Speeding Up Meat Decontamination By Freezing

Dear Editors:

EXPERIENCES after the Chernobyl nuclear accident (26 April 1986) have shown that large quantities of food were heavily affected by radioactive contamination, especially by radiocesium. The meat structurally contaminated with cesium is reportedly easily and very successfully decontaminated by pickling in NaCl solution (Wahl 1986). After several days of pickling in the brine the meat contains less than 5% of the initial radioactivity. An alternative way of meat decontamination is by cooking in salt water. (The soup containing the removed radioactivity is not for use and should be dispensed with.) Our experience shows that both decontamination processes can be notably speeded up by freezing the meat for a few hours and by subsequent unfreezing before decontamination. Ice crystals that are formed in the tissue as a result of freezing disrupt cell membranes, the phenomenon well known in histology as an artifact. Therefore, during decontamination by pickling the exchange of cesium ions in meat for sodium ions in the surrounding salt water solution is greatly enhanced (Fig. 1). In our experiment we used baby beef structurally contaminated with 41 Bq kg^{-1} ^{134}Cs and 182 Bq kg^{-1} ^{137}Cs. The brine contained 100 g NaCl per litre; for cooking, only a little salt was added to improve the taste.

In the process of meat decontamination by pickling, the cesium retention function is exponential:

$$A(t) = A_o\, e^{-0.674 \times t} \qquad (1)$$

where:

$A(t)$ = time-dependant cesium activity concentration in meat; and

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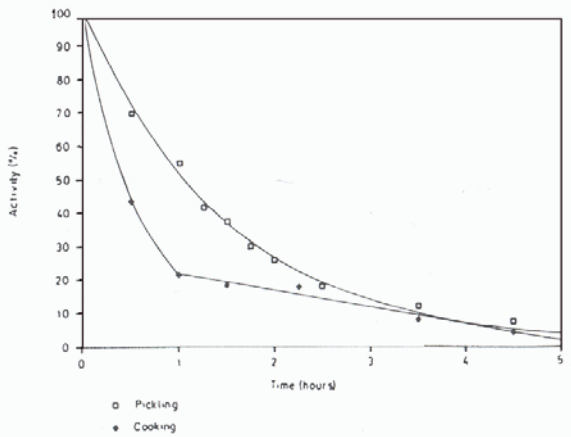

Fig. 1. The removal of radiocesium from meat by pickling in salt solution and cooking.

A_o = initial activity concentration.

After 3.5 hours of decontamination, the activity drops to 10% of the initial value. The time needed for the activity to reach 50% of the initial value is one hour. Therefore, from (1) mean decontamination time is $1/0.674 \approx 1.5$ hours.

The alternative mode of decontamination by cooking is much faster initially and at the end of one hour cesium activity drops to about 20% of the initial activity concentration. After that time, as shown in Fig. 1, the activity decreases linearly.

The addition of various spices (to the brine or soup) during both decontamination procedures improves the taste of decontaminated meat. Traditional brine constituents in Croatia are wine and the spice *Fructus Juniperi.*

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References

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