

Summary of Current and Emerging Interventions used during Red Meat Production

Technology	Documented applications	Treatment time	Approx. microbial reduction	Advantages	Disadvantages or limitations	Regulatory status			Tradename, distributor or proponent
						USA	EU	AUS	
Organic acids (e.g., acetic, lactic)	Carcasses, primals, livers, lips, cheekmeat, tongues	10-30 s, depending on temperature	1-3 log	Applied by spray or immersion. Much literature on effectiveness. Can be used with other interventions	If used on primals, they may be wet for packaging; possible discolouration of lean, organoleptic problems; concerns about acid-resistant pathogens, corrosion of equipment.	Yes	Some	Yes	CHAD, IMCD
Trisodium phosphate	Carcasses, livers, lips, cheekmeat, tongues	10 s	1 log		May have issues with phosphate removal from effluent and expensive disposal.	Yes	No	No	Ecolab
Peroxyacetic acid	Carcasses, primals	10-30 s	1.4 log	Low concentration	If used on primals they may be wet for packaging; possible discolouration of lean	Yes	No	Yes	Ecolab, Redox Chemicals, IMCD
Ozonated water	Carcasses, primals	15-60 s	1-2 log	Ozone dissipates quickly	If used on primals they may be wet for packaging; possible discolouration of lean at high concentrations, potential oxidation of fat	Yes	No	Yes	Ozone Safe Food, Hi Tech Pacific, Continental Water
Irradiation (Gamma rays)	Primals, ground beef	Several mins	2-6 log	Able to treat packaged food	Expensive to install - central treatment facility only; consumer acceptance issues.	Yes	No	No	ScanTech Holdings

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Irradiation (E-beam)	Primals, ground beef	Seconds	Up to 4 log	Able to treat packaged food	Expensive to install - central treatment facility only; consumer acceptance issues	Yes	No	No	ScanTech Holdings
Rinse and Chill™	Carcases	10-15 s	0.2-2 log	Meat quality improvements	Capital outlay	Yes	No	Yes	MPSC
High pressure processing	Primals, ground beef, processed meats	0.5-5 min	Up to 4 log	Increase shelf life by reducing initial microbial count, treat in-pack	Expensive; systems not yet large enough; possible meat colour/texture changes	Yes	Yes	Yes	Avure Technologies, NC Hyperbaric
Gas plasma	Cutting knife	340 s	5 log	Can treat irregular surfaces	Possible surface oxidation; consumer acceptance issues				
Pulsed electric fields	Ground beef, steaks	<1 s	1 log		Works best for liquids so limited meat applications at present. Commercial development incomplete				
Pulsed light	Primals	<1-10 s	1-3 log	Can be used on packaged product	Probably not suitable for opaque foods; not yet commercially viable for foods				
Ultraviolet light	Meat marinades and brine	≥10 s	Up to 4 log	Can be used on packaged product	Limited to surface sterilisation or liquids	Yes	No	Yes	Safe Foods Corp., Ultra Violet Products etc.

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Ultrasound	Primals	0.5-5 min	1 log	Possible to treat VP food.	High power equipment required. Commercial development incomplete	Yes	Yes	Yes	Innovative Ultrasonics, Hielscher Ultrasonics GmbH
Natural antimicrobials (i.e. bacteriocins, nisin, reuterin etc.)	Primals, processed meats, ground beef	Residual effect		Spray application, then VP chilled storage. Used as a surface coating (in alginate).	Some only effective on Gram-positive microbes.	Some	Some	Some	Danisco
Hot water or steam pasteurisation	Carcasses, primals	10-15 s at 75-95°C.	1-3 log	Can use in combination with chemicals for greater effect	If used on primals, they may be wet for packaging; possible discolouration of lean. Recirculation of water may be necessary.	Yes	Yes	Yes	JBT FoodTech
Steam vacuum	Carcasses	5 s	1-4 log	Directed at visible contamination	Labour costs, some bleaching of meat surface	Yes	Yes	Yes	Vac San – Kentmaster, CV-1 – Jarvis ANZ
Acidified sodium chlorite	Carcasses. Potential for vacuum packed primals, pork tongues, beef trim, ground meat	Up to 60 s	Up to 4 log	Not affected by organic load. Possible continual effect on stored product	If using strong acids as the activator, may need to consider storage and operator safety	Yes	Yes	Yes	Vibrex - Grayson, Sanova - Ecolab

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Activated lactoferrin	Carcasses, primals, ground beef	21 days	Up to 5 log	Can be used on VP beef; natural product. Possible continual effect on stored product	If used on primals, they may be wet for packaging	Yes	No	No	
Cetylpyridinium chloride (CPC)	Carcasses, hide, trimmings	10-30 s at 1% CPC	Up to 5 log	Effect on hide maintained up to 4 hrs (1 study); does not impact flavour, texture, appearance, or the odour of foods	Residual levels if used on meat at 1% CPC.	Yes	No		Safe Foods Corp.
Electrolysed oxidising water	Carcasses, surfaces	Spray or dip	1.5-3 log	Salt is the only chemical used	Initial capital needed – but may be substantially cheaper than other methods.	Yes	No	No	Enviolyte, e-Water Systems, EAU Technologies
Acidic calcium sulphate	Ground beef, ready-to-eat products			Makes pathogens more sensitive to heat e.g. during temp abuse/cooking.	Possible organoleptic effects	Yes	No	No	Mionix Corp.
Chlorine dioxide	Carcasses, primals, trimmings	10-15 s spray	1 log	Not affected by organic load. Possible continual effect on stored product	Spray cabinet required, full coverage of product required	Yes	Yes	Yes	Integra Water, Zychem Technologies

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