-red color consumers equate with fresh beef. After about three days, the pigment oxidizes to metmyoglobin, which turns the meat an unappetizing brown. Marchello's work focuses on slowing the change to metmyoglobin.

"If we can maintain the cherry-red color and keep down the microbial population, we've got it made," Marchello says.

One technique that shows promise involves the use of carbon dioxide, oxygen and nitrogen inside the packaged fresh

beef, creating, in effect, a special mini-atmosphere. Carbon dioxide discourages microbial growth, while oxygen preserves the color. The catch is that too much carbon dioxide turns the meat brown, while too much oxygen feeds the spoilage organisms.

Marchello has discovered that concentrations of 25 percent carbon dioxide and 40 percent oxygen work well, with nitrogen filling the remaining 35 percent. Yet more study is needed to determine the optimum amounts for different meat cuts.

Marchello tests different combinations of the gases, all native to Earth's atmosphere, using technology developed at the University of Arizona. He cuts a core sample out of the meat and sterilizes it, puts it in a sealed vial and measures the color change from red to brown in the muscle. The method requires only small amounts of meat.

The vial system enables Marchello to inject different atmospheric concentrations of carbon dioxide, oxygen and nitrogen into the container to study their effect on the myoglobin pigment. He can also inoculate the samples with spoilage bacteria and even such pathogens as salmonella and listeria to analyze their effect when combined with the atmospheric gases.

"The metmyoglobin forms more rapidly with bacterial growth and development, so the meat turns brown faster," Marchello says.

This is especially true with pre-frozen beef. During the research, a switch from UA meat lab beef to frozen commercial top round yielded the accidental discovery that beef shipped pre-frozen and later thawed at the grocery turns brown sooner than fresh meat.

Once the meat preservation system is refined, meat wrappers must be designed, a facet that Marchello expects will be handled by commercial firms.

"One of the critical things is to develop a packaging system that will have a 'pillow effect,'" Marchello says. The package must puff up to accommodate the volume of gas pumped into it.

As with all aspects of the marketing research, the new packaging technology must suit both domestic and foreign markets, such as Japan and Australia, where U.S. beef producers hope to expand in the future.