

Pulsed Electric Field (PEF)

An Emerging Technology

Pulsed electric field (PEF) treatment involves applying a short burst of high voltage to foods between two electrodes, and can be carried out at ambient or at refrigeration temperatures. It is thought that pulsed high-voltage (40kV/cm) stimulation ruptures microbial cell membranes, and decontamination of liquid or semisolid foods such as juices, milk and potato dextrose agar have been successful, achieving reductions of up to 6 log (Zhang et al. 1994).

The treatment is applied for less than one second, so there is little heating of the food, and it maintains its “fresh” appearance, shows little change in nutritional composition and has a satisfactory shelf-life (Castro *et al.* 1993, Kozempel *et al.* 1998). Microbial reductions of up to 9 log have been achieved in laboratory scale systems using treatments of 2 seconds to 300 seconds, and good results have been achieved in liquids such as water, milk and juices (Qin *et al.* 1995). Some successes have been achieved using pulsed low-voltage (220-380V) stimulation on rabbit meat and chicken legs (Mrigadat et al. 1980; Lin et al. 1983), but in beef, lamb and pork, no antimicrobial effect has been demonstrated. Further development of the construction of the PEF treatment vessel and the format of the product needs to be considered before this technology could be applied to larger cuts of meat and products, although, for example, an extruded meat paste may be treatable using this technology. Use of this technology in any scaled-up application will need to consider the safety of the equipment because of the high voltages used.

Electrical stimulation has long been in use in the meat industry to improve the texture of meat, and some research has been carried out to explore potential antimicrobial effects, as electrically stimulated carcasses seem to exhibit a slower onset of microbial spoilage than those that are not stimulated (Bawcom et al. 1995). Artificially inoculated beef steaks were successfully decontaminated using direct application of electrodes to each end of the steak, and reductions in microbial count were improved if the steaks were wetted prior to treatment.

References

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