



US and German consumer preferences for ground beef packaged under a modified atmosphere – Different regulations, different behaviour?



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ABSTRACT

New technologies in food processing can provide advantages to consumers and producers but often the technologies are applied in different, country-specific regulatory climates. Modified atmosphere packaging extends the shelf life of fresh meat and, with the inclusion of carbon monoxide, stabilizes colour. These packaging technologies can be used in the US and Europe, although a modified atmosphere package that includes carbon monoxide is allowed only in the US. This study applies choice experiments to analyse preferences of US and German consumers towards the meat attributes enhanced by the packaging. Results show that longer shelf life is preferred in the US as long as the technology is understandable. Consumers in both countries have clear preferences for cherry red meat colour. However, providing information on the use of carbon monoxide in the packaging decreases US consumers' willingness to pay and increases some German consumers' willingness to pay.

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Introduction

In markets today, consumers demand meat products that are safe, promote good health, are of high quality and convenient to purchase and use. In this context, maintaining an attractive colour and long shelf life as indicators of meat being “fresh” and safe to eat is of primary importance. Colour is the first quality attribute consumers use to evaluate meat quality, and it plays a major role in influencing purchase decisions (Viana et al., 2005), even if the colour does not affect taste or shelf life (Sørheim et al., 2001; Steenkamp, 1989).

Establishing and maintaining an attractive cherry red colour during retail display is a challenge for meat processors and the retail industry. Several processing technologies are available to improve the stability of colour while at the same time extending product shelf life. Modified atmosphere packaging (MAP) is one technology used to both extend shelf life and stabilize colour for fresh foods. MAP refers to the replacement of air in the headspace of the packaging with a single gas or a mixture of gases including for example high oxygen (O₂) levels, with at minimum 60% O₂ (McMillin, 2008; Sørheim et al., 2001). Besides high oxygen atmosphere, another option to preserve meat colour is the use of carbon

monoxide (CO) in concentrations between 0.3% and 0.5%. MAP with low concentrations of CO and high concentrations of carbon dioxide (CO₂) has been shown to provide stable, bright red colour to beef and pork products (Viana et al., 2005). The colour can be stabilized up to a year. However, the use of carbon monoxide (CO) in MAP (CO-MAP) for food is controversial and this has led to differing regulations and use across countries.

Of course, countries differ not only with respect to regulations but also with regard to consumers' attitudes towards new technologies and responses to information (e.g., Lusk and Fox, 2003; Lusk et al., 2004). A key question is whether the regulations as practiced are conform or at odds with consumers' preferences? With respect to the use of CO-MAP the EU has banned the application, despite an EC Health & Consumer Protection Directorate's report that pointed out that no risk of harm to human health could be assumed for the use of the CO-MAP technology (EC, 2001). To the authors' knowledge, at no point in time were consumer preferences taken into account when banning the technology. In the United States, the use of CO in consumer-ready fresh meat packaging (as CO-MAP) was approved by the U.S. Food and Drug Administration (FDA) in 2002, but since then several companies have withdrawn products using the packaging from their shelves in response to consumer group pressure about the use of the packaging technology (FDA, 2002, 2004).¹

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¹ As example, several US chains (including Walmart) discontinued carrying CO-MAP meats in 2007.

Although many studies exist on the technological effects and characteristics of MAP (e.g. Brooks et al., 2008; Cliffe-Byrnes and O'Beirne, 2005; Allende et al., 2004; Rocculi et al., 2004; Jayas and Jeyamkondan, 2002), there are only a few that address consumers' acceptance of MAP and especially CO-MAP. Recent examples of consumer acceptance studies include Van Wezemaal et al. (2011) who analysed acceptance of different packaging technologies. Their findings for European consumers show that vacuum packaging is the most accepted packaging technology followed by MAP, while technologies including different kinds of additives are less accepted.² Aaslyng et al. (2010) find that Scandinavian consumers prefer meat packaged without oxygen. Including carbon monoxide (CO) in the packaging to maintain the red colour had no impact on the consumers' preferences when choosing meat.

This study aims to extend the previous literature by adding direct measures of willingness to pay for certain meat product attributes, including not only the packaging technology but also the attributes of colour and shelf life. Within the limits of accepted economic experimental procedures, we provide a unique study design that allows an evaluation of whether consumers in different countries (Germany and USA) differ in their response to modified atmosphere packaging including carbon monoxide. Cross-country comparisons of consumer responses to technologies deepen our understanding of consumer preferences with respect to packaging technologies and product attributes. Through use of non-hypothetical choice experiments, we are also able to assess whether German consumers would be willing to purchase the CO-MAP products, if they existed in the market. Also, we evaluate whether labelling of MAP and CO-MAP would change US consumer preferences (currently those products are not labelled in the US regarding the packaging technology).

The contribution of this paper is to assess consumer preferences for different meat packaging methods when including varying information and labelling scenarios. Ground beef was chosen as the research product because it is a staple in the diet of consumers in industrial countries. Given the potential for MAP and CO-MAP to improve the profitability of producers and food retailers and to provide potential consumer quality attributes, consumers' preferences and willingness to pay (WTP) for these new technologies are critical to a better understanding of how to position the new technologies in the marketplace and to develop policies to appropriately inform consumers. Depending on the results, regulatory changes might be considered in both countries although preferences are not the only reason to change public policy.

The remainder of the paper is as follows. The section 'Background on modified atmosphere packaging and its regulations' provides detailed background on MAP and CO-MAP as well as on the underlying regulatory frameworks for each of the two countries. In the section 'Methodological background' the design of the study and the methodology applied in analysing the data are explained. The section 'Empirical results' presents empirical results of the study and the section 'Discussion and conclusions' provides conclusions based on the results.

Background on modified atmosphere packaging and its regulations

Modified atmosphere packaging

As mentioned previously, MAP is the packaging of food with a gas mix which differs considerably from that of pure air. MAP

² Results from the Van Wezemaal et al. (2011) study show that, on average, German consumers' acceptance of MAP is similar to other European countries such as Spain.

Table 1
Comparison of legislations and labelling requirements across countries.

Country	Relevant legislations	CO-MAP allowed	Required MAP labelling
USA	– Code of Federal Regulations part 21: Food and Drugs, part 170: regulates food additives; part 170.30: eligibility for classification as generally recognised as safe (GRAS), regulates packaging and protective gases understood to be food additives such as CO ₂ and N ₂ (http://www.cfsan.fda.gov/~dms/opi-appa.html)	Yes	GRAS substances do not have to be labelled. Only 'use-by date' stating amount of time the product will remain safe for consumption needs to be labelled
Canada	– Good Manufacturing Practice: covers CO ₂ and N ₂ – MAP gases are listed as "technical additives" as well as food additives – A list of technical additives includes all gases as "Head space flushing gases and packaging gases" (CFIA, 2007)	Yes, if <0.4% for meat	No need to label gases classified as technical additives on the packaging
EU member states	– 89/107/EEC: directive of food additives – 95/2/EC: directive of food additives other than colours or sweeteners, identifies as "packaging gases" those gases other than air introduced into a container before, during or after placing foodstuff in them – 94/54/EWG, Appendix: regards labelling of foodstuffs whose durability has been extended by means of packaging gases – EWG 2092/91, Appendix VI: regards labelling of E-numbers	No	Label: 'Packaged in a protective atmosphere'E-numbers on the packaging label, e.g. E290 for CO ₂ , E948 for O ₂
Germany	– German additive regulation ZzUv, Anlage VII §5 Abs.1, 1998: additives of technological nature do not have to be mentioned on package, but protective atmosphere is required to be labelled	No	'unter Schutzatmosphäre verpackt'
Australia, New Zealand	– Common food standard (FSANZ): no food packaging is allowed to make food unsafe or cause spoilage but no restrictions are in place with regard to MAP gases, producer is responsible for product and package content (NZFSA, 2008)	Yes, if <1%	No labels are needed to inform about use of MAP but information regarding storage and shelf life is required
	– CO, CO ₂ and N ₂ are identified as food additives from the subgroup of packaging gases		

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