Über die bakteriellen Verhältnisse in Pökel für Dosenschinken

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Die Anzahl von Bakterien in Pökel wurden während verschiedener Stadien der Produktion in 4 Fabriken untersucht. Zwei der Fabriken sterilisierten oder dekontaminierten den verwendeten Pökel vor der Wiederverwendung, während die beiden anderen den gebrauchten Pökel ohne Behandlung wiederverwendeten. Es wird konkludiert, dass die Anzahl der Bakterien im Pökel unter den beschriebenen Verhältnissen den bakteriellen Zustand des eingepökelten Fleisches widerspiegelt, dass das bakterielle Nivaeu des Pökels jedoch keinen Einfluss auf das des Fleisches hat. Solange die Anzahl von Bakterien in einem Pökel, der aus einer Mischung von neuem und zuvor angewandtem Pökel besteht, niedrig ist, lohnt es sich nicht, den Pökel zu sterilisieren oder zu dekontaminieren.
Eine Vergrösserung der Bakterienanzahl während der Produktion konnte nicht festgestellt werden.

On the bacterial levels in pickles for canned hams

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The numbers of bacteria in ham pickles during various stages of production in 4 plants were investigated. Two of the plants sterilized or decontaminated the overflow pickle prior to reusing it, whereas the two others recycled the pickle directly.
Based on the findings it is concluded that under the described circumstances the numbers of bacteria in the pickles reflect the bacterial load of the meat being cured rather than having an impact on the bacterial level of the meat. As long as the bacterial numbers of the pickle, consisting of a mixture of fresh and recycled pickle is reasonably low, there seems to be no advantage of sterilizing or decontaminating the recycled pickle.
No build-up of the bacterial numbers in the pickle was found during processing.

K 1:2

Sur le niveau bactérien dans les saumures pour les jambons en boîte

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On a examiné le nombre de bactéries dans les saumures pour jambons en bôite pendant les divers stades de la production dans 4 usines différentes. Dans deux des usines, la saumure qui débordait a été sterilisee ou purifiée avant d'être utilisée de nouveau, tandis que dans les deux autres usines, la saumure a été remise en circulation directement.
Sur la base des découvertes, il est conclu que, dans les circonstances décrites, le nombre de bactéries dans la saumure rèflèchit le niveau bactérien de la viande ayant été saumurée, plus qu'il n'influe sur le niveau bactérien de la viande. Tant que le nombre de bactéries dans la saumure, consistant en un mélange de la saumure nouvelle et reutilisée, est relativement bas, ce n'est évidemment pas un avantage de stériliser ou de purifier la saumure reutilisée.
Aucune augmentation du nombre de bactéries a été observée dans la saumure pendant la production.

On the bacterial levels in pickles for canned hams

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Introduction

Over the years much effort has been exerted to combat quality and shelf life problems during the production and marketing of canned, semi-preserved hams. Only 10 to 15 years back the problems were much greater, though, resulting in frequently occuring examples of greening of hams due to Str.faecalis and Lactobacillus, as well as a generally much shorter shelf life of sliced, vacuumpackaged ham than is normally found today. The production changes mainly responsible for more stable and uniform canned hams are many, including better refrigeration, improved inspection control of raw materials, improved curing methods, as well as better cooking procedures. A general increase in the hygiene level in the plants has of course also supported the improvements.

One obvious way of decreasing the bacterial level during manufacture of canned hams was to devise means of decreasing the numbers of bacteria in the injection pickle. Several ways for doing this have been suggested, such as passing the overflow pickle through an UV sterilizer(Andersen et al,1965) or filtering bacon brine through a sterile-filter (Dyett, 1969).

These and similar methods were taken into use in Danish meat canning plants in the beginning of the sixties. Together with other measures, including those mentioned above, this has resulted in canned, semi-preserved hams which after pasteurization usually have bacterial numbers below 10 bacteria per gram.

In view of the fact that so many improvements have taken place during processing etc. and that decreasing the bacterial numbers in ham pickles represented a cost, which perhaps was unnecessary today, this work was undertaken to extablish the possible effect of omitting cleaning of overflow ham pickle without discarding it, but instead of this to mix the pickle directly with fresh pickle and reuse it directly.

Experimental

The investigation was carried out in 4 different plants, which together manufacture well above 50 per cent of the production of Danish, canned hams.

The methodology for the use of overflow, recirculated pickle varied among the factories as follows:

Factory 1: Overflow ham pickle was sterilized through an UV sterilizer before being recirculated.

Factory 2: During the first part of the experiments the overflow ham pickle was passed through a Zeiss-sterilizing filter before being reused, whereas no sterilization took place during the last part of the experiments.

Factories 3 and 4: No sterilization of ham pickle took place during the investigation.

Sampling in each plant was made during periods of 3 to 6 hours on two consequetive working days in the middle of the week. The investigation was repeated in each plant, so the displayed figures shown here cover results from 4 working days.

Samples were drawn approx. every half hour during each sampling period.

Sampling of ham pickle was performed as follows:

a: From freshly made ham pickle.

b: From the tank for overflow ham pickle on the pickle injector.

c: From sterilized ham pickle (in the plants where this was done).

d: From ready-to-use pickle consisting of a mixture of freshly made and recirculated pickle.

Estimation of total aerobic bacterial counts were made on YB-agar(DIFCO) added 4 per cent sodium chloride.

Results and discussion

The results are shown in figures 1 through 5. As will be seen the counts for freshly made pickles are usually below 1000 bacteria per ml., but in many cases the pickle is nearly sterile.

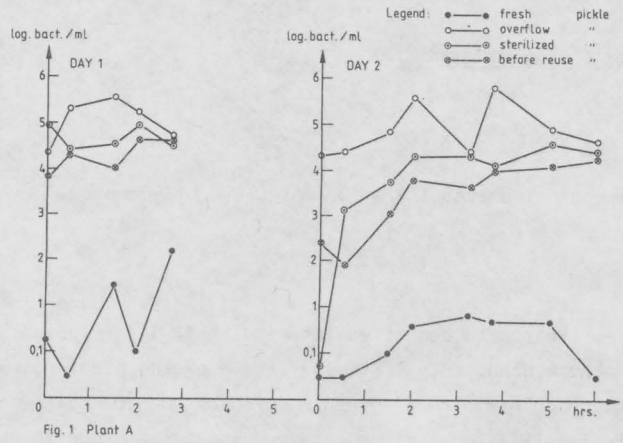

Fig. 1 Plant A

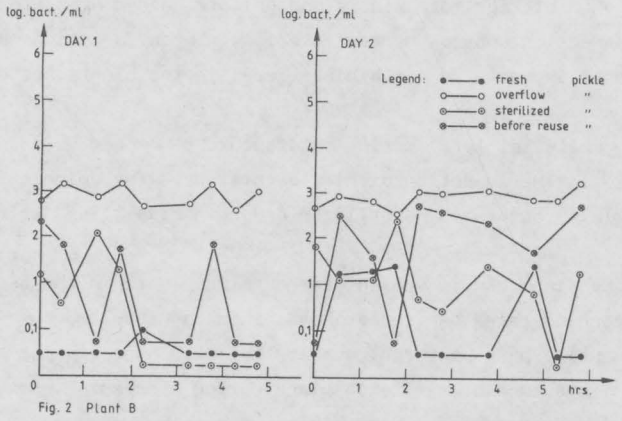

Fig. 2 Plant B

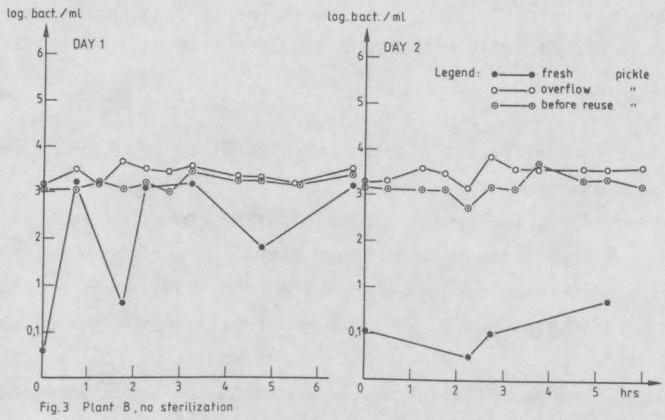

Fig. 3 Plant B, no sterilization

The differences among plants with regard to the bacterial load of overflow pickle is quite striking, from a level of around 1000 bacteria per ml. to well above 100 000 per ml.

The effect of sterilization of pickle using various methods is shown in figures 1 and 2. In plant no.1, where an UV sterilizer is used there seems to be a very slight effect of the sterilization. Experience from that particular plant has also shown on earlier occasions that to get the UV sterilizer to work effectively requires very close and continous attention.

In plant no.2, where a sterile filter was used, a better effect of the sterilization is obtained, usually the effect was a reduction of 2 to 3 $\log_{10}$ units. However, according to figure 3, which shows results from the same plant, taken the following weeks, but where the sterilization was discontinued, it was found that the bacterial load of overflow pickle was unchanged, indicaing that although it was possible to reduce the numbers of bacteria through the use of a sterilization filter this would have no bearing on the bacterial level of pickle used for curing during the production.

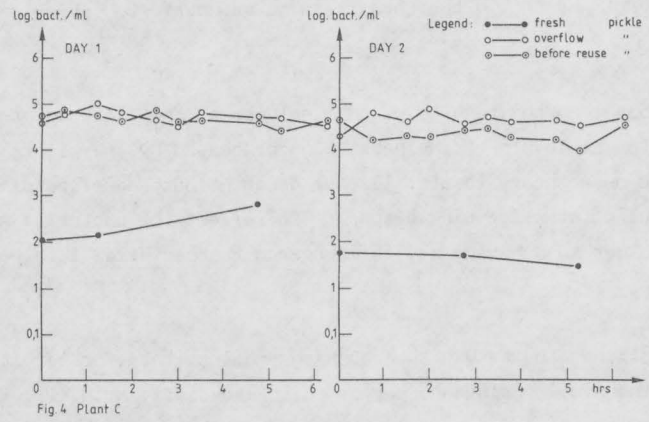

Fig. 4 Plant C

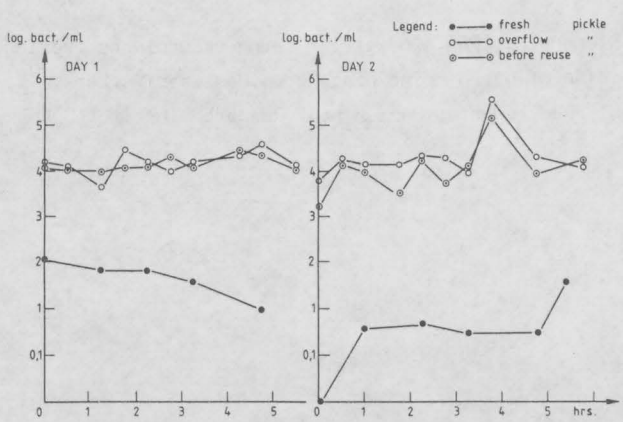

Fig. 5 Plant D

Figures 4 and 5 show the bacterial status of the pickles during the various stages in two plants not using any means of sterilization of overflow pickles before reuse. When comparing the figures in these plants with the figures in the other plants it will be seen that whether the pickles are sterilized or not before reuse, this does not seem to make any difference on the bacterial level of pickles used for injection. The differences appear rather to be due to variations in the bacterial status of the raw materials being processed at the time of the investigation. The bacterial levels shown in figures 2 and 3 thus correspond well with the fact that that particular plant is known usually to maintain a very high hygienic standard, while the bacterial levels displayed in figures 1 and 4 reflect a somewhat lower hygienic level. These observations were obtained through previous bacteriological investigations regarding the general hygienic levels in the plants concerned (Zeuthen, 1964-74).

In Denmark all productions of canned hams for export are sampled regularly and analysed bacteriologically. At least within the time this investigation was performed it has not been possible to demonstrate any significant differences in numbers of bacteria in the finished products among the plants participating in this investigation.

From the figures it will also be seen that no build-up of bacteria seems to take place in the pickle within several hours' production. In this connection it should be mentioned that the temperature in all curing rooms was 5-10°C throughout and that a thorough cleaning was performed every day.

Conclusions

Based on the findings above and the results of the analyses of the finished products it may be concluded that at least within the bacterial levels of the hams being processed by the plants participating in this investigation, it appears to be unnecessary to sterilize or decontaminate overflow pickle prior to recycling it. Also, the bacterial level of overflow pickle appears to reflect the bacterial numbers of the raw materials at the time of curing rather than having any influence on the bacterial level of th hams.

Acknowledgement

I wish to express my gratitude to the Danish Meat Research Institute for permitting me to publish this work. I also acknowledge the technical assistance performed by especially Mr.M.Kilévics, Mrs.S.M.Petersen,M.Hoff-Møller, and L.H.Szaras.

References

Andersen,P.E.,Jul,M., and Riemann,H.,1965, Industriel Levnedsmiddelkonservering, Teknisk Forlag,København p.956

Dyett,E.J.,1969, The filtration of bacon brine.Proc.Europ.Meat Res.Workers, 15, 135.

Zeuthen,P.,1964 - 74, Unpublished reports, Danish Meat Research Institute, Roskilde, Denmark.

Der Einfluss von Nitrat, Nitrit und Starterkultur auf das Wachstum von Yersinia enterocolitica in Rohwurst

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Yersinia enterocolitica wurde Rohwurstbrät bei dessen Herstellung zugesetzt. Es wurden zwei humanpathogene Stämme verwendet. Die Zugabe erfolgte in einer Menge von 10^5-10^6 Keimen pro Gramm Brät. Vier von fünf Testwürsten erhielten ausserdem folgende Zusätze: a. 150 mg/kg $NaNO_2$ b. 300 mg/kg KNO_3 c. Starterkultur + 150 mg/kg $NaNO_2$ und d. Starterkultur + 300 mg/kg KNO_3. Als Starterkultur fand ein Handelspräparat Verwendung.

Die Y. enterocolitica-Konzentration ging bei sämtlichen Proben während der Reifung der Wurst zurück, auch bei der zusatzstofffreien Kontrollwurst. Eine schnellere Abnahme wurde jedoch durch Einsatz von Nitrat oder Nitrit erzielt; am raschesten verlief die Abnahme, wenn zusätzlich zu den letztgenannten Stoffen Starterkultur verwendet wurde. Nach sieben Tagen betrug der Gehalt an Y. enterocolitica in diesen beiden Chargen etwa 10^3 Keime/g, nach 15 Tagen weniger als 10^2 Keime/g. Zum letztgenannten Zeitpunkt hatten die Würste einen pH von etwa 4,9 und einen a_w von 0,89.

The effect of nitrate, nitrite and a starter culture on the growth of Yersinia enterocolitica in dry sausage

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Yersinia enterocolitica was added to sausage mix during the preparation of dry sausage. Two strains pathogen to man were used. Y. enterocolitica cells were added at the level of 10^5-10^6 bacteria per gram of the sausage mix. The following further additions were made to four of the five test batches of the sausage mix: a. 150 mg/kg $NaNO_2$ b. 300 mg/kg KNO_3 c. a starter culture and 150 mg/kg $NaNO_2$ d. a starter culture and 300 mg/kg KNO_3. A commercial starter culture was used.

Y. enterocolitica counts decreased in all samples during the manufacturing process of the sausages, also in the control batch containing no additives. The decrease was, however, more rapid if nitrate or nitrite was used, and most rapid if the starter culture combined with the additives were used. After 7 days Y. enterotica counts for these two batches were at the level of 10^3/g and after 15 days below 10^2/g. At the latter point the pH-values of the sausages were ca. 4.9 and a_w 0.89.

K 2:2

Les effets du nitrate, du nitrite et d'une culture de démarrage sur la croissance de Yersinia enterocolitica dans le saucisson sec

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Il a été procédé à l'adjonction de Yersinia enterocolitica à la pate à saucisse au cours de la préparation du saucisson sec. Deux races pathogènes pour l'homme ont été utilisées, à raison de 10^5-10^6 bactéries par gramme de pate à saucisse. Quatre des cinq lots expérimentaux de pate à saucisse ont ensuite recu les additifs suivants: a. 150 mg/kg de $NaNO_2$, b. 300 mg/kg de KNO_3, c. une culture de démarrage avec 150 mg/kg de $NaNO_2$, et d. une culture de démarrage avec 300 mg/kg de KNO_3. La culture de démarrage utilisée était un produit du commerce.

La quantité de Yersinia enterocolitica a diminué dans tous les lots au cours du processus de fabrication du saucisson, y compris dans celui de référence ne contenant aucun additif. La diminution a cependant été plus rapide dans les lots nitraté et nitrité et la plus rapide dans ceux où une culture de démarrage avait été combinée avec l'additif. Au bout de 7 jours, la quantité de Yersinia enterocolitica dans ces deux derniers lots était de 10^3/g et au bout de 15 jours au dessous de 10^2/g. A ce dernier stade, les saucissons avaient pour pH env. 4,9 et a_w 0,89.

Влияние нитрата и нитрита и стартерных культур на рост Yersinia enterocolitic в сырокопченой колбасе.

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Yersinia enterocolitica ввели в колбасную массу сырокопченой колбасы в течении изготовительного процесса. Применяли клетки двух сильно патогенных родов Y.enterocolitica в количестве 10^5 - 10^6 бактерии на одну грамму колбасной массы. Комбинации в четырех сериях из пяти были: а. 150 мг/кг $NaNO_2$ б. 300 мг/кг KNO_3 .в. стартеркультура и 150 мг/кг $NaNO_2$ g. стартерная культура и 300 мг/кг KNO_3

Употреблялась торговая стартерная культура.

Во всех опытах, тоже в контрольном, определили уменьшение количества Y.enterocolitica во время изготовительного процесса колбасы. Самое резкоее уменьшение определили в опытных сериях с нитритом и нитратом, но сильнейшее сокращение в сериях с комбированием со стартерной культурой. В последних двух сериях определили через 7 суток Y.enterocolitica 10^3/гр а через 15 суток только 10^2/гр. Самая низкая степень пХ колбасы колебалась около 4,9 а $a_в$ 0,89