

Mycological and related studied on smoked fish

"دراسات فطرية وأخرى وثيقة الصلة علي الأسماك المدخنة"

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البحث الرابع: مشترك

Destruction of *Salmonella typhimurium* in ground beef by adding nisin and other chemical preservatives.

"القضاء علي جرثوم سالمونيلا تيفيموريوم في اللحوم البقرية المفرومة
بإضافة النيسين والمواد الحافظة الأخرى"

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البحث الخامس: مشترك

SOME STUDIES ON THE EFFICACY OF A BIOFILM- DISSOLVING AGENT (SPRAY- CULT) TO IMPROVE RECOVERY OF BACTERIA FROM SURFACES OF MEAT PROCESSING EQUIPMENT.

بعض الدراسات عن كفاءة مركب " سبراى كالت " في إزالة الطبقة الحيوية لتحسين فحص البكتريا المتواجدة على سطح أدوات ومعدات تجهيز وتصنيع اللحوم.

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Abstract

Experiments with a biofilm dissolving agent (Spray- cult) were carried out to improve recovery of bacteria on surfaces of meat processing equipment. Spray-cult is a liquid reagent intended to improve recovery of bacteria from food-equipment surfaces. This reagent contains surface active compounds to disintegrate biofilms and make bacteria accessible for microbial testing by agar contact technique. This reagent was tested in laboratory trials and under field conditions. Materials under study were polypropylene (plastic), stainless steel and aluminium. The microflora consisted of *Pseudomonas* sp., *Brochothrix thermosphacta*, *Enterobacteriaceae* and Gram positive cocci.

Application of this reagent before sampling with agar contact technique resulted in a significantly (t test; $p < 0.05$) better (median value + 38%) recovery of bacteria from experimentally contaminated surfaces. Under field conditions in meat processing companies, in 25 of 41 sampling sites, Spray- cult improved recovery rate, but this difference was not statistically significant.

Material and Methods

The application of SprayCult was tested. SprayCult is a biofilm- dissolving agent produced by Orian company of Finland to be sprayed onto surfaces immediately before sampling by agar-contact technique or swab technique.

Diagnostic equipment

Hygicult TPC (Orion) and total aerobic count agar (Merck 5463) in Rodac plates (in conjunction with Count- act applicator; Bio- Merieux) were used. With exception of the enumeration scheme, procedure was according to (DIN 10113-3, 1998). After 48 hours and 30° C incubation, mean colony counts/ cm² were recorded. Spraycult (SC) reagent (Orion) was applied according to the instructions of the manufacturer (Orion Company, 1999).

Preparation of surfaces

Aluminium, polypropylene and stainless steel surfaces (samples) were cleaned and then disinfected by wiping with 70 % isopropanol. To stimulate microbial contamination, minced meat juice (total aerobic count 105/ml; with ca. 104.6/ml *Pseudomonas sp.*, 104.2/ml *Brochothrix thermosphacta* and restricted numbers of Enterobacteriaceae and gram- positive cocci), was spread evenly onto the surfaces to give a ca. 0.5 mm thin film. Subsequently, the samples were stored overnight at 8° C. This procedure was repeated two times, to allow a build- up of an organic layer. This discontinuous procedure was considered to reflect the actual conditions in meat processing industry better than stimulations based on continuous flow of nutrient solutions over test surfaces. Each day, 4 samples of each type of sampling material were tested with and without application of SC in duplicate, giving a total of 8 results per surface sampling time combination. For the purpose of sampling, surfaces were divided in 5 x 5 cm, and two adjacent squares were used for one agar contact sampling (with and without SC) procedures. This trial was run in duplicate (**Table, 1**).

Field trial

Plastic, steel and aluminium surfaces of meat processing equipment in an Austrian meat processing company were sampled by Hygicult TPC with and without application of SC (**Table, 2**). Care was taken that the distance between the two sampling areas did not exceed 10 cm. At the time of sampling, surfaces were dry and had been cleaned and disinfected with (ca. 16 hrs.) before application.

Table (1) Mean colony counts on the surfaces of meat utensils contaminated with certain doses of bacteria and assessed without and with application of Spray- cult agent.

Descript- ion	cfu /cm ² without SC*	cfu /cm ² with SC*
a1	2,15	2,3
a2	3,25	5,4
a3	4,6	12,9
a4	4,25	4,5
p1	1,25	2,15
p2	3,2	6,2
p3	4,2	6,8
p4	19,5	16,1
s1	4,65	14,75
s2	8,4	8,9
s3	12,7	14,4
s4	11,8	12,05

Mean of 2 values; a ... aluminium, p polypropylene(plastic), s ... stainless steel; 1-4 day of sampling; SC ... SprayCult. *

Table (2) Colony counts on surfaces of visually clean meat processing equipment assessed by TPC (Hyg-icult) with and without application of Spray- cult

Description	type	cfu /cm ² with/ out SC	Ratio:with /without SC	Hygiene Scores*
Cutting board	pp	99/99	1	C/C
Cutting board	pp	99/10	9.9	C/B
Cutting board	pp,rough	7/3	2.33	B/B
Cutting board	pp,rough	7/3.5	2	B/B
Cutter expeller	pp	1/99	0.01	A/C
Cutter expeller, n=3	pp	99/99	1	C/C
Cutter expeller	pp,discoloured	10/5	2	B/B
Cutter expeller	pp,discoloured	8/3	2.67	B/B
Steel plate	ss	2/1	2	B/A
Steel plate	ss	2/1.3	1.54	B/B
meat slicer (knife)	ss	2.2/1.5	1.47	B/B
meat slicer (knife)	ss	2/2	1	B/B
meat slicer (cover)=2	ss	2/1.5	1.33	B/B
Cutter bowl, n=2	Steel	99/32	3.1	C/C
cutter , protection cover	ss	2/2	1	B/B
cutter , protection cover	ss	1/0.2	5	A/A
cutter , protection cover	ss	<1/<1	1	A/A
cutter , protection cover	ss	0/<1	<1	A/A
Bottom of vessel	ss	5/1	5	B/A
Bottom of vessel	ss	5.4/1.2	4.5	B/B
Bottom of vessel	ss	5/ 0	>5	B/A
Bottom of vessel	ss	3/1.2	2.5	B/B
cutter, cover	ss	2/5	0.4	B/B
cutter , protection cover	s	2/2	1	B/B
boiling pot	ss	1.5/1	1.5	B/A
boiling pot	ss	0.3/0	>1	A/A
Alu-vessel	al	2/<1	2	B/A
Alu-vessel	al	1.7/0.2	8.5	B/A
Alu-vessel	al	3/1	3	B/A
Alu-vessel	al	2.3/2	1.15	B/B
Alu-vessel	al	5/0	>5	B/A
Alu-vessel	al	2.3/0	>2.3	B/A
Alu-vessel, n=5	al	99/99	1	C/C

SC: Spray Cult n: number of replicates; if not specified, n= 1
Pp: polypropylene al: aluminium ss: stainless steel
Numbers in bold indicate better recovery when Spray Cult was used.
Letters in bold indicate different hygiene scores for Spraycult/non

Spraycult condition.

* **Internal factory standards for total bacterial count: very good (A)***
1cfu/cm² <, acceptable (B)* 10 cfu/cm² <, recleaning necessary (C).

Conclusion

The results indicate that the application of Spray- cult increases the recovery of bacteria from meat processing equipment surfaces, when agar contact techniques are used. This increased recovery may have an impact on hygiene assessment of cleaned surfaces.

Hence, food plant has to be cleaned regularly to ensure product safety and efficient plant operation. The ability to operate plant without contamination problems, would greatly aid the flexibility of food manufacture. There are a range of practical needs for deposit cleaning in the processing of foods, including the removal of biofilms which could lead to product contamination and/or endanger user.

Ways of ensuring clean surfaces are thus very important in the food industry. Deposits can be composed of product adhering to surfaces, or of cohesive films relatively loosely adhered to surfaces. Biofilms are a major problem in food processing environments, particularly because microorganisms growing on surfaces produce extracellular polysaccharides (EPS), which protect them against cleaning and disinfection agents. These biofilms can then act as a source of contamination of products. Bacteria of concern include agents of food borne disease (*Listeria monocytogenes*, *Salmonella* and *Escherichia coli*) as well as those which produce food spoilage (*Pseudomonas* species).

Industrially these problems are generally solved by a range of methods:

1-Manual cleaning of surfaces, using brushes, cloths etc to remove deposit from surfaces or blades.

2-Semi-automated cleaning methods such as sprays and jets to clean tanks and vessels.

3-Cleaning-in-place' (CIP) systems in which cleaning fluid is circulated through process plant to remove deposits.

