Gas Plasma

INTERVENTION SUMMARY	
Status	An Emerging Technology
Location	Packaging/retail
Intervention type	Surface treatment
Treatment time	Variable
Regulations	Not determined – technology very new
Effectiveness	Good
Likely Cost	High capital outlay
Value for money	Good potential. If using air (ie. O_2) as the gas, can be cost effective
Plant or process changes	Space would be required for installation of the equipment
Environmental impact	Energy is required, but no effluent produced
OH&S	The unit would require proper screening
Advantages	Can treat irregular surfaces. No chemicals or residues produced. The gases are ionised between the plates, and it is the gas that is in contact with the meat surface
Disadvantages or Limitations	Surface penetration only Consumer perception may be poor because of a perceived link to irradiation technology Possible surface oxidation Products are likely to be batch processed during treatment, but could be made continuous with conveyor feed

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Plasma-based sterilization effectively involves producing controlled lightning by applying microwaves to gases or vapours such as inert gas, oxygen or moisturised air. This results in free moving electrons, ions and neutral particles, which are contained in a field between two plates. Items to be sterilized are passed between these plates, and the contaminating microorganisms undergo intense electron or ion bombardment, so their spore coatings or cell wall materials are eroded, with fatal outcomes (Laroussi 2005).

Early work on ionisation of air showed that the surface of meat could be decontaminated using this kind of technology, and there have been claims of 80% reductions in microbial load on carcasses (Gysin 1986), and that growth was inhibited, resulting in a 1 log difference during storage of beef or pork (Mackey and Mead 1990). Ionisation of the air in a chill chamber could reduce the microbial load of the air, and thus reduce further aerogenous contamination of the stored carcasses, but these studies were difficult to repeat and the decontamination effects were difficult to prove.

Recently, stable electron fields have been established as outlined above, and researchers have been able to inactivate cultures of *E. coli* in times ranging from 4.5 seconds to 5 minutes (Maeda *et al.* 2003). The technique is currently being investigated for use in food pasteurisation. It a clean and environment-friendly, non-thermal sterilisation process.

References

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