



## Fact Sheet on Modified Atmosphere Packaging

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### Modified Atmosphere Packaging

Modified atmosphere packaging (MAP) is a packaging technology commonly used to extend the shelf life of fresh food products. This technology is used for fresh meats; cheese; fresh pasta; vegetables; bread; seafood; and snacks.

In a modified atmosphere packaging system, the composition of gases inside a package is altered by replacing it with a single gas or a mixture of gases, with the aim of extending the shelf life of the product. The ratio of oxygen, nitrogen, carbon dioxide and/or carbon monoxide is altered to best suit the food product. Extending the shelf life in this way, and reducing loss to spoilage, is an enormous economic benefit for the food industry.

### Modified Atmosphere Packaging Systems for Red Meat

Modified atmosphere packaging does pose unique challenges for red meat, as the reaction of myoglobin protein with atmospheric gases will affect the pigment of the meat product.

#### High Oxygen Modified Atmosphere Packaging System

In a high oxygen modified atmosphere packaging system, the myoglobin protein will react and bind with the oxygen to form a stable pigment that will give the meat a bright red colour. This is a desirable attribute that consumers associate with the freshness of the product. However, the high oxygen content in the packaging allows for growth of spoilage organisms and for lipid oxidation. Shelf life of the product is compromised.

#### Low Oxygen Modified Atmosphere Packaging System

In a low oxygen modified atmosphere packaging system, typically with high levels of carbon dioxide, growth of spoilage organisms is slowed. However, without the presence of oxygen to bind the myoglobin, the meat has an unappealing purple colour.

#### Carbon Monoxide Modified Atmosphere Packaging System

In a carbon monoxide system, with low oxygen, the carbon monoxide will react with the myoglobin and give the meat a bright red colour. The low oxygen mixture limits the growth of spoilage organisms. Carbon monoxide, a gas that can be fatal when inhaled in large quantities, is not harmful to human health when ingested.

In the United States, the Food and Drug Administration recognizes carbon monoxide as a GRAS (generally recognized as safe) compound for use in modified atmosphere packaging systems at

a maximum concentration of 0.4%. Carbon monoxide has been used in the United States since 2002 as a component of outer barrier bags, and since 2004 as part of the gas mixture inside a modified atmosphere package. Carbon monoxide has been used in Norway since 1970, with no evidence of increased risk to consumers. In the European Union, carbon monoxide is prohibited due to concerns with masked spoilage, though the European Commission's Scientific Committee on Food's 2001 opinion concluded that there is no health concern associated with the use of 0.3% - 0.5% concentrations of carbon monoxide.

Food additives and processing aids are approved on a case by case basis by Health Canada's Bureau of Chemical Safety. Until recently, carbon monoxide was not approved for use in Canada or in products imported into Canada. In 2010, a letter of no objection was issued by Health Canada for the use of carbon monoxide as a processing aid, at 0.4% in a modified atmosphere for meat products in a specific packaging system.

### **Modified Atmosphere Packaging Systems with Natural Additives**

There is interesting research being done in the field of natural additives in modified atmosphere packaging. Rosemary, traditionally used as an antioxidant and food preservative, has been found to have a similar effect as carbon monoxide when added to modified atmosphere packaging. Red meat is able to maintain a bright red colour for an extended period of time.

### **Consumer Information**

Some groups oppose the use of some modified atmosphere packaging systems, in particular those with carbon monoxide, as the colour preservation properties could potentially mask spoilage of the meat product. However, consumers should always use the expiration dates as the primary indicator of meat freshness, as well as other spoilage indicators.

When preparing any meat product, consumers should follow safe handling practices. This includes washing hands, utensils and any surfaces or utensils that touch raw meat; keeping raw meat and poultry cold; keeping raw and cooked products separate and cooking thoroughly using a meat thermometer.

### **Helpful Links:**

Health Canada – Bureau of Chemical Safety:

<http://www.hc-sc.gc.ca/ahc-asc/branch-dirigen/hpfb-dgpsa/fd-da/bcs-bsc/index-eng.php>

American Meat Institute:

[www.meatami.org](http://www.meatami.org)

[www.meatsafety.org](http://www.meatsafety.org)