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Truls Nesbakken
Fagsentret for kjøtt
PB 396 Økem
0513 Oslo
Norge

Use of CO as packaging gas for meat and meat products

After going through the scientific documents sent to us and having own projects supporting the results, our institute is ready to support the Norwegian proposal to allow CO gas as a packaging gas in EU.

Finnish Meat Research Institute



Markku Raevuori
Managing Director



Raymond Tuominen
Laboratory Director

The Use of CO as a Packaging Gas for Fresh Meat.

By Magne Yndestad

A previous report on the use of CO as a packaging gas concluded that there is unsatisfactory documentation on factors such as the development of pathogenic bacteria in the gas mixture in question (0.4% CO/60% CO₂/40% N₂). The Norwegian Research Center for Meat forwarded recent and complementary documentation on September 13, 1999.

Following scientific review, the content of this documentation can be summed up as follows:

Bacteriological Conditions

Numerous studies have been undertaken regarding trial storage involving concentrations of CO₂ in a range consistent with the "Norwegian" mixture (60-75% CO₂). Moreover, there are articles documenting the bactericidal effect of various other concentrations of gas mixtures containing CO₂. The conclusion to these trials is the following:

The low CO concentration (<0.5 CO) has no apparent effect on bacterial flora in products packaged with gas. This also holds true for N₂ (filler gas).

Concentrations of CO₂ below 5% may stimulate the growth of certain types of bacteria. Between 5 and 50%, we see an approximately linear inhibiting effect. This effect is somewhat significant, since the inhibition of growth of the sensitive flora is as much as 50% at 10% CO₂. The documented effect of CO₂ in high concentrations primarily applies to the psychrotrophic flora, including the most important spoilage bacteria.

As for the pathogenic bacteria, scientific literature in general points to the same tendency, i.e. inhibition of growth at both 4°C and higher temperatures (e.g. 10°C).

In comparison to other packaging methods or gas mixtures used, the mixture in question seems favorable both in terms of storage life and in terms of the relevant pathogens.

Following the last round of applications, The Norwegian Research Center for Meat has performed a relatively extensive study on freshly ground meat packaged in 0.3-0.5% CO/60-70% CO₂ and 30-40% N₂. Various pathogens, such as *E.coli* O157:H7, *Listeria monocytogenes*, and *Yersinia enterocolitica* were tested in this trial. The Research Center has evaluated factors such as the important possibility that the strong suppression of the general psychrotrophic flora may favor certain pathogens, which will not be inhibited to the same degree. The main conclusion, however, is that the aforementioned pathogens are inhibited both at 4°C and 10°C. Comparing the CO packaging method to packaging employing a high concentration of O₂ or vacuum, shows that the risk for growth of the applied pathogens is identical or lower when packaging with CO.

The Research Center has studied the circumstances concerning salmonella bacteria and the gas mixture in question in the same products. Since none of the cultures grew at +4°C, studies were only undertaken at 10°C.

In this case, storage with packaging gas containing CO performed worst with regard to *S. dublin*, *S. enteritidis* and *S. diarizonae*, as a relatively strong growth occurred following Day 2. *S. typhimurium* too had considerable growth, although "sausage" packaging scored lower.

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This is completely in line with what is known about a whole range of salmonella bacteria in foods, i.e. that they hold up very well when competing with other bacteria, and also grow very well at temperatures around 8-10°C.

These facts emphasize the importance of cooling regardless of what packaging method is chosen.

Sensorial Circumstances

The last report pointed to the particular fact that the CO packaged meat could retain a fresh red color for days after spoilage set in. Hence, the consumer cannot *see* whether the meat he or she buys is spoiled, as opposed to fresh meat packaged in other types of gas packaging.

The Research Center notes that when opening a package, the consumer will detect any spoilage odor, and hence not eat the product. This may be true, but it is a fact that many people won't react to any incipient decay when the products looks completely "fresh." However, the packaging method for which approval is sought is meant for fresh meat that will be treated with heat prior to use. This is an additional safety factor that is important in a comprehensive evaluation.

Conclusion

The first bacteriological/sanitary statement made was based on the documentation available at the time. The new data and other relevant information from scientific literature indicate that there is sufficient evidence that the use of CO as a packaging gas as described in the application won't result in any increased risk of transmittal of food-borne diseases among consumers.

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