REFRIGERATION, FREEZING AND THAWING

SESSION O: MICROBIOLOGY

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Today's present trend in food production with the amalgamation of small units into large ones, coupled with the development of new processing methods and new products lays an increasing responsibility on the technical staffs in the food production units. Their knowledge should not only comprise the information necessary to ensure that the foods are safe, but from an economic point of view, they should virtually also know all about the keeping quality of their products.

Two of the papers in this session 'The bacterial quality of frozen, chopped beef' by M. Catsaras and D. Grebot and 'The occurrence of Klebsielleae in chilled meat and meat products' by H. Hechelmann, Z. Bem, K. Uchida and L. Leistner add to our knowledge in this field. Information about the quality and the quantity of the microbial flora is so necessary in order to be able to evaluate and keep the productions in control.

The third paper, 'The effect of washing lamb carcasses' by C.A. Kelly, J.F. Dempster and A.J. McLoughlin describes a very interesting theme. As will be known, wiping cloths for cleaning up of freshly dressed carcasses has traditionally been used throughout the world until recently. The changed regulations have made this practice obsolete and the washing with hot water with or

without chlorine seems to be such an obvious replacement of the use of cloths. Washing with hot water has earlier been suggested and the paper mentions several references in this field from the last few years. One of these, 'Spray-washing of lamb carcasses' by Dr Bailey was even presented at the Meat Research Workers Meeting in 1971. Presumably the reason for doing the work all over again is that, it is so difficult, as in many other cases, to persuade or sell the results to industry. The next experiment will probably have to get some objective colour measurements included.

This procedure was suggested for beef carcasses and later also for pig carcasses within the Danish Meat Industry as early as 1962. At that time cloths were used and there is no doubt that these could significantly contribute to the contamination of the freshly slaughtered carcass when not used properly. At that time it was difficult to persuade the meat industry to employ such a practice and partly because the distribution pattern for meat was different at that time, it was still permitted to use cloths. The major objection was, of course, as it is today, that it was firmly believed by the industry that the colour of the carcasses would suffer, if hot water was used.

Paper 01: 'The bacterial quality of frozen, chopped beef'

This paper describes the results of a two year survey concerning the bacterial quality of frozen, chopped beef, comprising 825 samples. The examination is rather comprehensive in that it not only includes enumeration of a total aerobic count, but also E. coli, Cl. perfringens, Salmonella, and coagulase-positive

Staphylococci, but presumably all the different determinations are required in the Fresh Bacterial Standard. The paper concludes that the bacterial level of the examined samples generally is acceptable, but it is commented that Salmonella has been found in 2.5% of the samples. In my opinion it is correctly pointed out, though, that most of the samples were found within a very limited time and would therefore possibly originate from meat from one contaminated carcass.

It is generally agreed that frozen foods are usually very safe products, partly because it is quite certain that no growth occurs during distribution of the products, but very important too, it seems that the consumer has been accustomed to the idea that a frozen food should be used as soon as it is thawed. The main reason really why one should take an interest in the bacterial numbers and the species of bacteria present is because of the few cases, where the consumer does not use the product straight away.

The paper also mentions that in France, as in the case in several other countries, bacterial standards or guidelines have been introduced for these products. In this connection I would like to draw your attention to a paper given at last year's meeting, in which is outlined a bacterial quality control system for meat products. Briefly, in this system there are no legal bacterial standards for meat products, but a sliding guideline. When first the system was set up, a vast survey of the bacterial levels of frozen and other meat products was made. The guidelines were then set up which accepted 90% of the samples, and this was then considered the acceptable bacterial level within the first year. According to the results of the analyses performed, within a year

The following table shows the limits for various frozen meat products from the last 4 years

	1971		1972		1973		1974	
	$1^{o)}$	$2^{oo)}$	$1^{o)}$	$2^{oo)}$	$1^{o)}$	$2^{oo)}$	$1^{o)}$	$2^{oo)}$
Liverpate	5×10^4	100	5×10^4	100	1×10^4	100	1×10^3	100
Frozen dinners	-	-	-	-	-	-	3×10^3	100
Pork tenderloin	5×10^5	500	1×10^5	300	1×10^5	300	1×10^5	300
Sliced liver	5×10^5	1000	1×10^5	1000	1×10^5	1000	1×10^5	1000
Cuts of veal and pork	5×10^5	500	5×10^5	300	5×10^5	300	3×10^5	300
Ground beef and pork	5×10^6	5000	3×10^6	3000	3×10^6	3000	3×10^6	3000
Cuts of beef	1×10^6	500	1×10^6	300	1×10^6	300	1×10^6	300

$1^{o)}$ = Total counts per g. $2^{oo)}$ = Faecal Streptococci

(Adapted from The Danish Meat Products Laboratory)

As will be seen, within a 4 year period it has been possible to revise many of the figures.

all figures are then reviewed. Some of the figures are used the following year, others are revised.

Paper 02: 'The occurrence of Klebsielleae in chilled meat and meat products'

The work presented here, represents a comprehensive survey about the occurrence of especially gram-negative bacteria in some typical German meats and meat products. It is a paper which seems to add quite a bit of new knowledge about which micro-organisms spoil the products at retail level.

In the literature it has often been mentioned that the Klebsielleae are commonly found in poultry and chopped meat, as well as in fresh meats, but in this paper it is proved that not only can these bacteria virtually always be found in the meats, but also in 'Rohwurst', 'Bruhwurst' and other sausages. It also deals with some experiments with Bruhwurst which in fact prove that bacteria like salmonella, Proteus, enteropathogenic E. coli, Citrobacter, Klebsielleae and Enterobacteria can in fact multiply at fairly low temperature in these products.

In connection with these inoculation tests it would be interesting to know whether the inoculated meat products contained other bacteria as well. At the Meat Research Institute in Denmark we carried out some similar experiments with vacuum packaged cooked meat sausages some years ago. The experiments were much less comprehensive than the ones presented in this paper, but we concluded that provided the products were vacuum packaged, and cured to give a brine concentration of about 4, and had a 'natural' flora of about 1000 per gram in initial numbers, it was very hard for any gram-negatives to be able to multiply, at least at 5 - 6^{o}C.

Paper 03: 'The effect of washing lamb carcasses'

As mentioned in the introduction, the work carried out as reported in this paper seems not only to be good suggestion for the replacement of the use of wiping cloths but as proved from the experiments it also seems to give sufficient reduction in bacterial numbers to increase the shelf life of the dressed carcasses.

In connection with the trials carried out it would be interesting to know whether any higher pressures were tried out before the proper trials were started. During earlier mentioned Danish trials it was found, that if the spray operated at too high a pressure, this would penetrate some of the outer membranes of the dressed carcass, but, on the other hand the higher the pressure, the easier it was to clean the carcass.

The prospect of using chlorine as a disinfectant on the meat is very interesting. In some countries, and apparantly including Ireland, the use of the chlorine to be used on the meat is permitted, whereas this is strictly prohibited in other countries.

In concluding these comments, the two first papers give us relevant information about a very important theme, but they both point towards the fact that more research is needed, not only in the field which has been recorded here, but also in order to get more reliable data about the safety of the products, although we already have seen several excellent papers concerning this over the years.

Especially when it comes to the significance of the findings in relation to the shelf-life of pre-packaged meats and meat products it is important to get as much information as possible, when one considers the increased public demands about open dating of the products at retail level.