

# Consumer Acceptance of Fresh Meat Packaging with Carbon Monoxide

## A.S. Leaflet R2756

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### Summary and Implications

Because some consumers have expressed reservations about the use of carbon monoxide for fresh meat packaging, we hypothesized that providing consumers with factual information about this packaging technology would alleviate consumer fears and biases concerning carbon monoxide, and improve consumer acceptance of carbon monoxide in meat packaging. Consumers were given opportunities to purchase ground beef with three choices of product color (bright red, light red or reddish brown), three hypothetical shelf life differences (3, 5 or 14 days) and three prices (\$2.85, \$3.05 or \$3.25) both before and after information on packaging with carbon monoxide was provided. Following the initial purchasing experiment, the information on carbon monoxide describing the bright red color and extended shelf life achieved by this packaging technology was provided, and the purchasing experiment repeated to test the impact of communicating with consumers about carbon monoxide packaging. The results showed that consumers were willing to pay \$0.16 per pound for each level of improved color of ground beef. There was no purchasing preference for 5-day shelf life over 3-day shelf life but consumers were willing to pay \$0.36 per pound more for the 14-day shelf life. After information about carbon monoxide packaging as a means of providing improved color and shelf life was provided, willingness to pay declined to \$0.05 per pound for color and \$0.13 per pound for shelf life improvement. While the willingness to pay was less following information about carbon monoxide, it was still positive for those product attributes. These results suggest that strategies for improvement of consumer attitudes concerning carbon monoxide packaging may need to do more than simply communicate the advantages of the technology. Extended efforts to educate consumers about the science of the technology may be necessary in order to significantly improve consumer attitudes about carbon monoxide packaging.

### Introduction

Carbon monoxide was approved by the United States regulatory agencies for fresh meat packaging in 2004 at a concentration of 0.4% in the headspace gases of modified atmosphere packages (MAP). The advantages of carbon

monoxide use in MAP include a very stable, bright red meat color that has a much longer shelf life than other packaging systems and, when coupled with other gases such as carbon dioxide, will result in extended shelf life in terms of microbial control. The result of this packaging technology is fresh meat with a significantly longer shelf life in terms of both color and microbial growth. However, some consumer advocacy groups have expressed concerns about personal exposure to carbon monoxide, and about the potential for spoilage and/or pathogenic microbial growth to eventually become significant while product color remains attractive. While the use of 0.4% carbon monoxide in package gases has been clearly shown to represent no risk to consumers and the likelihood of growth of microbial pathogens is highly unlikely, the consumer perceptions of carbon monoxide in meat packaging has been generally negative. Because the consumer perceptions about carbon monoxide in meat packaging may be the result of both a lack of understanding of the science and being misinformed about this technology, this project was designed to test the hypothesis that providing consumers with factual information on MAP packaging with carbon monoxide will improve consumer acceptance of this packaging technology for fresh meat.

### Materials and Methods

A group of 106 consumers were given the opportunity to purchase ground beef at one of three color levels (bright red, light red or reddish brown), one of three hypothetical shelf life categories (3, 5 or 14 days) and at one of three prices (\$2.85, \$3.05 and \$3.25). Each person participating in the study was presented with two packages of ground beef at each setting. Each of the packages presented at one setting represented one of the color levels, one of the shelf life categories and one of the prices. The participant was asked to select which of the two (or neither) that they would be willing to purchase, and the participant was then required to complete the purchase with the \$20 provided to them for the study. The experiment was designed to compare 27 choice sets of packages selected by a statistical algorithm to be representative of all possible combinations of package attributes. No additional information on packaging was provided for the first experiment so that selections were made entirely on color, shelf life and price. Following the initial choice experiment, participants were provided with information on MAP and carbon monoxide packaging as a means of achieving improved product color and shelf life. The packaging information was shown to participants on an overhead projector and simultaneously read aloud. The choice experiment was then repeated with the same

attributes of color, shelf life and price to assess the effect of packaging information on purchase decisions.

### **Results and Discussion**

The results of the initial experiment showed that consumers preferred brighter red color, as expected. A strong consumer preference for cherry red color of fresh meat during purchasing decisions is well established. In this study, the consumers showed a willingness to pay \$0.16 more per pound for ground beef with light red color over reddish brown color, and \$0.32 per pound more for bright red color over reddish brown. There was no difference in willingness to pay for a 5-day shelf life over a 3-day shelf life but participants were willing to pay \$0.36 more per pound for a 14-day shelf life over 3 or 5 days. Following an objective description of the advantages of MAP with carbon monoxide for fresh meat packaging, the choice experiments were repeated, and included the ground beef with bright red color identified as packaged with carbon monoxide. The results following information of carbon monoxide packaging showed a decline in the willingness to pay to \$0.05 for color and \$0.13 for shelf life, though both still remained positive. Information collected from participants

about their “knowledge of carbon monoxide in food packaging” and “having heard about carbon monoxide in food packaging in the mass media” indicated that both knowledge factors had a negative effect on the willingness to pay for meat color produced by carbon monoxide. Thus, consumers are clearly willing to pay for improved meat color and longer shelf life, the perceived benefits of these attributes dissipate when consumer are informed about the technology used to achieve improvements in these attributes. Consequently, to improve consumer attitudes about carbon monoxide packaging of fresh meat, communications should be designed to not only inform consumers about the use of carbon monoxide but also educate consumers about the science of this technology for fresh meat packaging.

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**Table 1. Example of choices provided for one of the choice sets.**

Choice set 1	Attributes of samples of 1 lb of ground beef		
Price	\$ 2.85	\$3.05	
Color	Light red	Brownish red	None of these
Shelf life	3 days	5 days	
I would choose (check X one)			