Food Science Australia

A joint venture of CSIRO and Afisc

Report 994N001

Residual peroxide on crumpet and meat products.

12 February 1999

Prepared by

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for

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Food Science Australia
Commercial Report
Food & Packaging Technology Group

TITLE : Residual peroxide on crumpet and meat products.

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Date of Report : 12 February 1999

OBJECTIVE: Determine the residual hydrogen peroxide on the surface of Crumpet-Splits, sliced ham and frankfurts after being treated with various mixtures of acetic acid and hydrogen peroxide vapours.

SAMPLE: Samples of Crumpet-Splits, sliced ham and frankfurts were supplied by Laring Technologies for this examination.

TEST: The samples of Crumpet-Splits, sliced ham and frankfurts were exposed to acetic acid and hydrogen peroxide vapours in carbon dioxide. The peroxide vapours were generated by passing carbon dioxide through 50% hydrogen peroxide at approximately 24°C. The acetic acid vapours were generated by passing carbon dioxide through glacial acetic acid at approximately 24°C. Crumpet-Splits were stored at 25°C for 1 min, 5 min, 1 hour and 24 hours before being tested. Sliced ham and frankfurts were stored at 4°C for 1 min, 1 hour and 24 hours before being tested.

Residual hydrogen peroxide was detected using the Merck Reflectoquant analytical test kit. This comprised of the Reflectometer RQflex and Reflectoquant test strips (supplied by Merck Pty. Ltd. 207 Colchester Rd. Kilsyth Victoria 3137). This test kit has a measuring range of 0.5 to 25 mg/L H_2O_2.

Method 1. The peroxide on the surface of the samples was tested by placing the moistened test strips directly onto the sample surface for the required reaction time. In some samples there was insufficient surface liquid to give an even colour on the test strips.

Method 2. The sample was placed in a plastic bags and 20 ml of UHQ water added. Hydrogen peroxide concentration in the 20 ml of water was then measured. In some crumpet samples water was absorbed which made it difficult to obtain sufficient liquid to perform the peroxide test.

RESULTS:

Crumpets.

The Reflectometer readings (mg/L) for Method 1 of the Crumpet-Splits are given in Table 1. below. The results are for the test strip being moistened and placed on the underside of the crumpet. There are some results given for Method 2.

Table 1.

Gas Stream	H_2O_2 vapour	Acetic Acid vapour	Flow Rate L/min	Flushing period seconds	After 1 min.	After 5 min.	After 1 hour.	After 24 hours.
Control	0%	0%	40	4	Method 1 =Low[2]			
A.	100%	0%	40	4	Method 1 = 14.2	Method 1 = 11.2	Method 1 = 6.7	Method 1 = Low[2] Method 2 = 0.0[2]
B.	75%	25%	40	4	Method 1 = 16.5	Method 1 = 13.3	Method 1 = 4.6	Method 1 = Low[2] Method 2 = 0.0[2]
C.	50%	50%	40	4	Method 1 = 13.3	Method 1 = 5.7	Method 1 = +ve could not be read [3]	Method 1 = Low[2] Method 2 = 0.0[2]
D.	25%	75%	40	4	Method 1 = 10.0	Method 1 = 3.8	Method 1 = 0.8	Method 1 = 0.0[2] Method 2 = 0.0[2]
E.	0%	100%	40	4	Method 1 = 1.2 & error.[1] Method 2 = 0.0[2]	Not performed	Method 1 = 0.0[2]	Not performed

[1]This positive results appears to be due to the acetic acid interfering with the test strip.
[2]These readings are lower than the detection limit of 0.5 mg/L.
[3]The test strips developed a mottled blue colour which the Reflectometer could not read.

Sliced Ham.

The Reflectometer readings (mg/L) for the sliced ham are given in the Table 2 below.

Table 2.

Gas Stream	H_2O_2 vapour	Acetic Acid vapour	Flow Rate L/min	Flushing period seconds	After 1 min.	After 1 hour.	After 24 hours.
Control	0%	0%	40	3	Method 1 = Low[2]		
A.	100%	0%	40	3	Method 1 = +ve[1] Method 2 =4.8	Method 1 = Low[2] Method 2 = Low[2]	Method 1 = 0.0[2] Method 2 = 0.0[2]
B.	75%	25%	40	3	Method 1 = 0.3[2] Method 2 = 0.0[2]	Method 1 = Low[2] Method 2 = Low[2]	Method 1 = 0.0[2] Method 2 = 0.0[2]
C.	50%	50%	40	3	Method 1 = Low[2] Method 2 = Low[2]	Method 1 = Low[2] Method 2 = 0.0[2]	Method 1 = 0.0[2] Method 2 = 0.0[2]
D.	25%	75%	40	3	Method 1 = Low[2] Method 2 = Low[2]	Method 1 = Low[2] Method 2 = Low[2]	Method 1 = 0.0[2] Method 2 = 0.0[2]
E.	0%	100%	40	3	Method 1 = Low[2] Method 2 = Low[2]	Not performed	Not performed
F.	25%	75%	40	12	Method 1 = Low[2] Method 2 = Low[2]	Not performed	Not performed

[1]The test strips developed a mottled blue colour which the Reflectometer could not read.
[2]These readings are lower than the detection limit of 0.5 mg/L.

Frankfurts.

The Reflectometer readings (mg/L) for the frankfurts are given in the Table 3 below.

Table 3.

Gas Stream	H_2O_2 vapour	Acetic Acid vapour	Flow Rate L/min	Flushing period seconds	After 1 min.	After 1 hour.	After 24 hours.
Control	0%	0%	40	2	Method 1 = Low[2]		
A.	100%	0%	40	2	Method 1 = patchy 3.8 Method 2 =6.8	Method 1 = Low[2] Method 2 = 0.0[2]	Method 1 = Low[2] Method 2 = Low[2]
B.	75%	25%	40	2	Method 1 = too patchy Method 2 = 3.8	Method 1 = Low[2] Method 2 = Low[2]	Method 1 = Low[2] Method 2 = Low[2]
C.	50%	50%	40	2	Method 1 = 2.5 Method 2 = 2.2	Method 1 = Low [2] Method 2 = Low[2]	Method 1 = Low[2] Method 2 = Low[2]
D.	25%	75%	40	2	Method 1 = slight +ve[1] Method 2 = 0.1[2]	Method 1 = Low[2] Method 2 = 0.0[2]	Method 1 = Low[2] Method 2 = 0.0[2]
E.	100%	0%	40	2	Method 1 = Low[2] Method 2 = Low[2]	Method 1 = Low[2] Method 2 = Low[2]	Method 1 = Low[2] Method 2 = Low[2]
F.	25%	75%	40	8	Method 1 = 3.5 & patchy Method 2 = 1.5 & 4.6	Method 1 = Low[2] Method 2 = 0.0[2]	Method 1 = Low[2] Method 2 = Low[2]

[1]The test strips developed a mottled blue colour which the Reflectometer could not read.
[2]These readings are lower than the detection limit of 0.5 mg/L.

Comments.

Crumpet-Splits were the only product that had detectable levels of hydrogen peroxide one hour after treatment.

Sliced ham and frankfurts did not have detectable levels of hydrogen peroxide one hour after any of the treatments.

No hydrogen peroxide was detected on the Crumpet-Splits, sliced ham or frankfurts twenty four hours after treatment.

	TREATED AND CONTROL	STORED	AT 4oC.										
B0-Cidal	ACETIC ACID	MICROBIAL	CFU/G	CFU/G	CFU/G	CFU/G	CFU/G	CFU/G	CFU/G	CFU/G	CFU/G	CFU/G	CFU
AIM: TRIAL H202 AND 90% ACETIC.		TESTS	16 DAYS @ END SHELF LIFE.					23 DAYS + 1 WEEK					
CLIENT:		CONTROL											
FOODSTUFF:	SANDWICH HAM SLICED	S.P.C.	4.00E+02					2.60E+04					
			1.20E+06					3.40E+06					
			1.00E+02					2.70E+06					
USE BY:	28-Aug-98		7.00E+05					7.00E+03					
Aw:	0.95		5.90E+03					2.80E+05					
TEMPERATURE:	5 deg C.	AVERAGE=	**3.81E+05**					**5.97E+05**					
S.A.(mm)/g:	**26 grams.**												
pH:	6.1												
CODE	**980812A-B**	TA = 0.28%											
GAS MIX:	CYCLES:	S.P.C.	A1	A2	A3	A4	A5	A1	A2	A3	A4	A5	
CO2 / ACETIC-	A *1 OVERPRESSURE		<10	30	<10	<10	40	20	10	10	10	<10	
90%.			<10	<10	<10	<10	<10	<10	<10	<10	<10	30	
AND H202	TREATMENT TIME:		<10	<10	<10	<10	<10	20	<10	<10	<10	20	
	2X SECONDS= A												
	X SECONDS= B												
		S.P.C.	B1	B2	B3	B4	B5	B1	B2	B3	B4	B5	
	1] H202		<10	<10	<10	40	<10	10	<10	<10	<10	<10	
	2] AA / H202		<10	60	<10	<10	<10	<10	10	<10	10	<10	
TEMPERATURE	3] AA / H202		10	10	<10	<10	10	10	10	<10	40	10	
ACETIC-90%	4] AA / H202												
AFTER A5.	5] AA	A = 2X SECONDS	A1	A2	A3	A4	A5						
			H202	AA	AA	AA	100%AA						
	SURFACE INI pH	INITIAL[25EC]	6.1	5	**4.5**	4.3	4.3						
		2 MIN.	6.3	5.5	4.9	4.8	4.5						
		5 MIN.	6.3	5.8	5	4.9	**4.7**						
TEMPERATURE		24 HOUR			5.85								
H202=		TA		TA=0.33%	TA=0.40%	TA=0.40%	TA=0.42%						
		B = X SECONDS	B1	B2	B3	B4	B5						
			H202	AA	AA	AA	100%AA						
	SURFACE INI PH	INITIAL[15EC]	6.1	4.9	**4.7**	4.7	4.6						
		2 MIN.	6.3	5.6	5.2	4.8	4.8						
		5 MIN.	6.3	5.8	5.4	5.2	5						
		24 HOUR			6	5.7	5.7						
		TA				TA=0.34%							
						no acid	acid back note.						

Vaporex

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in food preservation

FRANKFURT FACT SHEET

Frankfurts, with skins, were initially sourced from retail outlets and a minimum effective treatment was established utilising a cool acetic and carbonic acid gas mix.

A series of trials were then conducted to highlight any detrimental effects the process may have on flavour, colour and the casing integrity during storage at 4°C and the cooking process.

The following observations were made and subsequently validated during on-site customer trials:

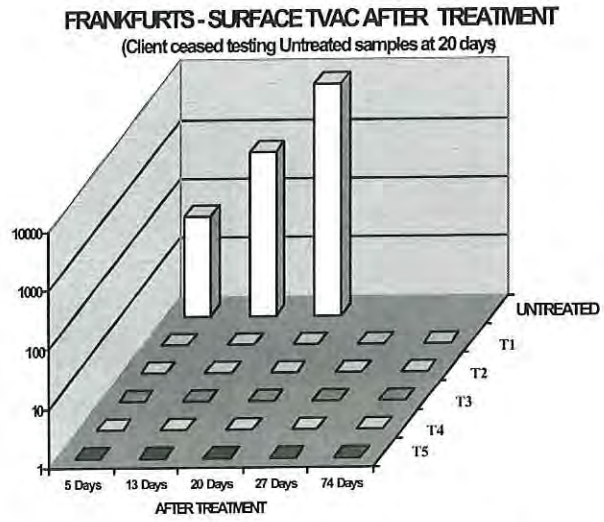
- No change to the colour or physical integrity of the casing.
- Absence of slime formation on the casing surface at all sampling times.

An acceptable flavour profile was achieved with T1. Treatments, T2-T4, developed incremental degrees of metallic off flavours from the synthetic acetic acid. Acidity was detected only at the T5 treatment.

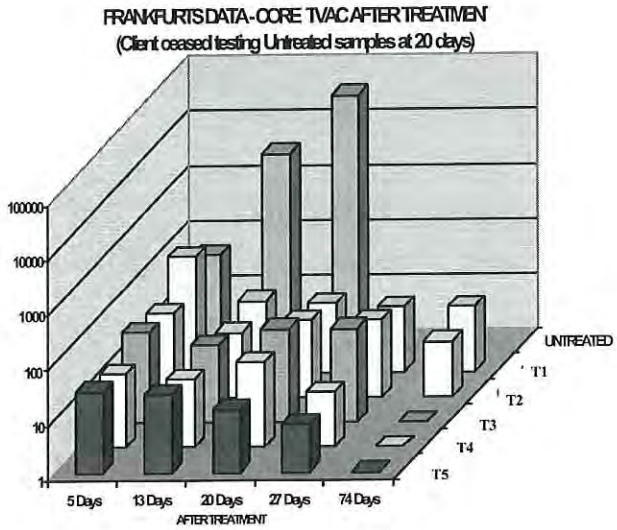
- Use of natural acetic acids and/or the blending of hydrogen peroxide into the gas mix can further minimise detrimental flavour effects.
- pH profile for T1 was:

DESCRIPTION	pH
UNTREATED	6.6
SURFACE @ 30 seconds	3.8
SURFACE @ 48 hours	5.8
CORE @ 48 hours	6.0
CORE @ 72 days	6.1

- Excellent microbial surface control was achieved by all treatments. This is shown by the following results from independent analysis:-



Microbiological bioburdens of frankfurt core samples also indicated excellent control which was proportional to treatment and exhibited gradual die off through to 74 days. A shelf life of 74 days or greater was not required by the customer. Counts on untreated controls were not performed beyond 20 days.



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Excellent microbiological control can be achieved with frankfurts and other such meat products processed into edible casings when treated by the VAPOREX process.

- As shown by the core counts, the VAPOREX process can provide additional quality to in process products, beyond it's primary aim. This advantage is achieved because in many formulations the existing preservative systems are not at their optimal pH. The acidulation resulting from the VAPOREX process enhances this preservative effect.

  Of greater importance is the fact that these internal preservatives, at the permitted concentrations, can only tolerate very low microbial loadings. When the surface microbial loading is controlled the internal preservative/s can more effectively control the lower internal microbial loading.

- The process consumable cost is approximately 1 cent per Kg under laboratory conditions.

RECOMMENDED EXPERIMENTAL PROTOCOL

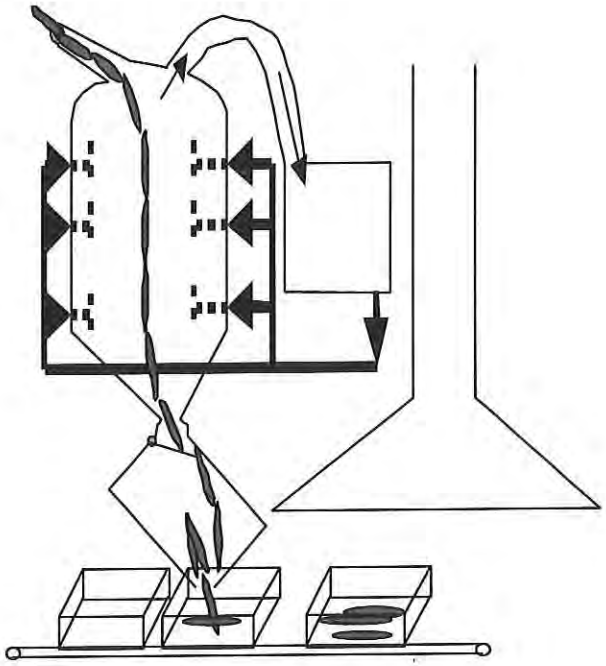
- Introduce hydrogen peroxide gas mix to the acetic and carbonic acid gases at appropriate temperatures in order to optimise this treatment, if required.

- Treatment could be applied in a simple vertical counter-current type applicator. Due to the fact that some manufacturers hand pack this product, a sterile airflow over the packing table is recommended. See **DIAG. 1.**

CRITICAL POINT:

- Minimise time between treatment and packing.

DIAG. 1



Australian & International Patents Pending

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FOOD SCIENCE AUSTRALIA
A JOINT VENTURE OF CSIRO AND AFISC

CSIRO AFISC Australian Food Industry Science Centre

Report 103489

Microbiological challenge studies on Vaporex treated frankfurts

by

[redacted]

30 November 2001

prepared for

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Summary

Three microbiological challenge studies were conducted on frankfurts inoculated with *Listeria monocytogenes* and treated by the Vaporex process. Five different treatments were evaluated. The results showed < 2 to 6 log reductions in *L. monocytogenes* could be obtained by the treatments on samples incubated for 28 d at acceptable and abusive refrigeration temperatures.

Background

Vaporex have developed a process utilising gaseous acetic acid (in CO_2) which can be applied to foods that may be susceptible to post-process contamination, particularly by pathogens. The process is applied during or immediately prior to packaging and would be suited to products such as smallgoods. Smallgoods, such as frankfurts have been the source of *Listeria monocytogenes* that has caused illness, and products contaminated with the organism are frequently recalled in the USA. Contamination of smallgoods with *L. monocytogenes* generally occurs after processing and prior to packaging, so a terminal listerial process is warranted. Irradiation and other non-thermal processes have been considered, but cost and the production of off-flavours may limit the application of these technologies.

Vaporex requested microbiological challenge studies to evaluate the efficacy of their process on frankfurts inoculated with *L. monocytogenes*. According to the information supplied by Vaporex, different gas generating systems, different acetic acid concentrations and different gas application temperatures were evaluated (Table 1). Although different application times were used, according to Vaporex, contact times for all treatments were ~3 secs. Due to the development of condensate, different frankfurt temperatures were tested. Frankfurts were surface inoculated, dried, treated by Vaporex and then stored at 4-5°C (acceptable refrigeration temperatures) or 8-9°C (abuse temperatures) for varying periods, as directed by Vaporex. Counts of *L. monocytogenes* were monitored throughout.

Study 1 commenced 23 April 2001; study 2 commenced 15 May 2001; study 3 commenced 28 June 2001. Prior to study 1, trials were conducted to evaluate and optimise the inoculation, drying, and recovery procedures.

Table 1: **Vaporex treatments evaluated.**

Challenge study no.	Treatment no.	Frankfurt temp at treatment (°C)*	CO_2/HAc temp (°C)*	Titratable acidity %HAc (w/w)*	Mean biocide concentration (mg/cm^2 frankfurt)*	Incubation time (days)
1	1	2	23	0.18	0.99	7
2	2	2	36	0.46	2.53	14
	3	2	50	1.12	6.15	14
3	4#	22	36	0.25	1.37	28
	5	22	36	0.27	1.48	28

* Information supplied by Vaporex.
\# Included additional CO_2/ HAc heating treatment.

***Table 2: L. monocytogenes* cultures used for studies.**

Culture no.	Source
FRRB 2472	Scott A, clinical origin
FRRB 2727	Beef
FRRB 2728	Beef
FRRB 2729	Beef
FRRB 2730	Beef
FRRB 2731	Beef

Methods

A cocktail of *L. monocytogenes* cultures was used for each study. Five of the cultures were isolated from beef and the sixth was a human clinical isolate (Table 2). They were inoculated individually into brain heart infusion broths and incubated at 8-9°C for 4 days prior to each study. Trials had shown this resulted in approximately 2 x 10^9 colony forming units (cfu) *L. monocytogenes* / mL broth. Cultures were diluted using sterile, filtered water, to provide approximately equal numbers of each strain, and combined to provide the inoculum cocktail.

Frankfurts were supplied by Vaporex on the day of inoculation of each study. They were stored at ~1°C until required and then placed on trays in a biohazard cabinet. They were surface inoculated with 40 µL *L. monocytogenes* cocktail / frankfurt to provide approximately 10^6 *L. monocytogenes* / frankfurt and allowed to dry (approximately 20 mins). Each frankfurt was transferred into a stomacher bag, which was then heat sealed. For the first two studies, frankfurts were refrigerated for 1 hour until they were 2-4°C. For the third study, the frankfurts were not chilled after drying to avoid formation of condensate that may have affected the efficacy of the Vaporex treatment. Inoculated and packaged frankfurts were treated using the Vaporex treatment by Vaporex personnel for treatment. After treatment they were incubated at 4-5 or 8-9°C in individual stomacher bags. The temperature throughout the inoculation process was monitored on an uninoculated frankfurt, using a Squirrel temperature logger (Grant Instruments, UK). For study 1 only, uninoculated, treated and untreated frankfurts were included. For studies 2 and 3 inoculated, untreated frankfurts were included.

To ensure that the inoculation and drying procedures did not change the water activity (a_w) of the frankfurts appreciably, a_w was monitored using an Aqualab CX-3 analyser (Decagon Devices, Washington USA). Sterile filtered water was used to inoculate additional frankfurts, as described. After drying, the inoculated surface was removed and transferred into a container for a_w measurement. For studies 2 and 3 the cut surface of the meat was covered with Vaseline to minimise any effect on the a_w reading from the cut meat surface.

Numbers of *L. monocytogenes* were monitored throughout the studies, depending on the incubation period requested.

Approximately 100 mL Fraser broth (without the selective supplement) were transferred into each stomacher bag containing a frankfurt for testing. The bag was resealed and the frankfurt

massaged gently for 1 min to transfer the *L. monocytogenes* cells into the broth. Some of the broth was removed aseptically for testing and diluted using 0.1% peptone solution. Diluted and undiluted broths were plated onto brain heart infusion agar (BHA) and Oxford agar using the spread plate technique. Oxford agar plates were incubated at 37°C for 2 d. BHA plates were incubated at 30°C for 1-3 days. Cells from colonies on BHA were examined microscopically and grouped accordingly. Presumptive *L. monocytogenes* colonies were streaked onto Oxford agar and incubated for 2 d at 37°C and examined for colony morphology typical of *L. monocytogenes*.

Broths from treated samples were transferred (without the frankfurt) to sterile containers and ½ Fraser selective supplements added, in accordance with Australian Standard method AS 1766.2.16.1:1998. They were incubated at 30°C overnight or until they were black in colour, when they were streaked onto Oxford agar. Broths not showing a colour change were streaked after 7 d. Broths from untreated, inoculated samples were not incubated. Additional inoculated broths (without frankfurts and without treatment) were included to monitor the detection procedures. Oxford agar plates were incubated at 37°C for 2 d. For study 1, 0.1 mL from each ½ Fraser broth was transferred to Fraser broth after 24 h and the Australian Standard procedure followed. However this was found to be unnecessary as incubation of the ½ Fraser broth was sufficient to recover the listeria without interference from competing organisms.

In study 1, bags from which treated frankfurts had been removed were tested for the presence of listeriae to ensure none remained on the bag surface. These tests were conducted on bags on the day of inoculation and also after bags had been held overnight at 4-5 and 8-9°C. 100 mL Fraser broth (without the selective supplement) were transferred into the bag, massaged for 1 min and tested as described, including broth incubation.

Storage temperatures were monitored with TingTag data loggers (Gemini Data Loggers, UK).

Results

Storage temperatures were shown to average 3.9 (4-5°C) and 9.1°C (8-9°C) for all studies.

Results are shown in Table 3 for the inoculum recovery and a_w for each study. The results showed the a_w was not changed appreciably after inoculation and drying.

Counts of the initial inoculum and of the frankfurts after inoculation and drying showed good recovery of the organisms, indicating that little inactivation occurred during these procedures. Some inactivation occurred in studies 2 and 3, although this was within the limits acceptable for inoculation studies. In all studies, the inoculated, procedural controls showed growth of *L. monocytogenes*. *L. monocytogenes* was not detected on the untreated, uninoculated samples (limit of detection 1 cfu / 100 mL diluent), however, Gram positive cocci and yeasts were detected by 7 days. The tests on bags after the treated frankfurts had been removed did not detect *L. monocytogenes* in the enrichment broths (incubated for 3 d) initially or when the bags had been held overnight at 4-5 or 8-9°C. This indicated that no *L. monocytogenes* cells remained on the bag surface after the inoculated frankfurt was removed. This test was discontinued for studies 2 and 3.

Table 3: **Inoculum[a] recovery and a_w for each study.**

Study	a_w before inoculation	a_w after inoculation	Inoculum / frankfurt	Inoculum applied / mL diluent	Inoculum recovered / mL diluent
1	0.966	0.963	7×10^5	7×10^3	7×10^3
2	0.960	0.968	1×10^6	1×10^4	7×10^3
3	0.947	0.939	1×10^6	1×10^4	5×10^3

[a] Counts expressed as colony forming units.

Results are shown in Figures 1-3 for the behaviour of *L. monocytogenes* in studies 1-3. Figure 1 shows the averaged results for three replicates of one treatment stored at either 4-5°C or 8-9°C over 7 d. Figures 2 and 3 show the averaged results for duplicate samples from treatments stored at 4-5°C or 8-9°C for 14 and 28d, respectively.

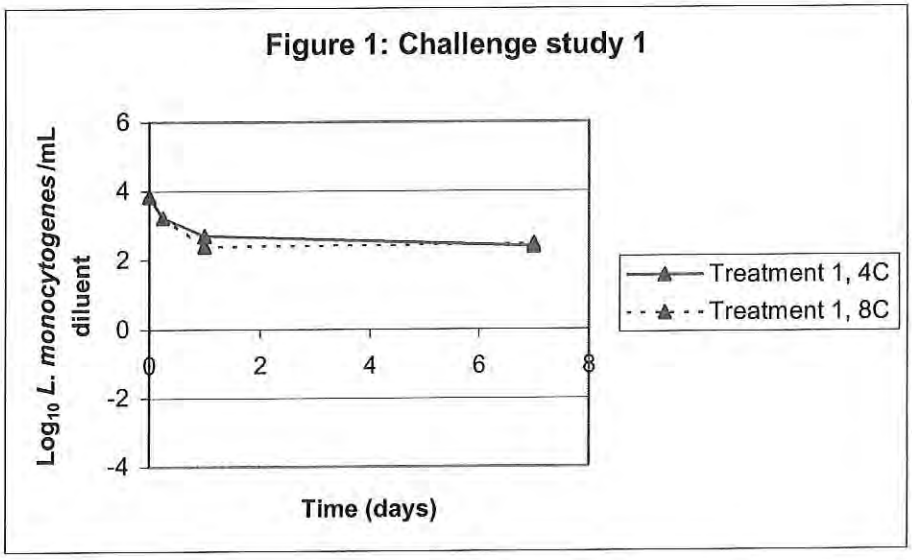
On untreated inoculated samples, rapid growth of *L. monocytogenes* was observed on samples stored at 8-9°C. Growth was much slower at 4-5°C and was not observed until after 21 d. Untreated inoculated samples stored at 8-9°C were spoiled by mould growth by 14 d in studies 2 and 3. The treated inoculated samples stored at 4-5°C showed no visible spoilage after 4 months.

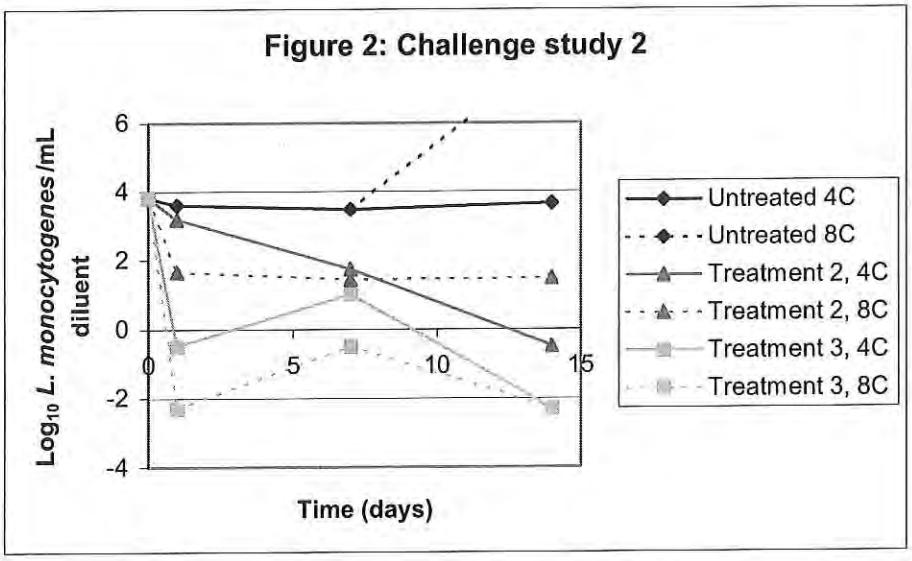
In the inoculated, treated samples the anti-listerial effects observed correlated well with the acetic acid concentrations on the frankfurt (calculated by Vaporex as the mean biocide concentration / cm^2 frankfurt, Table 1). Treatment 3 from study 2 showed the highest anti-listerial effect, attaining ~6 log reduction over 14 days in samples incubated with and without temperature abuse. This treatment used the highest acetic acid concentration and application temperature (50°C).

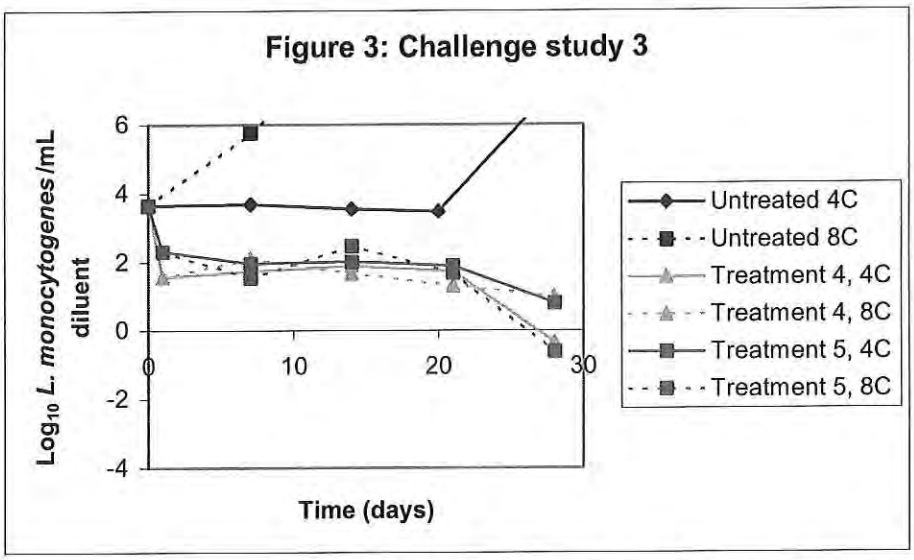
Treatment 2 was the second most effective treatment for samples incubated without temperature abuse, in which a 4 log reduction was observed over 14 d. This treatment used less than half the concentration of acetic acid at a lower application temperature (36°C) compared to treatment 3. However for samples incubated at 8-9°C, a 2 log reduction only was observed in 14 d.

Treatments 4 and 5 showed a lower anti-listerial effect from a lower acetic acid concentration applied at 36°C. A reduction of around 2 logs was observed over 21 d with both treatments, which increased to 3-4 logs over 28 d, depending on storage temperature. Both were more effective than treatment 1 that contained an even lower concentration of acetic acid applied at 23°C, and resulted in < 2 log reduction. Treatment 4 used an additional gas heating treatment and a slightly reduced acid concentration than treatment 5. Little difference was observed in the counts for both treatments.

For treatments 4 and 5 the frankfurts were at ~22°C, compared to around 2°C for the other treatments. Due to the number of variables in each treatment it is not possible to gauge if this had a significant impact on the anti-listerial effect, however it established that it was possible to obtain an anti-listerial effect in the presence of small amounts of condensate (Treatments 1-3).







Figures 1-3: Numbers of *L. monocytogenes* recovered from diluent following Vaporex treatments 1-5, during storage at 4-5 and 8-9°C. All results are expressed as $\log_{10}$ *L. monocytogenes* cfu/mL diluent used to recover the organisms and not per frankfurt or per g frankfurt.

Comments

The studies showed that acetic acid vapour in CO_2 had an antilisterial effect. The degree of the effect appears to be dependent on a number of factors, including the acid concentration and possibly the application temperature, presence or absence of condensate. Treatment 3 showed the greatest effect, but also used the highest concentration of acetic acid, more than double the concentration used in treatment 2 and more than 4 times the concentrations used in treatments 1, 4 and 5.

A 6 log reduction in a cocktail of *L. monocytogenes* strains was obtained over 14 days when samples following treatment 3 were incubated at acceptable and abuse temperatures.

Treatments 1-3 were conducted over 7-14 d. It is possible that a greater anti-listerial effect may be obtained when incubated for a longer period, due to the residual acid, such as occurred in Study 3, treatments 4 and 5.

Variability was observed between samples stored at acceptable and abuse temperatures. In two of the five treatments evaluated, the anti-listerial effect was lower at the abuse temperature. This must be considered in determining an anti-listerial process.

Some initial anti-listerial effect may be obtained from the carrier CO_2, depending on the concentration and storage temperature. For this to be significant, a barrier film would be required which was not used in these studies.

[redacted]
Microbiologist
Food Safety & Quality Group

In the food industry, sodium hypochlorite is used as a general-purpose disinfectant. It is most stable in a slightly alkaline solution, and it is for this reason that the concentrate is supplied stabilized with sodium hydrocide at a pH of up to 12. An in-use solution of between 50 and 300 ppm will have a pH between 7 and 9. The optimum pH for disinfection is pH 5·0 but the solution is less stable. Below pH 5·0, chlorine gas will be produced.

Applications for sodium hypochlorite in the food industries are CIP, soak and spray. Sodium hypochlorite has many advantages: it is nonfoaming; it is not affected by water hardness; it does not leave an active residue, and it has a wide antimicrobial spectrum which includes activity against bacterial spores and viruses. It is also fast-acting and cheap.

However, sodium hypochlorite has numerous disadvantages: it can be corrosive to a wide range of components, including stainless steel; it is irritating to the skin and eyes; the in-use solution is unstable; it is inactivated by organic materials, and it may give rise to taint problems.

Chlorine dioxide Chlorine dioxide (ClO_2) is an unstable and toxic gas which is soluble in water. When chlorine dioxide is generated in solution, as shown below, it is a very effective water disinfectant at point of use.

$$5NaClO_2 + 4HCl \rightleftharpoons 4ClO_2 + 5NaCl + 2H_2O$$

Chlorine dioxide at use concentrations (0·5–1 ppm) overcomes some of the disadvantages of hypochlorite in that it is nontainting, noncorrosive and nontoxic. Its sole use at present is in water disinfection.

Iodine Iodine itself is not very soluble in water, and the vapour is irritating to the eyes, making it difficult to handle. Iodine is a very reactive element, and it is this reactivity which makes it a good disinfectant.

Iodine compounds used in the food industry contain iodine complexed with polyvinylpyrrolidone and other surface active agents, usually in an acid solution. These are known as iodophors and were first introduced in 1949.

The complexes formed between iodine and carrier molecule are water-soluble and overcome the handling difficulties of iodine whilst retaining the disinfecting power. On dilution the iodophors release iodine gradually, and it is the free iodine which acts as the disinfecting agent. The optimum pH for microbial activity is pH 5·0.

Acid				Alkaline
I_2	$\rightleftharpoons$ HOI	$\rightleftharpoons$ OI^-	$\rightleftharpoons$	IO^-
Greatest activity	Some activity	Inactive		Inactive

The surface-active agents provide better wetting and organic soil penetration, thus making iodophors less affected by soil than hypochlorite. The choice of surface-active agent may lead to foam generation in applications such as CIP.

Iodophors have a broad antimicrobial spectrum which is similar to hypochlorite, although they are less active against bacterial spores. In common with sodium hypochlorite, they are fast-acting but are more expensive. Iodophors are used in soak baths and spray application at up to 10 ppm available iodine. In solution, iodophors are yellow-brown in colour. This colour can be an advantage: in a soak bath application the colour indicates the presence of iodine; the in-use solutions are unstable, so that as the iodine dissipates the solution will become colourless.

Staining may be a problem, especially with some plastics, and this may also result in taint problems. Iodophors can be corrosive; it is therefore necessary to ensure that the correct dilution is used; otherwise, damage to plant and personnel may occur.

Bromine Bromine itself is not used as a disinfectant, mainly because of its handling difficulties. Bromochlorodimethylhydantoin is supplied as a powder or a solid. In solution it releases hypobromous and hypochlorous acids.

Oxygen-releasing Compounds

Peracetic acid Peracetic acid was introduced in 1955. The material is supplied as an equilibrium mixture:

$$CH_3C(=O)OOH + H_2O \rightleftharpoons CH_3C(=O)OH + H_2O_2$$

Peracetic acid	Water	Acetic acid	Hydrogen peroxide

It is soluble in water and is completely biodegradable, breaking down to harmless products:

$$2CH_3C(=O)OOH \rightarrow 2CH_3C(=O)OH + O_2$$

As supplied, peracetic acid is corrosive and has a very irritant smell, similar to vinegar; because of these properties it is unpleasant to handle and manual use is not recommended. It is suitable for CIP as it is nonfoaming.

Peracetic acid is a highly reactive material. As an in-use solution is it not very stable and will react with organic materials. Peracetic acid may attack plant materials, such as rubber gaskets, and at higher concentrations corrosion may be a problem.

Peracetic acid has a wide antimicrobial spectrum which includes bacterial spores and viruses. This activity is fast and is maintained at temperatures lower than ambient.

Hydrogen peroxide Hydrogen peroxide (H_2O_2) was introduced as a disinfectant in 1887. It is supplied in solution which has a tendency to decompose:

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

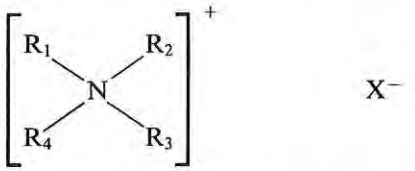
Manual use of hydrogen peroxide is not recommended,

but it is used in spray applications such as aseptic packaging. Hydrogen peroxide is both bactericidal and fungicidal. Some bacteria and fungi are less sensitive because of catalase activity which destroys H_2O_2. Hydrogen peroxide is slow-acting, so that a long contact time or elevated temperature is required for effective disinfection.

Nonoxidizing Disinfectants

Quaternary Ammonium Compounds

Quaternary ammonium compounds (QACs) were first introduced in 1917 and are probably the best known cationic surface-active agents. Their general formula is as follows:



X is usually a halide but sometimes a sulphate ion. R_1, R_2, R_3 and R_4 may be a variety of alkyl or aryl groups.

QACs are generally poor detergents but good wetting agents. In solution they ionize to produce a cation, the substituted nitrogen part of the molecule, which provides the surface-active property. The length of the carbon chain in the R groups affects the disinfectant ability; usually C_8 to C_{18} are the most effective.

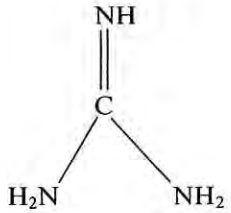
The surface-active nature of these molecules tends to make them too high-foaming for CIP use, but they can be used for soak and manual cleaning at 200–400 ppm active. The optimum activity is around neutral pH, but QACs are active between pH 3·0 and 10·0. Activity may be inhibited by water hardness.

QACs are noncorrosive and are stable at in-use dilution. Their major disadvantages are that they are affected by organic soil, and that they tend to cling to surfaces, so that they may be difficult to rinse off, resulting in possible taint problems.

The antimicrobial range of QACs is less than that of the oxidizing disinfectants. They are less effective against Gram-negative bacteria than against Gram-positive bacteria. They also have limited activity against bacterial spores and very little activity against viruses. To be effective against yeasts and moulds, a higher concentration is required.

Biguanides

Biguanides with antimicrobial activity were first reported in 1933. The biguanides are derivatives of guanidine, a naturally occurring substance found in vegetables such as turnips and cereals:



Biguanides are usually supplied as polymers in the salt form, mostly as the hydrochloride. Optimum activity lies between pH 3·0 and pH 9·0. Below pH 3·0, activity is suppressed, whilst above pH 9·0 they are precipitated.

They are cationic in nature but are not regarded as surface-active. Biguanides do not foam and are, therefore, suitable for CIP; they may also be used for soak and manual cleaning. They are noncorrosive but taint may be a problem if not properly rinsed. The in-use solution is stable, but is affected by organic soil and, to some extent, by hard water.

Most biguanides have equal antibacterial activity against Gram-positive and Gram-negative microorganisms. They are less effective against moulds and yeasts, and are ineffective against bacterial spores and viruses.

Amphoterics

Amphoterics have been in use as disinfectants since the early 1950s. They are based on a substituted amino acid, usually glycerine. The term ampholyte is often used to describe them because in solution they ionize to produce cations, anions or zwitterions, depending on pH:

$$R{-}\overset{+}{N}H_2{-}CH_2{-}CH_2{-}C(=O)OH$$

Acid cation

$$R{-}\overset{+}{N}H_2{-}CH_2{-}CH_2{-}C(=O)O^-$$

Zwitterion

$$R{-}NH{-}CH_2{-}CH_2{-}C(=O)O^-$$

Akaline anion

Only certain amphoterics have disinfecting ability and surface activity. The disinfecting ability appears to increase with the increase of basic groups.

Amphoterics tend to be viscous liquids that are freely soluble in water. They are generally too high-foaming for use in CIP, but are suitable for soak, spray and hand use. Amphoterics are equally effective against Gram-negative and Gram-positive bacteria; they are less effective against yeasts and moulds, and have very little effect against bacterial spores and viruses. Optimum activity lies between pH 3·0 and 9·0.

Properties such as soil tolerance and corrosion vary with the amphoteric concerned. Corrosion is not usually a problem. The in-use solution, usually 1000 ppm active, is stable.

Acid Anionics

The active molecule in acid anionics varies considerably. There are two main types: those based on carboxylic

acids, which include fatty acids and derivatives, and those based on anionic surfactants combined with mineral acid.

Acid anionics tend to be formulated products with additions to aid activity or solubility. Properties will vary with product, but they tend to have some detergent and wetting ability. The higher-foaming products are unsuitable for CIP, so that their general use is for spray. They are not suitable for hand use since a pH of 2 is required for optimum antimicrobial activity.

The antimicrobial activity is against Gram-negative and Gram-positive bacteria, but they are less effective against bacterial spores and viruses. Certain carboxylic acid types are active against yeasts and moulds. Both types are affected by organic soil and water hardness but, again, both properties will vary with the product. The in-use solutions are stable.

Effluent Problems

The oxidizing disinfectants are degraded very easily by organic soil to ineffective products. Peracetic acid and hydrogen peroxide break down to the products that have been described earlier.

The breakdown products from the halogens will vary with pH of the effluent but in general, halide ions will be produced. The halogens should not be mixed with acid products as chlorine will react with organic chemicals to produce organo-chloro compounds which may be carcinogenic. The nonoxidizing disinfectants in modern products tend to consist of biodegradable compounds. The cationic products will adsorb onto organic material. The biguanides are incompatible with alkaline chemicals and will form a precipitate. ***See*** Effluents from Food Processing, On-site Processing of Waste; Effluents from Food Processing, Disposal of Waste Water; Effluents from Food Processing, Composition and Analysis

Analysis of Disinfectants in Waste Water

Obviously, detection will tend to depend on the concentration of disinfectant present. The oxidizing disinfectants are unlikely to be detected. Halide ions can be detected but cannot be identified as coming from the disinfectant.

Using an available chlorine probe, chlorine may be detected up to 200 ppm but, because of the presence of organic material and other chemicals, the presence of available chlorine may not be detected. As with chlorine, available iodine can be detected using a probe but iodine is converted very quickly to iodide. The breakdown products of peracetic acid and hydrogen peroxide are unlikely to be detected.

For the quaternary ammonium compounds, the biguanides and the amphoterics, it would be necessary to know the specific active molecule to be able to quantify these activities in effluent. The active content could then be determined by HPLC.

Acid anionics can be detected in the effluent by determining the anionic content.

Comparison with Steam

There is no chemical suitable for use as a disinfectant in the food factory that can compete with steam. It is effective against bacteria, moulds, yeasts, bacterial spores and viruses. It is not affected by soil and hard water. There are no corrosion or stability problems and it leaves no residues. The drawbacks are that it cannot be used with heat-sensitive plant materials, and it needs careful use to avoid human contact.

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Overall Approach

In considering the overall approach to cleaning procedures in the factory, a number of aspects are significant, and these can be grouped under three main headings: general factory and environmental hygiene; process equipment, and cleaning and sanitation; training, monitoring and audits.

Legislation, in the form of the Food Safety Act 1990, has focused attention on the rights of the consumer. The legal implications of failure to comply with the law are extensive, should the product not meet the expectations of the consumer, the Environmental Health Officer or the Office of Fair Trading. Demonstration of 'Due Diligence' under the terms of the law could rely on effective cleaning methods, monitoring of performance, clearly defined controls of the procedure and accurate records. ***See*** Legislation, International Standards

Company and is now called the Dole–Martin aseptic system. At the end of the 1940s, Alpura AG and the Sulzer Company of Switzerland revitalized the development of the HTST process, using temperatures above 130°C, and called it the ultra-high-temperature (UHT) process. This was the basis of the Tetra Pack (Lund, Sweden) aseptic system for liquid dairy products.

Presterilization of Food

The specific method used for presterilization depends on the characteristics of the food.

Homogeneous, low-viscosity liquids can be heat-treated in suitable heat exchangers with high flow velocity and turbulence and very short holding times. The plate heat exchanger is the predominant one for these foods, using temperatures ranging from 135°C to 150°C, and up to 160°C for low-acid foods (pH $\geq 4{\cdot}5$), with holding times of 2–5 s. For high-acid foods, temperatures below 100°C are applied. Viscous foods may require the use of agitated or scraped-surface heat exchangers, using similar time–temperature schemes as above.

Liquids with small particles, having less effective heat transfer properties, will require the use of special plate, tubular, or scraped-surface heat exchangers. Products in this group may be soups with small particles, rice puddings, etc.

Liquids with larger particles such as meat cubes or vegetable particles, 15–25 mm or more in diameter, require more time to achieve sterility. Processes are being developed in which the carrier liquid is separately UHT-treated continuously, while the solid product is batch-sterilized. Other systems based on 'ohmic heating' (electrical resistance heating) are also being developed. ***See*** Heat Treatment, Electric Process Heating

Sterilization of Packaging Materials

The sterilization processes, for packaging materials or packages, which are currently applied commercially include the following:

1. Heat – saturated or superheated steam, steam with hot air or the heat applied during the extrusion of plastic packaging materials.
2. Irradiation – infrared (IR), ultraviolet (UV) or ionizing.
3. Chemicals – concentrated (20–35%) hydrogen peroxide (H_2O_2), peracetic acid or ethanol.

The process applied depends on the specific packaging material as well as the aseptic filling system.

Heating with saturated or superheated steam is the oldest method and has been applied for the heating of cans and lids in the Dole system from its inception, as well as for metal drums in later systems. A mixture of hot air and steam is also applied for sterilizing the inner surfaces of lids and cups made of polypropylene which have thermal stability up to 160°C.

Temperatures of 180–230°C, for about 3 min, are reached in the blow moulding process of plastics. However, temperature distribution may not always be uniform, and therefore chemical resterilization prior to aseptic filling is necessary.

Irradiation by IR is basically dry heat irradiation and can only be applied to surfaces which are heat-resistant; IR can also be used on wet surfaces. Ultraviolet irradiation is a surface sterilization process, and is most commonly applied in conjunction with H_2O_2. ***See*** Irradiation of Foods, Basic Principles

Ionizing rays are commercially applied to presterilize large plastic bags, using isotopes such as cobalt 60, for 'bag in the box' systems.

Chemical treatment is predominantly carried out with H_2O_2 and to a much lesser extent (only in Europe) with peracetic acid. The sterilization can be carried out by dipping, spraying or rinsing packaging material with H_2O_2 followed by heating in order to increase effectiveness of the process and assure removal of residual peroxide which could damage the product. Sterilization with H_2O_2 was approved by the US Food and Drug Administration (FDA) only in the late 1970s, and this held up the introduction of aseptic filling into carton packages in the USA until the beginning of the 1980s.

Aseptic filling of the presterilized product into the presterilized package is an integral part of the process, but is its weakest and most fallible component. Adherence to good manufacturing procedures, strict quality assurance, and maintenance of hygienic conditions are needed to avoid malfunction and product spoilage. Furthermore, since most packages are made of plastics or paperboard, which have less mechanical stability than cans or glass, they are more vulnerable to damage and reinfection.

Packaging Materials and Systems

Liquid foods can be packed either in large 'bulk' containers or in small retail packages. The preservation method can be conventional or aseptic for either type of container, the latter method being the preferred one. Materials that can be used for packaging liquid foods include metal cans, both tin-plated steel and aluminium cans, glass, laminated cardboard, and plastics.

Metal Cans and Drums

The use of metal cans is mainly for packaging of carbonated soft drinks and beer for the retail market. In

quantities of the reagents used for the sample. Any turbidity shown in the sample does not exceed that of the control.

Packaging and Storage Store in tight containers.

Hydrogen Peroxide

H_2O_2 Formula wt 34.01

CAS: [7722-84-1]

DESCRIPTION

A clear, colorless liquid having a slightly pungent odor. It is miscible with water. The grades of Hydrogen Peroxide suitable for food use usually have a concentration between 30% and 50%.

Note: Although Hydrogen Peroxide undergoes exothermic decomposition in the presence of dirt and other foreign materials, it is safe and stable under recommended conditions of handling and storage. Information on safe handling and use may be obtained from the supplier.

Functional Use in Foods Bleaching, oxidizing agent; starch modifier; preservative.

REQUIREMENTS

Identification Shake 1 mL of the sample with 10 mL of water containing 1 drop of 2 *N* sulfuric acid, and add 2 mL of ether. The subsequent addition of a drop of potassium dichromate TS produces an evanescent blue color in the water layer that upon agitation and standing passes into the ether layer.
Assay Not less than the labeled concentration or within the range stated on the label.
Acidity (as H_2SO_4) Not more than 0.03%.
Heavy Metals (as Pb) Not more than 10 mg/kg.
Iron Not more than 0.5 mg/kg.
Phosphate Not more than 0.005%.
Residue on Evaporation Not more than 0.006%.
Tin Not more than 10 mg/kg.

TESTS

Assay Accurately weigh a volume of the sample equivalent to about 300 mg of H_2O_2 into a 100-mL volumetric flask, dilute to volume with water, and mix thoroughly. To a 20.0-mL portion of this solution add 25 mL of 2 *N* sulfuric acid, and titrate with 0.1 *N* potassium permanganate. Each mL of 0.1 *N* potassium permanganate is equivalent to 1.701 mg of H_2O_2.
Acidity Dilute 9 mL (10 g) with 90 mL of carbon dioxide-free water, add methyl red TS, and titrate with 0.02 *N* sodium hydroxide. The volume of sodium hydroxide solution should not be more than 3 mL greater than the volume required for a blank test on 90 mL of the water used for dilution.
Heavy Metals Evaporate 1.8 mL (2 g) to dryness on a steam bath with 10 mg of sodium chloride, and dissolve the residue in 25 mL of water. The solution so obtained meets the requirements of the *Heavy Metals Test*, Appendix IIIB, using 20 µg of lead ion (Pb) in the control (*Solution A*).
Iron Evaporate 18 mL (20 g) to dryness on a steam bath with 10 mg of sodium chloride, dissolve the residue in 2 mL of hydrochloric acid, and dilute to 50 mL with water. Add about 40 mg of ammonium persulfate crystals and 10 mL of ammonium thiocyanate TS, and mix. Any red or pink color does not exceed that produced by 1.0 mL of *Iron Standard Solution* (10 µg Fe) in an equal volume of solution containing the quantities of the reagents used in the test.
Phosphate Evaporate 400 mg to dryness on a steam bath. Dissolve the residue in 25 mL of approximately 0.5 *N* sulfuric acid, add 1 mL of ammonium molybdate solution (500 mg of $(NH_4)_6Mo_7O_{24}.4H_2O$ in each 10 mL of water) and 1 mL of *p*-methylaminophenol sulfate TS, and allow to stand for 2 h. Any blue color does not exceed that produced by 2.0 mL of *Phosphate Standard Solution* (20 µg PO_4) in an equal volume of solution containing the quantities of the reagents used in the test.
Residue on Evaporation Evaporate 25 g to dryness in a tared porcelain or silica dish on a steam bath, and dry to constant weight at 105°. The weight of the residue does not exceed 1.5 mg.
Tin

Aluminum Chloride Solution Dissolve 8.93 g of aluminum chloride, $AlCl_3.6H_2O$, in sufficient water to make 1000 mL.

Gelatin Solution On the day of use, dissolve 100 mg of gelatin in 50 mL of boiled water that has been cooled to between 50° and 60°.

Tin Stock Solution Dissolve 250.0 mg of lead-free tin foil in 10 to 15 mL of hydrochloric acid, and dilute to 250.0 mL with dilute hydrochloric acid (1 in 2).

Standard Solution On the day of use, transfer 5.0 mL of *Tin Stock Solution* into a 100-mL volumetric flask, dilute to volume with water, and mix. Transfer 2.0 mL of this solution (100 µg Sn) into a 250-mL Erlenmeyer flask, and add 15 mL of water, 5 mL of nitric acid, and 2 mL of sulfuric acid. Place a small stemless funnel in the mouth of the flask, and heat until strong fumes of sulfuric acid are evolved. Cool, add 5 mL of water, evaporate again to strong fumes, and cool. Repeat the addition of water and heating to strong fumes, then add 15 mL of water, heat to boiling, and cool. Dilute to about 35 mL with water, add 1 drop of methyl red TS and 2.0 mL of the *Aluminum Chloride Solution*, and mix. Make the solution just alkaline by the dropwise addition of ammonium hydroxide, stirring gently, and then add 0.1 mL in excess.

Caution: To avoid dissolving the aluminum hydroxide precipitate, do not add more than 0.1 mL in excess of the ammonia solution.

Centrifuge for about 15 min at 4000 rpm, and then decant the supernatant liquid as completely as possible without disturbing the precipitate. Dissolve the precipitate in 5 mL of dilute hydrochloric acid (1 in 2), add 1.0 mL of the *Gelatin Solution*, and dilute to 20.0 mL with a saturated solution of aluminum chloride.

Sample Solution Transfer 9 mL (10 g) of the sample into a 250-mL Erlenmeyer flask, and add 15 mL of water, 5 mL of nitric acid, and 2 mL of sulfuric acid. Mix, and heat gently on a hot plate to initiate and maintain a vigorous decomposition. When decomposition is complete, place a small stemless funnel in the mouth of the flask, and continue as directed for the *Standard Solution*, beginning with ". . . and heat until strong fumes of sulfuric acid are evolved."

Procedure Rinse a polarographic cell or other vessel with a portion of the *Standard Solution*, then add a suitable volume to the cell, immerse it in a constant temperature bath maintained at 35° ± 0.2°, and deaerate by bubbling oxygen-free nitrogen or hydrogen through the solution for at least 10 min. Insert the dropping mercury electrode of a suitable polarograph, and record the polarogram from −0.2 to −0.7 V and at a sensitivity of 0.0003 μA/mm, using a saturated calomel reference electrode. In the same manner, polarograph a portion of the *Sample Solution* at the same current sensitivity. The height of the wave produced by the *Sample Solution* is not greater than that produced by the *Standard Solution* at the same half-wave potential.

Packaging and Storage Store in a cool place in containers with a vent in the stopper.

Hydroxylated Lecithin

CAS: [8029-76-3]

DESCRIPTION

Hydroxylated Lecithin is derived from a complex mixture of acetone-insoluble phosphatides from soybean and other plant lecithins, consisting chiefly of phosphatidyl choline, phosphatidyl ethanolamine, and phosphatidyl inositol, as well as other minor phospholipids and glycolipids mixed with varying amounts of triglycerides, fatty acids, sterols, and carbohydrates. The mixture is treated with hydrogen peroxide, benzoyl peroxide, lactic acid, and sodium hydroxide, or with hydrogen peroxide, acetic acid, and sodium hydroxide, to produce a hydroxylated product having an iodine value approximately 10% lower than that of the starting material. Hydroxylated Lecithin may vary in consistency from fluid to plastic, depending upon the content of free fatty acid and oil and whether it contains diluents. It is light yellow in color and has a characteristic "bleached" odor. It is partially soluble in water, but hydrates readily to form emulsions; it is more dispersible and hydrates more readily than crude lecithin.

Functional Use in Foods Emulsifier; clouding agent.

REQUIREMENTS

Acetone-Insoluble Matter (phosphatides) Not less than 50.0%.
Acid Value Not more than 70.
Heavy Metals (as Pb) Not more than 0.002%.
Hexane-Insoluble Matter Not more than 0.3%.
Iodine Value Between 85 and 95.
Lead Not more than 10 mg/kg.
Peroxide Value Not more than 100.
Water Not more than 1.5%.

TESTS

Acetone-Insoluble Matter (phosphatides)

Purification of Phosphatides Dissolve 5 g of phosphatides from previous *Acetone-Insoluble Matter* determinations in 10 mL of petroleum ether, and add 25 mL of acetone to the solution. Transfer approximately equal portions of the precipitate to each of two 40-mL centrifuge tubes using additional portions of acetone to facilitate the transfer. Stir thoroughly, dilute to 40 mL with acetone, stir again, chill for 15 min in an ice bath, stir again, and then centrifuge for 5 min. Decant the acetone, crush the solids with a stirring rod, refill the tube with acetone, stir, chill, centrifuge, and decant as before. The solids after the second centrifugation require no further purification and may be used for preparing the *Phosphatide–Acetone Solution*. Five g of the purified phosphatides are required to saturate about 16 L of acetone.

Phosphatide–Acetone Solution Add a quantity of purified phosphatides to sufficient acetone, previously cooled to a temperature of about 5°, to form a saturated solution, and maintain the mixture at this temperature for 2 h, shaking it vigorously at 15-min intervals. Decant the solution through a rapid filter paper, avoiding the transfer of any undissolved solids to the paper and conducting the filtration under refrigerated conditions (not above 5°).

Procedure If it is plastic or semisolid, soften a portion of the sample by warming it in a water bath at a temperature not exceeding 60° and then mixing it thoroughly. Transfer 2 g of a well-mixed sample, accurately weighed, into a 40-mL centrifuge tube, previously tared with a glass stirring rod, and add 15 mL of *Phosphatide–Acetone Solution* from a buret. Warm the mixture in a water bath until the sample melts, but avoid evaporation of the acetone. Stir until the sample is completely disintegrated and dispersed, and then transfer the tube into an ice bath, chill for 5 min, remove from the ice bath, and add about one-half of the required volume of *Phosphatide–Acetone Solution*, previously chilled for 5 min in an ice bath. Stir the mixture to complete dispersion of the sample, dilute to 40 mL with chilled *Phosphatide–Acetone Solution* (5°), again stir, and return the tube and contents to the ice bath for 15 min. At the end of the 15-min chilling period, stir again while still in the ice bath, remove the stirring rod, temporarily supporting it in a vertical upside-down position, and centrifuge the mixture immediately at about 2000 rpm for 5 min. Decant the supernatant liquid from the centrifuge tube, crush the centrifuged solids with the same stirring rod previously used, and refill the tube to the 40-mL mark with chilled (5°) *Phosphatide–Acetone Solution*, and repeat the chilling, stirring, centrifugation, and decantation procedure previously followed. After the second centrifugation and decantation of the supernatant acetone, again crush the solids with the assigned stirring rod, and place the tube and its contents in a horizontal position at room temperature until the excess

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acidic substances known; Hammett acidity function (H_0) −10.98: Hyman, Katz, *loc. cit.* In aqueous soln, it is a weak acid: Ka 6.46 × 10^{-4} mole/l, Vanderborgh, *Talanta* **15,** 1009 (1968). Forms a constant boiling mixture with water, *see* Hydrofluoric Acid. Dissolves silica, silicic acid, glass. Should be stored in steel cylinders. LC_{50} (1 hr) in rats, mice, monkeys: 1278, 500, 1780 ppm by inhalation, K. C. Back *et al., Reclassification of Materials Listed as Transportation Health Hazards* (TSA-20-72-3, PB 214-270).

USE: Catalyst, especially in the petroleum industry (paraffin alkylation); in fluorination processes, especially in the aluminum industry; in the manuf of fluorides; for separating uranium isotopes; in making fluorine contg plastics; in dye chemistry. *Caution:* Extremely corrosive to skin and eyes. Causes severe burns which may not be painful or visible for several hours. *See also* Hydrofluoric Acid.

4724. Hydrogen Iodide. *Anhydrous hydriodic acid.* HI; mol wt 127.93. I 99.21%, H 0.79%. Prepd by catalytic union of the elements: Caley, Burford, *Inorg. Syn.* **1,** 159 (1939); Powell, Campbell, *J. Am. Chem. Soc.* **69,** 1227 (1947). May also be prepd by treating concd hydriodic acid solns with P_2O_5: Schmeisser in *Handbook of Preparative Inorganic Chemistry* **vol. 1,** G. Brauer, Ed. (Academic Press, New York, 2nd ed., 1963) pp 286-289. Lab prepn: Hoffman, *Inorg. Syn.* **7,** 180 (1963). Purification: A. Klemenc, *Die Behandlung und Reindarstellung von Gasen* (Vienna, 2nd ed., 1948) p 239; Irving, Wilson, *Chem. & Ind. (London)* **1964,** 653. Reviews of prepn and properties of HI and other hydrogen halides: Hills in *Mellor's Comprehensive Treatise on Inorganic and Theoretical Chemistry* **vol. II,** suppl. 1 (originally published as suppl. II, part 1) 857-869 (1956); Downs, Adams, in *Comprehensive Inorganic Chemistry* **vol. 2,** J. C. Bailar, Jr. *et al.,* Eds. (Pergamon Press, Oxford, 1973) pp 1280-1329.

Colorless, acrid, non-flammable gas. Fumes in moist air. Decomposed by light. mp −50.8°. bp_{760} −35.1°; $bp_{2\ atm}$ −18.9°; $bp_{5\ atm}$ +7.3°; $bp_{10\ atm}$ 32.0°; $bp_{60\ atm}$ 127.5°. d^0 5.66; d^{25} 5.23 g/l. Crit temp 151.0°, crit press. 82.0 atm. Sp heat (25°) 0.0545 cal/g/°C. Extremely sol in water. Soly (g/100 g H_2O): 234 (10°); 900 (0°). Soly in organic solvents: Gerrard, *Chem. & Ind. (London)* **1969,** 295; Ahmed *et al., J. Appl. Chem.* **20,** 109 (1970). Forms an azeotrope with water, *see* Hydriodic Acid. Reacts with the lower aliphatic alcohols forming the corresponding iodo compds. Forms a colorless liquid at atm pressure when cooled with dry ice and ether or similar cooling mixture. Attacks natural rubber.

USE: Manuf of hydriodic acid, organic iodo compds, to remove iodine from iodo compds. *Caution:* Strong irritant.

4725. Hydrogen Peroxide. Hydrogen dioxide; hydroperoxide; Albone; Hioxyl. H_2O_2; mol wt 34.02. H 5.94%, O 94.06%. First reported by Thenard in 1818; prepd by treating barium peroxide with acid. Manuf of aqueous solns: Faith, Keyes & Clark's *Industrial Chemicals,* F. A. Lowenheim, M. K. Moran, Eds. (Wiley-Interscience, New York, 4th ed., 1975) pp 487-495; R. Powell, *Hydrogen Peroxide Manufacture* (Noyes Dev. Corp., Park Ridge, N.J., 1968) 221 pp. Production of anhydr. hydrogen peroxide by continuous fractional crystn: Crewson, Ryan, **U.S. pat. 2,724,-640** (1955 to Becco). *Reviews:* W. C. Schumb *et al., Hydrogen Peroxide* A.C.S. Monograph Series no. **128** (Reinhold, New York, 1955) 759 pp; Ebsworth *et al.,* in *Comprehensive Inorganic Chemistry* **vol. 2,** J. C. Bailar, Jr. *et al.,* Eds. (Pergamon Press, Oxford, 1973) pp 771-778; J. R. Kirchner in Kirk-Othmer *Encyclopedia of Chemical Technology* **vol. 13** (Wiley-Interscience, New York, 3rd ed., 1981) pp 12-38.

Colorless, rather unstable liquid; bitter taste; caustic to the skin. Distillable in high vacuum. May dec violently if traces of impurities are present. d^0 1.463. mp −0.43°. bp 152°. Misc with water; sol in ether; insol in petr ether; decomposed by many organic solvents.

Marketed as a soln in water in concns of 3-90% by wt. Solns of hydrogen peroxide gradually deteriorate and are usually stabilized by the addition of acetanilide or similar organic materials. Agitation or contact with rough surfaces, metals or many other substances accelerates decomposition. Rapidly dec by alkalies, finely divided metals; the presence of mineral acid renders it more stable.

USE: A 90% soln is used in rocket propulsion. As dough

conditioner, maturing and bleaching agent in food. *Caution:* Strong oxidizer. Undiluted form can cause burns of skin, mucous membranes.

THERAP CAT: Anti-infective.

THERAP CAT (VET): Topical antiseptic and cleansing agent (as a dilute soln).

4726. Hydrogen Peroxide Solution 3%. Hydrogen dioxide soln; oxydol. Contains 2.5-3.5% by wt of H_2O_2 = 8-12 vols oxygen.

Colorless, slightly acid liq. d about 1.00. Foams in the mouth. *Keep protected from light and in a cool place. Incompat:* Alkalies, ammonia and their carbonates, albumin, balsam Peru, phenol, charcoal, chlorides, alkali citrates; ferrous, mercurous or gold salts; hypophosphites, iodides, lime water, permanganates, sulfites, tinctures, and organic matter in general.

USE: In the plastics industry; white discharge printing on indigo-dyed wool; bleaching feathers, hair, silk, straw, ivory, flour, bone, gelatin, and textile fabrics; renovating old paintings, engravings; as oxidizer in manuf dyes; disinfecting water and hides; artificially aging wines, liquors, etc.; refining oils and fats; as antichlor; with paraphenylenediamine as a dye for furs, dead hair, etc.; in photography as hypo eliminant; with NaOH for cleaning metal surfaces, for gilding, silvering, etc. In pharmaceutical prepns, mouthwashes, dentifrices, sanitary lotions.

THERAP CAT: Topical anti-infective.

THERAP CAT (VET): Topical antiseptic and cleansing agent.

4727. Hydrogen Peroxide Solution 30%. Superoxol. Contains 30% by wt of H_2O_2 = 100 vols of oxygen.

Clear, colorless liquid. d about 1.11. Miscible with water. Now replacing the 3% soln for industrial uses; diluted to the required strength immediately before use. It also is used for making the 3% soln.

Caution! Strong oxidizing agent. Avoid contact with skin and eyes—wear rubber gloves and goggles. Avoid contact with combustible materials. Drying of concd product on clothing or other combustible materials may cause fire. In case of contact, immediately flush with plenty of water for at least 15 min; for eyes, get medical attention. Avoid contamination from any source, including metals, dust, etc. Such contamination may cause rapid decompn, generation of large quantities of oxygen gas and high pressures.

Store in original closed container. Be sure that the container vent is working satisfactorily. Do not add any other product to container. When empty, rinse thoroughly with clean water.

4728. Hydrogen Selenide. Selenium hydride. H_2Se; mol wt 80.98. H 2.49%, Se 97.51%. Prepd by heating selenium and hydrogen in a sealed tube at 440°: Hautefeuille, *Bull. Soc. Chim.* [2] **7,** 198 (1867); by passing a mixture of hydrogen and selenium vapor over pumice stone at 440°: Corenwinder, *Ann. Chim. Phys.* [3] **34,** 77 (1852); by warming potassium or ferrous selenide with hydrochloric acid: Berzelius, *Acad. Handl. Stockholm* **39,** 13 (1818); by the action of water on aluminum selenide: Fonzes-Diacon, *Traité de Chimie Minérale, Paris* **1,** 469 (1904); Waitkins, Shutt, *Inorg. Syn.* **2,** 183 (1946).

Gas. Disagreeable odor. d_4^{-42} 2.12. bp −41.3°. Liquefies at 0° under a pressure of 6.6 atm; at 18°, 8.6 atm; at 52°, 21.5 atm; at 100°, 47.1 atm; at the crit temp 137°, 91.0 atm. mp −65.73°. v.p. at −30°, 1.75 atm; v.p. at 0.2°, 4.5 atm; v.p. at 30.8°, 12 atm. K_1 at 25° = 1.30 × 10^{-4}; K_2 at 25° = 1 × 10^{-11}. Soly in water (ml/100 ml): 377 (4°); 270 (22.5°). Sol in carbonyl chloride and carbon disulfide. Unites directly with most metals to form metal selenides. Approx LC_{50} (30 min) in guinea pigs: 6 ppm, *Handbook of Toxicology* **vol. 1,** W. S. Spector, Ed. (Saunders, Philadelphia, 1956) pp 340-341.

Caution: Irritating to eyes, mucous membranes. Causes garlic odor of breath, dizziness, nausea.

4729. Hydrogen Sulfide. Sulfureted hydrogen; "hydrosulfuric acid". H_2S; mol wt 34.08. H 5.92%, S 94.09%. In coal pits, gas wells, sulfur springs, from decaying organic matter contg sulfur. Produced by reacting dil sulfuric acid with iron sulfide, by reacting hydrogen and sulfur in the vapor phase, by heating sulfur with paraffin. Lab prepn from CaS and $MgCl_2$ in

Syn. **1,** 111 (1939). Pu
(1950).

Flammable, poisonous
ten eggs, perceptible i
sweetish taste. Burns i
temp 260°C. Explosive
limit 4.3% by vol, upper
−6 0.33°: Giauque, Blu
Heavier than air; 1.539
1.00). One gram H_2S di
ml water at 20°, in 314
hol at 20°; in 48.5 ml
Water solns of H_2S are
the formation of elem
turbid rapidly. In a 50
the precipitation of sul
freshly prepd satd wate
673, 713 ppm by inhal
tion of Materials Liste
(TSA-20- 72-3; PB 21

Human Toxicity: E
and death from respir
seconds after one or
since sense of smell ma
of high concns. Low
tiva and mucous mem
lassitude may appear
Commercial Products,
Wilkins, Baltimore, 4t

USE: In the manuf c
cal reagent.

4730. Hydrogen T
1.56%, Te 98.44%. P
aluminum telluride; b
or phosphoric acid wi
Am. Chem. Soc. **36,** 8
parative Inorganic Ch
demic Press, New Yo

Colorless gas. Offe
ousl mp −49°. bp
gas: 6.234 g. Liquid
dry gas is stable to
traces of moisture, ru
quick decompn. A s

Caution: Imparts
similar to hydrogen

4731. Hydrogen
carbonyl; iron tetrac
169.91. C 28.27%,
$(CO)_4$. Prepn from
Syn. **2,** 243 (1946);
6116 (1957); Bishop

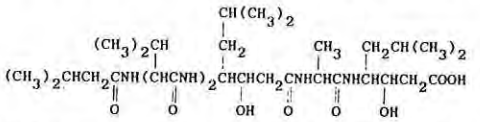
Colorless crystals.
dec below −10° on
bonyls impart a red
seating odor. Sol in
ble at room temp; s
$(CO)_4$, are stable at
cluded but dec grad

4732. Hydrohyd
1,3,dioxolo[4,5-g]iso
C 69.09%, H 6.85%
drastinine, Cotarni
nine: Topchiev, *J.*
2718 (1934); Clays
Müller, *Ann.* **615,**
(1959).

Crystals from p
spectrum: Dobbi
Sol in alc, ether,

Merck 11th.

(1985). Tissue distribution in rats: D. A. W. Grant *et al., Biochem. Pharmacol.* **31,** 2302 (1982). Effect on gastric ulcers in man: O. Bonnevie *et al., Gut* **20,** 624 (1979); L. B. Svendsen *et al., Scand. J. Gastroenterol.* **14,** 929 (1979).



Colorless needles, mp 228-229° (dec). $[\alpha]_D^{27}$ −90.3° (c = 0.288 in methanol). Sol in methanol, ethanol, acetic acid DMSO. Practically insol in benzene, chloroform, ether, and water. LD_{50} in mice, rats, rabbits, dogs (mg/kg): 1090, 875, 820, 450 i.p.; all >2000 orally (Umezawa, 1970).

7105. Peptide T. $C_{35}H_{55}N_9O_{16}$; mol wt 857.87. C 49.00%, H 6.46%, N 14.69%, O 29.84%. Octapeptide segment of the human immunodeficiency virus (HIV) envelope glycoprotein (gp 120); named peptide T because of its high threonine content. Has been reported to block the *in vitro* binding of HIV envelope to human leukocyte receptor CD4. Isolation, neuropharmacology and anti-HIV activity of peptide and analogs: C. B. Pert *et al., Proc. Nat. Acad. Sci. USA* **83,** 9254 (1986). Characterization of active core structure, T[4-8], and chemotactic effects: C. B. Pert, M. R. Ruff, *Clin. Neuropharmacol.* **9,** Suppl. 4, 482 (1986). Chemotactic effects and structural homology with vasoactive intestinal peptide (VIP), *q.v.*: M. R. Ruff *et al., FEBS Letters* **211,** 17 (1987). Competitive binding studies at VIP receptor: T. D. Nguyen, *Peptides* **9,** 425 (1988). Structural homology with thymosin α_1, *q.v.*: T. D. Nguyen, L. A. Scheving, *Biochem. Biophys. Res. Commun.* **145,** 884 (1987). Evaluation of anti-HIV activity: J. Sodroski *et al., Lancet* **1,** 1428 (1987). Clinical evaluation in treatment of AIDS: L. Wetterberg *et al., ibid.* 159. Chromatographic purification of *[D-Ala¹] peptide T amide,* a metabolically stable and more potent analog of peptide T: T. R. Burke, M. Knight, *J. Chromatog.* **411,** 431 (1987). Blood to brain transport of the amide in mice: C. M. Barrera *et al., Brain Res. Bull.* **19,** 629 (1987). Brief review of debate over effectiveness of peptide T: D. M. Barnes, *Science* **237,** 128 (1987).

Ala-Ser-Thr-Thr-Thr-Asn-Tyr-Thr

7106. Peptonized Iron. Iron peptonized; Saferon. A compd of iron oxide and peptone, rendered sol by the presence of Na citrate, contg 16-18% Fe. The iron is in nonionic form, hence not detectable by the usual reactions and is assumed to be more readily assimilated. Prepn: *U.S.D.,* 25th ed., p 1800.

Dark brown, lustrous granules or brown powder. Characteristic odor and taste. Affected by light. Freely sol in water, yielding neutral or alkaline solns. Practically insol in alcohol. *Protect from light.*

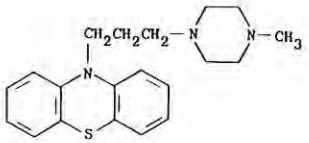
THERAP CAT: Hematinic.

7107. Peracetic Acid. *Ethaneperoxoic acid;* peroxyacetic acid; acetyl hydroperoxide. $C_2H_4O_3$; mol wt 76.05. C 31.58%, H 5.30%, O 63.11%. CH_3COOOH. Prepd from acetaldehyde and oxygen in the presence of cobalt acetate: Ger. pats. **269,937; 272,738** (1914); *Frdl.* **11,** 73; by the autoxidation of acetaldehyde: Wallace; Golding, U.S. pats. **2,833,813-4** (1958 to du Pont). A 50% soln may be obtained from acetic anhydride, hydrogen peroxide, and sulfuric acid: D'Ans, Frey, *Ber.* **45,** 1848 (1912); Erlenmeyer, *Helv. Chim. Acta* **8,** 795 (1925).

Liquid, acrid odor. Explodes violently on heating to 110°. Freely sol in water, alcohol, ether, H_2SO_4. Stable in dil aq soln. Strong oxidizing agent.

Caution: Strongly irritating to skin and eyes.

7108. Perazine. *10-[3-(4-Methyl-1-piperazinyl)propyl]-10H-phenothiazine; N*-methylpiperazinyl-*N'*-propylphenothiazine; 10-(γ-methylpiperazinopropyl)phenothiazine; P 725; Taxilan. $C_{20}H_{25}N_3S$; mol wt 339.49. C 70.75%, H 7.42%, N 12.38%, S 9.45%. Prepn: Hromatka *et al., Monatsh.* **88,** 56, 193 (1957); **91,** 107 (1960); Horclois, **Brit.** pat. **780,193** (1957 to Rhône-Poulenc).



Crystals, mp 51-53°. $bp_{0.001}$ 160-170° (air bath temp).

Dihydrochloride, $C_{20}H_{27}Cl_2N_3S$, hygroscopic needles, dec 228-230°.

Dihydrochloride hemihydrate, platelets from ethanol, mp 225-227°.

Dimaleate, $C_{28}H_{33}N_3O_8S$, crystals from water, mp 210°.

THERAP CAT: Antipsychotic.

7109. Perbenzoic Acid. *Benzenecarboperoxoic acid; peroxybenzoic acid;* benzoyl hydroperoxide. $C_7H_6O_3$; mol wt 138.12. C 60.87%, H 4.38%, O 34.75%. C_6H_5COOOH. Prepd from dibenzoyl peroxide by treatment with a soln of sodium methoxide in methanol at 0°: Braun, *Org. Syn.* **13,** 86 (1933); *cf.* Bergmann, Witte, Ger. pat. **409,779;** *Chem. Zentr.* **1925, I,** 1911.

Leaflets from benzene. Acrid odor. mp 41-43°. Very volatile. Sublimes in desiccator. bp_{15} 100-110° (partial decomposition). Volatile with steam. Very sparingly sol in water, but turns liquid upon contact with water; sparingly sol in petr ether; freely sol in other organic solvents. Stability of solns with chloroform, carbon tetrachloride, ether, benzene: Prileshajew, *Chem. Zentr.* **1911, I,** 1280; Kolthoff *et al., J. Polymer Sci.* **2,** 199 (1947), *C.A.* **41,** 4960 (1947). Forms an unstable acid sodium salt, and a somewhat more stable neutral sodium salt.

USE: To convert ethylenic compounds into oxides; in analysis of unsatd compounds, to determine the number of double bonds.

7110. Perchloric Acid. $ClHO_4$; mol wt 100.47. Cl 35.29%, H 1.01%, O 63.70%. $HClO_4$. Prepd from potassium perchlorate and sulfuric acid: Schmeisser in *Handbook of Preparative Inorganic Chemistry* **vol. 1,** G. Brauer, Ed. (Academic Press, New York, 2nd ed., 1963) pp 318-320. Comprehensive monograph: J. C. Schumacher, *Perchlorates* (Reinhold, New York, 1960).

The anhydr acid is a colorless, volatile, very hygroscopic liquid. d^{22} 1.768; bp_{11} 19°. Dec when distilled at atmospheric pressure, sometimes with explosive violence. mp −112°. Combines vigorously with water with evolution of heat. Undergoes spontaneous and explosive decompn, hence it is marketed only in mixture with water contg 60-70% $HClO_4$, density 1.5 and 1.6, respectively. The aq acid is very caustic and may deflagrate in contact with oxidizable substances. Density of aq solns at 15°: 1% = 1.0050; 10% = 1.0597; 20% = 1.1279; 30% = 1.2067; 40% = 1.2991; 50% = 1.4103; 60% = 1.5389; 70% = 1.6736. Density of aq solns at 25°: 65.0% = 1.597; 70.0% = 1.664; 75.0% = 1.731.

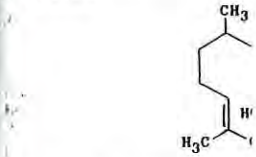
USE: The acid in analytical chemistry as an oxidizer and for separation of potassium from sodium. Its salts for explosives and for plating of metals. *Caution:* Corrosive to skin, mucous membranes.

7111. Perchloryl Fluoride. $ClFO_3$; mol wt 102.46. Cl 34.61%, F 18.54%, O 46.85%. *Reviews:* Downs, Adams in *Comprehensive Inorganic Chemistry* **vol. 2,** J. C. Bailar, Jr. *et al.,* Eds. (Pergamon Press, Oxford, 1973) pp 1391-1393; Christe, Schack in *Advan. Inorg. Chem. Radiochem.* **18,** 319-398.

Usually stored in cylinders as liq under pressure. mp −147.7°. bp −46.7°. d^{20} (liq) 1.434. Critical temp 95.2°. Crit pressure 53 atm. Crit density: 0.637. Heat of vaporization 4.6 kcal/mol. Trouton constant: 20.4. Dipole moment 0.03. Heat of formation of gas at 25° −5.12 kcal/mol. Sp heat of liq: 0.229 cal/g/°C at −40°; 0.290 at +50°. Does

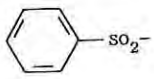
not corrode base metals whe
resistance to electrical breakc
USE: In organic synthesis t
organic molecules. As oxid
high voltage systems. *Hand*
direct contact with reducing
Eng. News **37,** 60 (1959). E
tion: Causes methemoglobi
absorbed through skin.

7112. Perezone. *2-(1,5-*
5-methyl-2,5-cyclohexadiene
hexenyl)-3-hydroxy-5-methy
acid. $C_{15}H_{20}O_3$; mol wt 24
19.33%. From roots of *Trix*
adnata Gr., *Compositae):* W
roots of *Radix pereziae:* M
(1885); Anschütz, *Ber.* **18,**
395, 1, 15 (1913). Structu
Commun. **1965,** 354; Bates
1965, 1793.



Yellow plates from water
−17° (ether).

7113. Perfluidone. *1,1,1*
ylsulfonyl)phenyl]methanes
(phenylsulfonyl)methanesu
phenylsulfonyltrifluoromet
Destun. $C_{14}H_{12}F_3NO_4S_2$;
3.19%, F 15.02%, N 3.69%,
pre-emergence herbicide. P
pat. **2,118,190** (1972 to Min
19402u (1972). Activity: W
(1973).



Cryst solid, mp 142-144°
$<1 \times 10^{-5}$ mm Hg. Soly
(g/l): acetone 750; benzene
anol 595.

USE: Herbicide.

7114. Performic Acid.
mic acid; permethanoic acid
mol wt 62.03. C 19.36%, H
A strong oxidizing agent.
mixture of 20 g formic ac
H_2SO_4 is allowed to intera
D'Ans, Kneip, *Ber.* **48,** 1
Chem. Soc. **68,** 907 (1946).
The 90% soln is a colorle
with metals, their oxides, r
tion. Has lower vapor pre
with water, alc, ether. Sol i
unstable, gassing being not
effective concn showing a
USE: For oxidation, epo
tions. *Caution:* Irritant.

7115. Pergolide. *8-[(*
line; D-6-*n*-propyl-8β-me
141B. $C_{19}H_{26}N_2S$; mol wt
8.91%, S 10.19%. Dopami
plasma prolactin concentra
J. Bach, U.S. pat. **4,166,1**
effects in rats: R. W. Full

Peracetic acid · formed from acetic acid, hydrogen peroxide + water

understood, but it is known that chlorine is effective between pH 7 and 9. As sodium hypochlorite, its effect would be due to nascent oxygen, which is very effective against microbial germs. The problem with the use of chlorine is to know the level of addition required. Resistance to chlorine varies widely between microbial species which are to be killed. In terms of corrosion, chlorine is a strong oxidizing agent. For metallic cans, chlorination of 0·5–2 mg l^{-1} of free chlorine is sufficient to prevent their recontamination through suction via seams in the cans due to the increasing vacuum level developing inside. Higher chlorine levels may induce corrosion phenomena (detinning and rust on tinplate, pitting on aluminium cans).

With the very high chlorine concentrations (300 to 1500 mg l^{-1}) needed for thorough disinfection (in dairies, for example) the risk of pitting and crevice formation on stainless steel is higher as the temperature and contact durations increase. The lower the pH value, the higher the risk. Sometimes, corrosion inhibitors are also needed to improve the chemical inertness of stainless steels.

Iodine containing compounds are considered as having no action on stainless steels, but should not be used for cleaning and disinfecting aluminium and aluminium alloys.

Solutions of peracetic acid (300 mg l^{-1}) made from acetic acid, hydrogen peroxide and water, which have very good bactericidal properties, may be used at room temperature, for short durations (about 20 min) on austenitic steels and aluminium alloys.

Bacterial corrosion, although uncommon, may appear in some food industries, e.g. in buried tubing. Every material, even metals may be attacked by microorganisms adhering to surfaces and inducing there, through their bioactivity, accumulation of acids and dissolved gases. For example, we may quote ferrobacteria and sulphate-reducing bacteria. Ferrobacteria, acting on the anodic site, take their energy from the oxidation of ferrous ions to ferric ions, thus producing rapid formation of rust as they continuously modify the equilibrium by simultaneous anodic and cathodic depolarization. Sulphate-reducing bacteria use hydrogen and induce cathodic depolarization: jelly-like vesicles appear, which are living bacterial colonies.

Ways to Prevent Corrosion

Some common ways of preventing corrosion of metals have already been mentioned:

- Organic coatings with inert macromolecular polymers used for cans and for steel-based equipment in food industry plants.
- When using unprotected metals (aluminium alloys and stainless steels), the following must be considered:
  -avoid as far as possible two metals joining;
  -choose the best suitable material;
  -modify aggressive media composition with inhibitors;
  -use cathodic protection by coupling a sacrificial anode metal to the material to be protected. The use of a metal as a sacrificial anode does not suppress corrosion and theoretically is not to be used for materials in contact with food (unless the corroding metal is specifically authorized for contact with food (e.g. tinplate).

Regulations on Materials in Contact with Foodstuffs

The corrosion of a metallic material induces migration of metallic elements to the foodstuff with which it is in contact. Thus, materials and objects to be used in contact with foods must be inert with regard to foodstuffs. That is, they must not, under their various conditions of use, liberate elements liable to modify the foodstuff composition significantly, i.e. imparting a toxic character or changing its organoleptic qualities (contamination, for example, by iron or tin).

Firm regulations are always based on definite listing: everything which is not precisely authorized is forbidden. Some local regulations stipulate limits for global or specific migration levels. They vary from one country to the other. On a worldwide basis, the *Codex Alimentarius* is the reference. ***See*** Legislation, Packaging Legislation

Traces of cleaning agents incompletely rinsed may pollute the foodstuff, although this operation is mandatory. The choice of corrosion inhibitors to be added to the cleaning products must always be done with reference to the list of compounds authorized for cleaning.

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Marsal P (1965–1985) [Various publications on the subject, particularly on the corrosion of metal packaging including (1981–1982) *On some corrosion factors in canned foods*; (1977) *Matching tinplate cans to their contents*; (1979) *Influence of nitrates upon tinplate corrosion*; (1985–1986) *Practical use of organic coatings in the protection and decoration of metal containers.*] Thionville: French Tinplate Research Centre.

Vargel C (ed.) (1979) *Le Comportement de l'Aluminium et de ses Alliages.* Paris: Dunod Technique.

P. Marsal
Thionville, France

Schedule A: Patents and Patent Applications for the PROCESS owned by VAPOREX

"Method and apparatus for the application of volatile substances conveyed in a carrier gas" (the vacuum process)

Country	Application or Patent Number	Filing Date / Priority Date	Status
Australia	730,402 [75449/96]	18-12-96/20-12-95	Granted
Canada	2,193,611	18-12-96 / 20-12-95	Pending
Europe	96309247.3	18-12-96 / 20-12-95	Pending
South Africa	96/10603	17-12-96 / 20-12-95	Granted
USA	6,224,930	20-12-96 / 20-12-95	Granted

"Method and Apparatus for applying volatile substances to materials" (the non-vacuum process)

Country	Application or Patent Number	Filing Date / Priority Date	Status
Australia	734,421 [80852/98]	20-8-98/22-8-97	Allowed
Canada	2,241,054	18-6-98/ 22-8-97	Pending
USA	6,265,006	19-6-98 / 22-8-97	Granted

Summary of Challenge Studies on Frankfurts for Vaporex

Three microbiological challenge studies have been conducted on frankfurts inoculated with *Listeria monocytogenes* and treated by the Vaporex process. The treatments varied in gas concentration, gas application temperature, frankfurt temperature at application, and the length of time incubated samples were stored (Table 1). The results are shown in Figures 1-3.

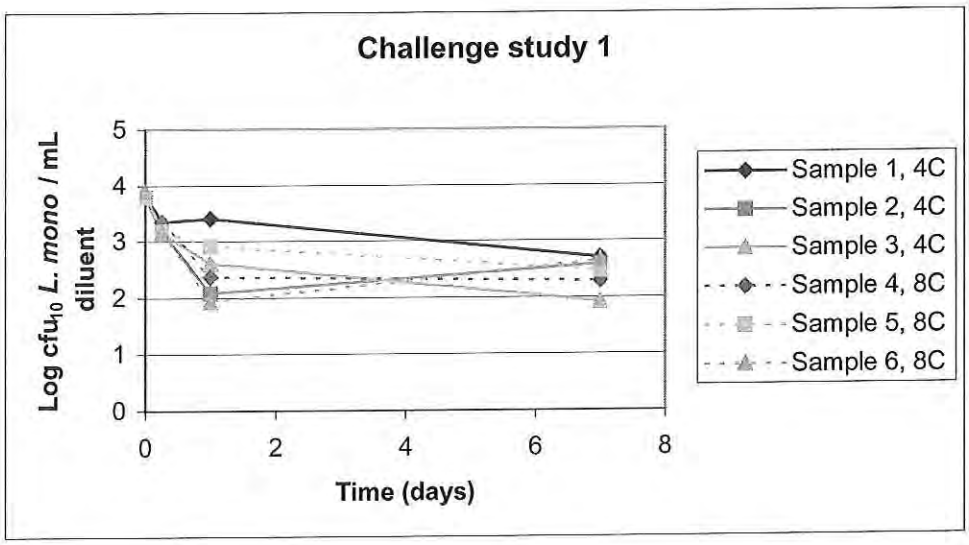
Table 1: **Vaporex treatments evaluated.** Acetic acid only

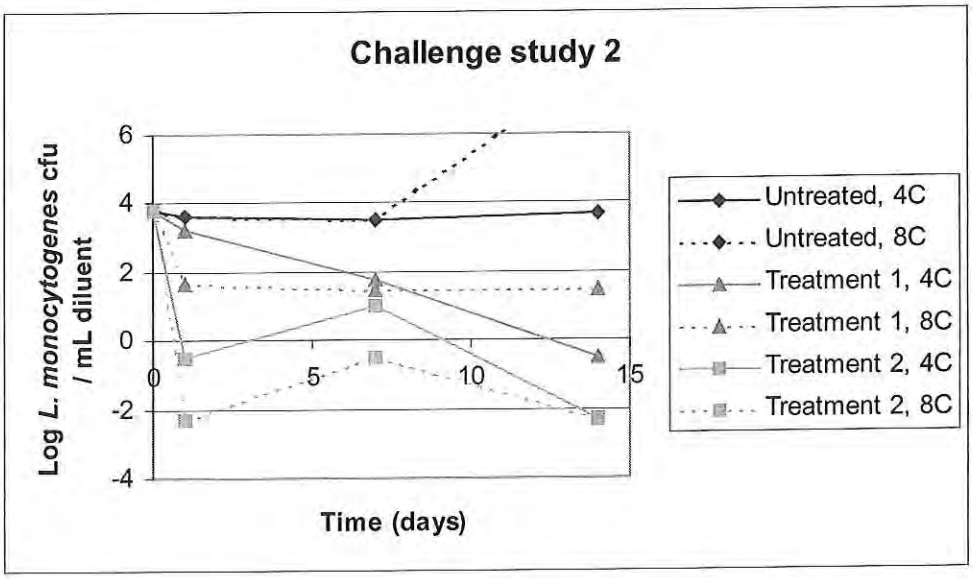
Challenge study no.	Treatment no.	Frankfurt temp at treatment (°C)	Gas temp (°C)	Treatment time (secs)	Mean HAc in CO_2 concentration (g/L)	Incubation time (days)
1		2	23	4	0.111	7
2	1	2	36	4	0.231	14
	2	2	50	4	0.442	14
3	1	22	36	5.3	0.092	28
	2	22	36	5.3	0.095	28

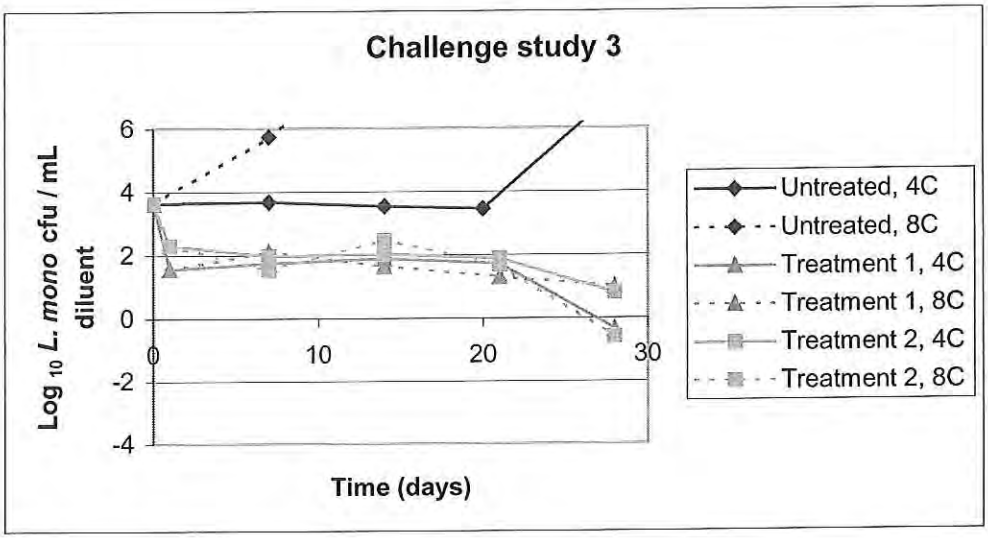
Figure 1, for Study 1 shows the results of 3 replicates from one treatment stored at either 4-5°C or 8-9°C. Figures 2-3 show the results of duplicate samples from two treatments, stored at 4-5°C or 8-9°C. All results are expressed as $\log_{10}$ *L. monocytogenes* cfu/mL diluent used to recover the organisms and not per frankfurt or per g frankfurt.

Treatment 2 from Study 2 showed the greatest anti-listerial effect, attaining ~6 log reduction over 14 days. Treatments in the Study 3 showed variability, depending on storage temperature (and possibly reflecting variability of gas application or acid retention), with the greatest effect producing a 4 log reduction over 28 days.

[redacted]
Microbiologist'
Food Safety & Quality Program


Challenge study 1
Log cfu10 L. mono / mL diluent
5
4
3
2
1
0
0
2
4
6
8
Time (days)
Sample 1, 4C
Sample 2, 4C
Sample 3, 4C
Sample 4, 8C
Sample 5, 8C
Sample 6, 8C


Challenge study 2
Log L. monocytogenes cfu / mL diluent
6
4
2
0
-2
-4
0
5
10
15
Time (days)
Untreated, 4C
Untreated, 8C
Treatment 1, 4C
Treatment 1, 8C
Treatment 2, 4C
Treatment 2, 8C


Challenge study 3
Log 10 L. mono cfu / mL diluent
6
4
2
0
-2
-4
0
10
20
30
Time (days)
Untreated, 4C
Untreated, 8C
Treatment 1, 4C
Treatment 1, 8C
Treatment 2, 4C
Treatment 2, 8C

29-JUN-2001 10:06 FR PRIMO SMALLGOODS.
& M QUALITY SMALLGOODS PTY LTD A.C.N. 002 781 142
A.B.N. 67 002 781 142

Trading as

PRIMO SMALLGOODS

19 Hume Highway, Chullora NSW 2190
Postal Address: P.O. Box 549, SYDNEY MARKETS NSW 2129
Telephone Office: (02) 9742 0000 Fax: (02) 9742 0011

HAM, BACON & SMALLGOODS MANUFACTURERS, SPECIALISTS IN ITALIAN SALAMIS

29th June 2001

Director,
Biotechnology Innovation Fund
Biotechnology Australia
Industry Science and Resources
Canberra ACT 2600

Dear Sir

Re BIF Application by Vaporex Pty Ltd

We are writing to support a BIF Application being made by Vaporex Pty Ltd. We are familiar with the Vaporex process for the control of food spoilage organisms. Food safety is a major concern of the smallgoods industry and we believe that the Vaporex process could have wide application in the treatment of smallgoods.

We would be pleased to work with Vaporex Pty Ltd in carrying out the program of work set out in the application for BIF funding. We consider the work program proposed is suitable to prove the concept of the process in commercial terms. The trials should firstly provide microbial testing evidence to show that food safety is improved and that shelf life is extended at a laboratory level in respect of 2kg portion smallgoods. The proof in principle of the process at a factory floor level and the establishment of hard costings to allow an assessment of the economics of the process is the second desired outcome from the work program.

We commend this project to the selection panel for the BIF as we think the technology in innovative and the subject matter of the proposed research has substantial commercial and public health importance.

[redacted]

GENERAL MANAGER

FOOD SCIENCE AUSTRALIA
A JOINT VENTURE OF CSIRO AND AFISC

CSIRO AFISC Australian Food Industry Science Centre

27 June 2001

Assessment Officer
Biotechnology Innovation Fund
AusIndustry Regional Office

Dear Sir / Madam,

Food Science Australia have been collaboratively funding preliminary investigations with Vaporex Pty limited over the past three months into the efficacy of the VAPOREX process against *Listeria monocytogenes*.

Results of the three studies to-date have shown that the VAPOREX process can have a substantial effect on the post VAPOREX treatment survival of *Listeria monocytogenes*. A report on this work will be available shortly.

As foods, particularly meat products contaminated with *Listeria monocytogenes* represent a proven health risk and currently there are only limited methods for control which are not always commercially desirable or feasible, Food Science Australia is keen to continue the collaborative investigations with Vaporex.

A successful commercialisation of the VAPOREX process is in the best interests of many food manufacturers and consumers alike; additionally Vaporex is an Australian owned company and has a strong patent position both in Australia and internationally, including the USA.

Food Science Australia is aware that Vaporex is seeking funding in order to continue their input into these and future collaborative trials in order to fast-track the commercialisation of the VAPOREX process.

To this end Food Science Australia wish to support Vaporex's application to the Commonwealth Government's AusIndustry Biotechnology Innovation Fund for research funding.

Yours sincerely,

[redacted]
Business Development Manager

GWF

George Weston Foods Limited

A.C.N. 008 429 632

June 26, 2001

Director
Biotechnology Innovation Fund
Biotechnology Australia
Industry Science and Resources
CANBERRA ACT 2600

Dear Sir

Re: BIF APPLICATION BY VAPOREX PTY LTD

This letter is written in support of a BIF Application being made by Vaporex Pty Ltd. We are aware of the vaporex process for the control of food spoilage organisms and believe that it will have wide application in the food industry.

We are agreeable to work with Vaporex Pty Ltd in carrying out the program of work set out in the application for BIF funding. We believe that the work program proposed is suitable to prove the concept of the process in commercial terms. The first expected outcome is the establishment of microbial testing to show that food safety is improved and that shelf life is extended at a laboratory level in respect of two distinct food products. The second outcome is the proof in principle of the process at factory floor level and the establishment of hard costings to allow an assessment of the economics of the process.

Food safety is an important issue for the food industry and we commend this project to the selection panel for the BIF.

Yours faithfully

[redacted]

General Manager
Research and Analytical Services
Weston Technologies

C:\DOCUDAIS\Biotechnology Aust

CORPORATE OFFICE
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PO BOX 5579 WEST CHATSWOOD NSW 2057 AUSTRALIA
TELEPHONE 02 9415 1411 INTERNATIONAL + 612 9415 1411 FACSIMILE 02 9419 2907 INTERNATIONAL + 612 9419 2907

WORLD TRADE ORGANIZATION

G/SPS/N/USA/504
28 September 2001

(01-4663)

Committee on Sanitary and Phytosanitary Measures

Original: English

NOTIFICATION

1.	**Member to Agreement notifying:** UNITED STATES **If applicable, name of local government involved:**
2.	**Agency responsible:** Food and Drug Administration - FDA
3.	**Products covered (provide tariff item number(s) as specified in national schedules deposited with the WTO; ICS numbers may be provided in addition, where applicable). Regions or countries likely to be affected, to the extent relevant or practicable:** Food additives
4.	**Title and number of pages of the notified document:** Secondary Direct Food Additives Permitted in Food for Human Consumption (2 pages)
5.	**Description of content:** The Food and Drug Administration (FDA) is amending the food additive regulations to provide for the safe use of a mixture of peroxyacetic acid, octanoic acid, acetic acid, hydrogen peroxide, peroxyoctanoic acid, and 1-hydroxyethylidene-1, 1-diphosphonic acid as an antimicrobial agent on poultry carcasses, poultry parts, and organs. The original notice of petition for this action was published in the Federal Register on 30 March 2001 and inadvertently not notified.
6.	**Objective and rationale: [X] food safety, [ ] animal health, [ ] plant protection, [ ] protect humans from animal/plant pest or disease, [ ] protect territory from other damage from pests**
7.	**An international standard, guideline or recommendation does not exist [X].** **If an international standard, guideline or recommendation exists, give the appropriate reference and briefly identify deviations:**
8.	**Relevant documents and language(s) in which these are available:** 66 FR 48208, 19 September 2001 (Available in English)
9.	**Proposed date of adoption:** This rule is effective 19 September 2001.
10.	**Proposed date of entry into force:** This rule is effective 19 September 2001.
11.	**Final date for comments:** Submit written objections and requests for a hearing by 19 October 2001. **Agency or authority designated to handle comments: [ ] National notification authority, [ ] National enquiry point, or address, fax number and E-mail address (if available) of other body:** The full text, which includes instructions for commenting, and the guidance document will be sent upon request to the address in paragraph 12.

./.

12. Texts available from: [X] National notification authority, [X] National enquiry point or address, fax number and E-mail address (if available) of other body:

United States SPS Enquiry Point/Notification Authority
Attn: [redacted]
Room 5545 South Agriculture Building
Stop 1027
1400 Independence Avenue, S.W.
Washington, D.C.20250
Tel: (202) 720-2239
Fax: (202) 690-0677
[redacted]

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Food and Drug Administration

21 CFR Part 173

[Docket No. 01F-0142]

Secondary Direct Food Additives Permitted in Food for Human Consumption

AGENCY: Food and Drug Administration, HHS.

ACTION: Final rule.

SUMMARY: The Food and Drug Administration (FDA) is amending the food additive regulations to provide for the safe use of a mixture of peroxyacetic acid, octanoic acid, acetic acid, hydrogen peroxide, peroxyoctanoic acid, and 1-hydroxyethylidene-1,1-diphosphonic acid as an antimicrobial agent on poultry carcasses, poultry parts, and organs. This action is in response to a petition filed by Ecolab, Inc.

DATES: This rule is effective September 19, 2001. Submit written objections and requests for a hearing by October 19, 2001. The Director of the Office of the Federal Register approves the incorporation by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51 of a certain publication in § 173.370 as of September 19, 2001.

ADDRESSES: Submit written objections to the Dockets Management Branch (HFA-305), Food and Drug Administration, 5630 Fishers Lane, rm. 1061, Rockville, MD 20852.

FOR FURTHER INFORMATION CONTACT: Robert L. Martin, Center for Food Safety and Applied Nutrition (HFS-215), Food and Drug Administration, 200 C St. SW., Washington, DC 20204-0001, 202-418-3074.

SUPPLEMENTARY INFORMATION: In a notice published in the **Federal Register** of March 30, 2001 (66 FR 17430), FDA announced that a food additive petition (FAP 1A4728) had been filed by Ecolab, Inc.; Ecolab Center, 370 Wabasha St., St. Paul, MN 55102. The petition proposed to amend the food additive regulations in part 173 *Secondary Direct Food Additives Permitted in Food for Human Consumption* (21 CFR part 173) to provide for the safe use of a mixture of peroxyacetic acid, octanoic acid, acetic acid, hydrogen peroxide, peroxyoctanoic acid, and 1-hydroxyethylidene-1,1-diphosphonic acid as an antimicrobial agent on poultry carcasses, poultry parts, and organs.

FDA has evaluated data in the petition and other relevant material. Based on this information, the agency concludes that the proposed use of the additive is safe and the additive will achieve its intended technical effect as an antimicrobial agent on poultry carcasses, poultry parts, and organs. Therefore, 21 CFR 173.370 is amended as set forth below.

In accordance with § 171.1(h) (21 CFR 171.1(h)), the petition and the documents that FDA considered and relied upon in reaching its decision to approve the petition are available for inspection at the Center for Food Safety and Applied Nutrition by appointment with the contact person listed above. As provided in § 171.1(h), the agency will delete from the documents any materials that are not available for public disclosure before making the documents available for inspection.

In the notice of filing, FDA gave interested parties an opportunity to submit comments on the petitioner's environmental assessment. FDA received no comments in response to that notice.

The agency has carefully considered the potential environmental effects of this action. FDA has concluded that the action will not have a significant impact on the human environment, and that an environmental impact statement is not required. The agency's finding of no significant impact and the evidence supporting that finding, contained in an environmental assessment, may be seen in the Dockets Management Branch (address above) between 9 a.m. and 4 p.m., Monday through Friday.

This final rule contains no collections of information. Therefore, clearance by the Office of Management and Budget under the Paperwork Reduction Act of 1995 is not required.

Any person who will be adversely affected by this regulation may at any time file with the Dockets Management Branch (address above) written objections by October 19, 2001. Each objection shall be separately numbered, and each numbered objection shall specify with particularity the provisions of the regulation to which objection is made and the grounds for the objection. Each numbered objection on which a hearing is requested shall specifically so state. Failure to request a hearing for any particular objection shall constitute a waiver of the right to a hearing on that objection. Each numbered objection for which a hearing is requested shall include a detailed description and analysis of the specific factual information intended to be presented in support of the objection in the event that a hearing is held. Failure to include such a description and analysis for any particular objection shall constitute a waiver of the right to a hearing on the objection. Three copies of all documents shall be submitted and shall be identified with the docket number found in the brackets in the heading of this document. Any objections received in response to the regulation may be seen in the Dockets Management Branch (address above) between 9 a.m. and 4 p.m., Monday through Friday.

List of Subjects in 21 CFR Part 173

Food additives, Incorporation by reference.

Therefore, under the Federal Food, Drug, and Cosmetic Act and under authority delegated to the Commissioner of Food and Drugs and redelegated to the Director, Center for Food Safety and Applied Nutrition, 21 CFR part 173 is amended as follows:

PART 173—SECONDARY DIRECT FOOD ADDITIVES PERMITTED IN FOOD FOR HUMAN CONSUMPTION

1. The authority citation for 21 CFR part 173 continues to read as follows:

Authority: 21 U.S.C. 321, 342, 348.

2. Section 173.370 is amended by revising paragraphs (b) and (c) to read as follows:

§ 173.370 Peroxyacids.

* * * * *

(b)(1) The additive is used as an antimicrobial agent on red meat carcasses in accordance with current industry practice where the maximum concentration of peroxyacids is 220 parts per million (ppm) as peroxyacetic acid, and the maximum concentration of hydrogen peroxide is 75 ppm.

(2) The additive is used as an antimicrobial agent on poultry carcasses, poultry parts, and organs in accordance with current industry standards of good manufacturing practice (unless precluded by the U.S. Department of Agriculture's standards of identity in 9 CFR part 381, subpart P) where the maximum concentration of peroxyacids is 220 parts per million (ppm) as peroxyacetic acid, the maximum concentration of hydrogen peroxide is 110 ppm, and the maximum concentration of 1-hydroxyethylidene-1,1-diphosphonic acid (HEDP) is 13 ppm.

(c) The concentrations of peroxyacids and hydrogen peroxide in the additive are determined by a method entitled "Hydrogen Peroxide and Peracid (as Peracetic Acid) Content," July 26, 2000, developed by Ecolab, Inc., St. Paul, MN, which is incorporated by reference. The concentration of 1-hydroxyethylidene-

1,1-diphosphonic acid is determined by a method entitled "Determination of 1-hydroxyethylidene-1,1-diphosphonic acid (HEDP) Peroxyacid/Peroxide-Containing Solutions," August 21, 2001, developed by Ecolab, Inc., St. Paul, MN, which is incorporated by reference. The Director of the Office of the Federal Register approves these incorporations by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. You may obtain copies of these methods from the Division of Petition Review, Center for Food Safety and Applied Nutrition, Food and Drug Administration, 200 C St. SW., Washington, DC 20204–0001, or you may examine a copy at the Center for Food Safety and Applied Nutrition's Library, 200 C St. SW., rm. 3321, Washington, DC, or at the Office of the Federal Register, 800 North Capitol St. NW., suite 700, Washington, DC.

Dated: September 6, 2001.

L. Robert Lake,

Director of Regulations and Policy, Center for Food Safety and Applied Nutrition.

[FR Doc. 01–23263 Filed 9–18–01; 8:45 am]

BILLING CODE 4160–01–S

DEPARTMENT OF TRANSPORTATION

Coast Guard

33 CFR Part 165

[COTP Western Alaska–01–002]

RIN 2115–AA97

Safety Zone; Gulf of Alaska, Southeast of Narrow Cape, Kodiak Island, Alaska

AGENCY: Coast Guard, DOT.

ACTION: Temporary final rule; correction.

SUMMARY: The Coast Guard is correcting the effective period for a temporary final rule for a safety zone in the Gulf of Alaska, southeast of Narrow Cape, Kodiak Island, Alaska, that was published in the **Federal Register** on August 21, 2001 and then amended in the **Federal Register** on August 29, 2001. This correction is being made because of a revision in the window of time that the rocket is now scheduled to launch. This correction changes the effective period from 2 p.m. to 7:30 p.m. on September 17, 2001, to the same hours each day from September 21, 2001 through September 29, 2001.

DATES: 33 CFR 165.T–01–002 published August 21, 2001 (66 FR 43776), corrected August 29, 2001 (66 FR 45619), and as further corrected in this document, is effective September 21, 2001 through September 29, 2001.

ADDRESSES: The public docket for this rulemaking is maintained by Coast Guard Marine Safety Office Anchorage, 510 "L" Street, Suite 100, Anchorage, AK 99501. Materials in the public docket are available for inspection and copying at Coast Guard Marine Safety Office Anchorage. Normal office hours are 7:30 a.m. to 4 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: LCDR Diane Kalina, Marine Safety Office Anchorage, at (907) 271–6700.

SUPPLEMENTARY INFORMATION: The Coast Guard published a temporary final rule in the **Federal Register** on August 21, 2001, (66 FR 43774) establishing a temporary safety zone in the Gulf of Alaska, southeast of Narrow Cape, Kodiak Island, Alaska, effective from 2 p.m. on August 31, 2001 through 7:30 p.m. on September 15, 2001. We then published a correction in the **Federal Register** on August 29, 2001 (66 FR 45619) changing the effective period to a single day, September 17, 2001, to reflect a change in the launch schedule. The zone is needed to protect the safety of persons and vessels operating in the vicinity during a rocket launch from the Alaska Aerospace Development Corporation (AADC), Narrow Cape, Kodiak Island facility. The AADC recently revised the window of time for the rocket to launch to September 21, 2001 through September 29, 2001. The Coast Guard is amending the effective period of the rule to correspond with the new schedule for the launch. This correction changes the one-day effective period, September 17, 2001, to a 9-day effective period, September 21, 2001 through September 29, 2001.

In rule FR Doc. 01–21083 published on August 21, 2001 (66 FR 43774), as amended by a correction published on August 29, 2001 (66 FR 45619), make the following corrections. On page 43775, in the first column, starting on line 3, remove the words "on September 17, 2001" and add in its place the words "each day between September 21, 2001 and September 29, 2001". On page 43775, in the first column, starting on line 27, remove the words "on September 17, 2001" and add in its place the words "each day between September 21, 2001 and September 29, 2001". On page 43775, in the second column, starting on line 36, remove the words "on September 17, 2001" and add in its place the words "from September 21, 2001 to September 29, 2001". On page 43776, in the second column, starting on line 4, remove the words "from 2 p.m. through 7:30 p.m. on September 21, 2001" and add in its place the words "from 2 p.m. through 7:30 p.m. each day from September 21, 2001 through September 29, 2001".

Dated: September 6, 2001.

W.J. Hutmacher,

Captain, U.S. Coast Guard, Captain of the Port, Western Alaska.

[FR Doc. 01–23340 Filed 9–14–01; 4:51 pm]

BILLING CODE 4910–15–U

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 52

[MD059/71/98/114–3077; FRL–7057–4]

Approval and Promulgation of Air Quality Implementation Plans; Maryland; Rate of Progress Plans, Corrections to the Base Year Inventories, and Contingency Measures for the Maryland Portion of the Philadelphia-Wilmington-Trenton Ozone Nonattainment Area

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: EPA is approving State Implementation Plan (SIP) revisions submitted by the State of Maryland. These revisions establish the three percent per year emission reduction rate-of-progress (ROP) requirement for the period from 1996 through 2005 for the Maryland portion of the Philadelphia-Wilmington-Trenton ozone nonattainment area (the Philadelphia area), namely Cecil County. EPA is also approving contingency measures for failure to meet ROP and corrections to the 1990 base year inventories of ozone precursor emissions for Cecil County. EPA is approving these revisions in accordance with the requirements of the Clean Air Act.

EFFECTIVE DATE: This final rule is effective on October 19, 2001.

ADDRESSES: Copies of the documents relevant to this action are available for public inspection during normal business hours at the Air Protection Division, U.S. Environmental Protection Agency, Region III, 1650 Arch Street, Philadelphia, Pennsylvania 19103; and Maryland Department of the Environment, 2500 Broening Highway, Baltimore, Maryland, 21224.

FOR FURTHER INFORMATION CONTACT: Kristeen Gaffney, (215) 814–2092. Or by e-mail at *gaffney.kristeen@epa.gov.*

SUPPLEMENTARY INFORMATION:

I. Background

On July 13, 2001 (66 FR 36717), EPA published a notice of proposed

Vaporsex file A429
Jim Gruber
PPOF

Handbook of Biocide and Preservative Use

Edited by

H.W. Rossmoore
Professor of Biological Sciences
Wayne State University
Michigan

BLACKIE ACADEMIC & PROFESSIONAL
An Imprint of Chapman & Hall
London · Glasgow · Weinheim · New York · Tokyo · Melbourne · Madras

Sodium and hydrogen peroxides are used primarily as sanitizing agents i batch-clean local sites or components of a cooling water system. Routine addition of peroxide has not been practical as a routine primary microbicide treatment for once-through or open recirculation systems. The required high concentration levels and extensive contact time have been the limiting factors Limited use of peroxides in closed loop systems has taken place where effluent restrictions have made use of other materials not practical. The peroxides have many of the same advantages as ozone, and when appropriate to use, are much cheaper and more safe than ozone. When using peroxide to sanitize a system, care must be taken not to stimulate corrosion.

3.4.3 Non-oxidizing microbicides

Due to limitations of chlorine and other oxidizing microbicides, and to the increased use of alkaline scale and corrosion control programmes, non-oxidizing microbicides are becoming more widely used as a primary microorganism control treatment, or as a supplement to oxidizing microbicides. The most widely used types are described as follows.

Quaternary ammonium salts ('quats' as they are commonly known) are cationic surface-active quaternary nitrogen chemicals. The quaternary ammonium compounds probably represent the widest used group of non-oxidizing compounds used for process cooling water treatment. They are generally effective for controlling algae and bacteria with their activity against specific microorganisms varying with the structure of the compound, i.e. alkyl characteristics. Quats are generally most effective against algae and bacteria at neutral to alkaline pH. Quaternary ammonium compounds are generally not effective fungicides at any pH. Their biocidal/biostatic activity is attributed to the cationic charge, which forms an electrostatic bond with the negatively charged microorganism cell wall; and which results in distortion of the cell wall permeability, protein denaturation and death of the cell.

The activity of most quats is reduced by high chloride concentrations, high concentrations of oil and other organic foulants and by accumulations of sludge in the system. The 'diamine-quats' are less affected by these factors. Excessive overfeed of some types of quats may contribute to foaming problems, especially in open recirculating systems with organic contaminations.

Polymeric quaternary ammonium compounds are effective broad-spectrum microbicides produced by polymerizing quaternary nitrogen groups into low molecular weight polymers. Their activity is basically the same as the alkyl-quats, with the exception they are not surface active (do not cause foam), and have a greater degree of effectiveness against some fungal microorganisms. The polymeric quats typically require longer contact times than the alkyl-quats. High levels of suspended solids in the water inhibit the activity of these microbicides due to their cationic polymeric characteristics.

has good permeability properties. Because of its flammability, it is generally used as a mixture with an inert gas such as dichlorodifluoromethane concentrations of around 500 ppm, its D value against a variety of sp forming bacteria on paper surfaces ranges from about 2 to 12 min. Prop oxide (Methyloxirane) has the formula C_3H_6O, and a molecular weight of 5 It is colourless and ethereal, and is soluble in water and miscible with ethanol.

12.2.15 Hydrogen peroxide

This compound (H_2O_2 m.w. 34.01) exists as a colourless liquid, and miscible with water. It has been shown to be effective in preserving raw (up to 0.05%), especially for cheese making; and it is effective for liquid white. It is a component of the naturally occurring lactoperoxidase syste milk. Hot hydrogen peroxide is used as a sterilant for aseptic packa containers. At temperatures around 25°C, the D values of H_2O_2 against b sporeformers range between 2 and 7 min while at around 90°C the D va may be less than 1 min. It can be assayed by placing 300 mg into a 10 volumetric flask, diluting to volume with water followed by thorough mi To a 20.0-ml portion of this solution, add 25 ml of diluted sulphuric ac and titrate with 0.1 N K-permanganate. Each ml of 0.1 N K-permangana 1.701 mg of H_2O_2 (National Academy of Sciences, 1963).

12.2.16 Acetic and lactic acids

Acetic acid ($C_2H_4O_2$, m.w. 60.05) is produced in foods such as pick fermenting organisms, and it is a component of mayonnaise. It is used in water sprays for meat carcasses. It has a pungent odour, and is miscible w water and ethanol. Although it is known to depress pH, it is antimicrobial by other poorly understood mechanisms. Lactic acid is a colourless or yellow liquid that consists of a mixture of lactic acid ($C_3H_6O_3$) and lactic anhydr ($C_6H_{10}O_5$). It is hygroscopic and miscible with water and ethanol. It is produced naturally in many fermented foods such as yogurt and sauerkraut, and it is used as a spray for meat carcasses. According to the FAO, the acceptable daily for humans of either acetic or lactic acid is unlimited.

To assay, weigh the equivalent of 3 g into a 250-ml flask, add 50 ml NaOH, mix and boil for 20 min. Following the addition of phenolphthalein titrate the excess alkali in the hot solution with 1 N H_2SO_4, and perform a bl determination. Each ml of 1 N NaOH = 90.08 mg lactic acid (National Ac of Sciences, 1963).

12.2.17 Chlorine dioxide

This gaseous compound (ClO_2, m.w. 67.46) has the odour of chlorine and is unstable in light. Its solubility in water is less than 3 g/l, and it undergoes sh

<PRE>
[Federal Register: November 1, 2001 (Volume 66, Number 212)]
[Notices]
[Page 55175-55178]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]
[DOCID:fr01no01-56]

ENVIRONMENTAL PROTECTION AGENCY

[PF-1047; FRL-6805-7]

Notice of Filing a Pesticide Petition to Establish a Tolerance for a Certain Pesticide Chemical in or on Food

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: This notice announces the initial filing of a pesticide petition proposing the establishment of regulations for residues of a certain pesticide chemical in or on various food commodities.

DATES: Comments, identified by docket control number PF-must be received on or before December 3, 2001.

ADDRESSES: Comments may be submitted by mail, electronically, or in person. Please follow the detailed instructions for each method as provided in Unit I.C. of the SUPPLEMENTARY INFORMATION. To ensure proper receipt by EPA, it is imperative that you identify docket control number PF-1046 the subject line on the first page of your response.

FOR FURTHER INFORMATION CONTACT: By mail: [redacted]Biopesticides and Pollution Prevention Division, Registration Division (7505W), Office of Pesticide Programs, Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460; telephone number: (703) 308-8733; e-mail address: <A HREF=[redacted]

SUPPLEMENTARY INFORMATION:

I. General Information

A. Does this Action Apply to Me?

You may be affected by this action if you are an agricultural producer, food manufacturer or pesticide manufacturer. Potentially affected categories and entities may include, but are not limited to:

Categories	Examples of NAICS codes	potentially affected entities
Industry	111	Crop production
	112	Animal production

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	311	Food manufacturing
	32532	Pesticide manufacturing

This listing is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this action. Other types of entities not listed in the table could also be affected. The North American Industrial Classification System (NAICS) codes have been provided to assist you and others in determining whether or not this action might apply to certain entities. If you have questions regarding the applicability of this action to a particular entity, consult the person listed under FOR FURTHER INFORMATION CONTACT.

B. How Can I Get Additional Information, Including Copies of this Document and Other Related Documents?

1. Electronically. You may obtain electronic copies of this document, and certain other related documents that might be available electronically, from the EPA Internet homepage at <A HREF="http://frwebgate.access.gpo.gov/cgi-bin/leaving.cgi?from=leavingFR.html&log=linklog&to=http://www.epa.gov/">http://www.epa.gov/</A>.
To access this document, on the homepage select ``Laws and

Regulations" `` Regulation and Proposed Rules," and then look up the entry for this document under the ``Federal Register--Environmental Documents." You can also go directly to the Federal Register listings at <A HREF="http://frwebgate.access.gpo.gov/cgi-bin/leaving.cgi?from=leavingFR.html&log=linklog&to=http://www.epa.gov/fedrgstr/">http://www.epa.gov/fedrgstr/</A>.

2. In person. The Agency has established an official record for this action under docket control number PF-1046. The official record consists of the documents specifically referenced in this action, any public comments received during an applicable comment period, and other information related to this action, including any information claimed as confidential business information (CBI). This official record includes the documents that are physically located in the docket, as well as the documents that are referenced in those documents. The public version of the official record does not include any information claimed as CBI. The public version of the official record, which includes printed, paper versions of any electronic comments submitted during an applicable comment period, is available for inspection in the Public Information and Records Integrity Branch (PIRIB), Rm. 119, Crystal Mall #2, 1921 Jefferson Davis Highway, Arlington, VA, from 8:30 a.m. to 4 p.m., Monday through Friday, excluding legal holidays. The PIRIB telephone number is (703) 305-5805.

C. How and to Whom Do I Submit Comments?

You may submit comments through the mail, in person, or electronically. To ensure proper receipt by EPA, it is imperative that you identify docket control number PF-1046 in the subject line on the first page of your response.

1. By mail. Submit your comments to: Public Information and Records Integrity Branch (PIRIB), Information Resources and Services Division (7502C), Office of Pesticide Programs (OPP), Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460.

2. In person or by courier. Deliver your comments to: Public Information and Records Integrity Branch (PIRIB), Information Resources and Services Division (7502C), Office of Pesticide Programs (OPP), Environmental Protection Agency, Rm. 119, Crystal Mall #2, 1921 Jefferson Davis Highway, Arlington, VA. The PIRIB is open from 8:30 a.m. to 4 p.m., Monday through Friday, excluding legal holidays. The PIRIB telephone number is (703) 305-5805.

3. Electronically. You may submit your comments electronically by e-mail to: <A HREF="mailto:opp-docket@epa.gov">opp-docket@epa.gov</A>, or you can submit a computer disk as described above. Do not submit any information electronically that you consider to be CBI. Avoid the use of special characters and any form of

encryption. Electronic submissions will be accepted in Wordperfect 6.1/ 8.0 or ASCII file format. All comments in electronic form must be identified by docket control number PF-000. Electronic comments may also be filed online at many Federal Depository Libraries.

D. How Should I Handle CBI That I Want to Submit to the Agency?

Do not submit any information electronically that you consider to be CBI. You may claim information that you submit to EPA in response to this document as CBI by marking any part or all of that information as CBI. Information so marked will not be disclosed except in accordance with procedures set forth in 40 CFR part 2. In addition to one complete version of the comment that includes any information claimed as CBI, a copy of the comment that does not contain the information claimed as CBI must be submitted for inclusion in the public version of the official record. Information not marked confidential will be included in the public version of the official record without prior notice. If you have any questions about CBI or the procedures for claiming CBI, please consult the person identified under FOR FURTHER INFORMATION CONTACT.

E. What Should I Consider as I Prepare My Comments for EPA?

You may find the following suggestions helpful for preparing your comments:

1. Explain your views as clearly as possible.
2. Describe any assumptions that you used.
3. Provide copies of any technical information and/or data you used that support your views.
4. If you estimate potential burden or costs, explain how you arrived at the estimate that you provide.
5. Provide specific examples to illustrate your concerns.
6. Make sure to submit your comments by the deadline in this notice.
7. To ensure proper receipt by EPA, be sure to identify the docket control number assigned to this action in the subject line on the first page of your response. You may also provide the name, date, and Federal Register citation.

II. What Action is the Agency Taking?

EPA has received a pesticide petition as follows proposing the establishment and/or amendment of regulations for residues of a certain pesticide chemical in or on various food commodities under section 408 of the Federal Food, Drug, and Comestic Act (FFDCA), 21 U.S.C. 346a.

EPA has determined that this petition contains data or information regarding the elements set forth in section 408(d)(2); however, EPA has not fully evaluated the sufficiency of the submitted data at this time or whether the data support granting of the petition. Additional data may be needed before EPA rules on the petition.

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List of Subjects

Environmental protection, Agricultural commodities, Feed additives, Food additives, Pesticides and pests, Reporting and recordkeeping requirements.

Dated: October 17, 2001.

[redacted]

Director, Registration Division, Office of Pesticide Programs.

Summary of Petition

The petitioner summary of the pesticide petition is printed below as required by section 408(d)(3) of the FFDCA. The summary of the petition was prepared by the petitioner and represents the view of the petitioners. EPA is publishing the petition summary verbatim without editing it in any way. The petition summary announces the availability of a description of the analytical methods available to EPA for the detection and measurement of the pesticide chemical residues or an explanation of why no such method is needed.

BioSafe Systems

PP 8F4996

EPA has received a pesticide petition 8F4996 from Biosafe Systems, 80 Commerce Street, Glastonbury, CT 06033], proposing pursuant to section 408(d) of the Federal Food, Drug, and Cosmetic Act (FFDCA), 21 U.S.C. 346a(d), to amend 40 CFR part 180 to establish an amendment/ expansion of an existing tolerance exemption for the biochemical pesticide hydrogen peroxide in or on all postharvest agricultural food commodities at the rate of 1% hydrogen peroxide per application.

Pursuant to section 408(d)(2)(A)(i) of the FFDCA, as amended, Biosafe Systems has submitted the following summary of information, data, and arguments in support of their pesticide petition. This summary was prepared by [Biosafe Systems] and EPA has not fully evaluated the merits of the pesticide petition. The summary may have

been edited by EPA if the terminology used was unclear, the summary contained extraneous material, or the summary unintentionally made the reader conclude that the findings reflected EPA's position and not the position of the petitioner.

A. Product name and Proposed Use Practices

Hydrogen peroxide is for use to control plant pathogenic diseases on plants, food commodities, greenhouse surfaces and other agricultural use sites. BioSafe Systems maintains 2 registrations for 27.00% hydrogen peroxide end-use products, ZeroTol (EPA Reg. No. 70299-1) and Oxidate (EPA Reg. No. 70299-2), for these uses.

B. Product Identity/Chemistry

1. Identity of the pesticide and corresponding residues. Hydrogen peroxide reacts on contact with a surface on which it is applied, and rapidly degrades to oxygen and water, neither of which is of toxicological concern.

2. Analytical method. An analytical method for the detection of residues of hydrogen peroxide is not applicable. Hydrogen peroxide is used in low concentrations and rapidly degrades into water and oxygen.

TOX.

C. Mammalian Toxicological Profile

Hydrogen peroxide at a concentration of 27% has a pH of 1.05, at which concentration the Agency assumes a toxicity category I for skin and eye irritation. BioSafe Systems has submitted toxicology information from open literature for aqueous solutions containing 6% and 50% hydrogen peroxide. The concentrate (27% hydrogen peroxide) will be diluted with water at the rate of 1:50 or 1:100 or 1:300 and thus, the concentration of hydrogen peroxide in the product at the time of application will range from 0.09% to 0.54%.

The information from open literature demonstrated that solutions containing 6% hydrogen peroxide have an acute oral LD<INF>50</INF> <gr-thn-eq>5,000 mg/kg in rats (toxicity category III), an acute dermal LD<INF>50</INF> <gr-thn-eq>10,000 mg/kg in rabbits (toxicity category IV), and an inhalation LC<INF>50</INF> of 4 milligrams per liter (mg/l) (toxicity category IV). The 6% hydrogen peroxide solutions are mild irritants to rabbit skin and cause sever irreversible corneal injury in half of the exposed rabbits (toxicity category I). Toxicology information from open literature demonstrated that solutions that contained 50% hydrogen peroxide have an acute oral LD<INF>50</INF> <gr-thn-eq>500 mg/kg in rats (toxicity category II) and an acute dermal LD<INF>50</INF> <gr-thn-eq>1,000 mg/kg in rabbits (toxicity category

II). No deaths resulted after an 8-hour exposure of rats to saturated vapors of 90% hydrogen peroxide, LC<INF>50</INF> is 4 mg/l (2,000 ppm). Solutions that contain 50% hydrogen peroxide are also extremely irritating (corrosive) to rabbit eyes (toxicity category I).

EPA has concluded that for food use at an application rate of <ls-thn-eq>1% hydrogen peroxide, no apparent acute toxicity and subchronic toxicity end-points exist to suggest a significant toxicity. An RfD (chronic toxicity) for hydrogen peroxide has not been estimated because of its short half-life in the environment and lack of any residues of toxicological concern. For similar reasons, an additional safety factor was not judged necessary to protect the safety of infants and children. Additionally, hydrogen peroxide is listed by the Food and Drug Administration as Generally Recognized as Safe (GRAS).

Additionally, hydrogen peroxide is used to treat food at a maximum level of 0.05% in milk used in cheese-making, 0.04% in whey, 0.15% in starch and corn syrup, and 1.25% in emulsifiers containing fatty acid esters as bleaching agents (21 CFR Part 184.1366). As a GRAS substance, hydrogen peroxide may be used in washing or to assist in the lye peeling of fruits and vegetables (21 CFR 173.315).

Food exposure.

D. Aggregate Exposure

1. Dietary exposure--i. Food. For the proposed uses, the concentrate of hydrogen peroxide will be diluted with water at the rate of 1:50, 1:100 or 1:300 corresponding to a low concentration of hydrogen peroxide in the product at the time of application (0.09% - 0.54%). The solution, having a low concentration of hydrogen peroxide, reacts on contact with the surface on which it is sprayed, and degrades rapidly to oxygen and water. Therefore residues in or on treated food commodities (growing and postharvest crops) are expected to be negligible. Additional sources of the GRAS substance hydrogen peroxide in concentrations range from 0.04% to 1.25% in various foods as cited above (21 CFR Part 184.1366).

ii. Drinking water. At the proposed application rates, the use of hydrogen peroxide to treat food commodities will result in minimal transfer of residues to potential drinking water sources. This is due to the low application rate and the rapid chemical degradation of hydrogen peroxide into oxygen and water, neither of which is of toxicological concern. The EPA Office of Water has stated that it has seen no new data that contradict the assessment previously given which is that low concentrations of hydrogen peroxide do not typically persist in drinking water at levels that pose a health risk.

2. Non-dietary exposure. There will be minimal amounts of non-dietary exposure to hydrogen peroxide, primarily through infrequent or short use of topical hydrogen peroxide products for treating minor skin

injuries, and through use of oral mouthwashes. Exposure is expected to be minimal, and when used hydrogen

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peroxide rapidly degradates into oxygen and water, neither of which is of toxicological concern.

E. Cumulative Exposure

Because of the low use rates of hydrogen peroxide, its low toxicity and rapid degradation, EPA does not believe that there is any concern regarding the potential for cumulative effects of hydrogen peroxide with other substances due to a common mechanism of action. Because hydrogen peroxide is not known to have a common toxic metabolite with other substances, EPA has not assumed that hydrogen peroxide has a common mechanism of toxicity with other substances.

F. Safety Determination to the General U.S. Population, and Infants and Children

Because hydrogen peroxide is of low toxicity, the proposed uses employ low concentrations of hydrogen peroxide, and hydrogen peroxide degrades rapidly following application, EPA concludes that this exemption from the requirement of a tolerance in or on all food commodities for hydrogen peroxide, when applied at <ls-thn-eq>1%, will not pose a dietary risk under reasonably foreseeable circumstances. Further, the EPA Office of Water has stated that it has seen no new data that contradict the assessment previously given which is that low concentrations of hydrogen peroxide do not typically persist in drinking water at levels that pose a health risk. Accordingly EPA concluded that there is a reasonable certainty of no harm to consumers, including infants and children, from aggregate exposure to hydrogen peroxide.

G. Effects on the Immune and Endocrine Systems

There is no evidence to suggest that hydrogen peroxide in the proposed concentrations will adversely affect the endocrine system.

H. Existing Tolerances

An exemption from the requirement of a tolerance (40 CFR Part 180.1197) is established for residues of hydrogen peroxide in or on all food commodities at the rate of <ls-thn-eq> 1% hydrogen peroxide per

application on growing crops and postharvest potatoes when applied as an algaecide, fungicide and bactericide.

I. International Tolerances

There is no Codex Alimentarium Commission Maximum Residue Level (MRL) for hydrogen peroxide.

[FR Doc. 01-27469 Filed 10-31-01; 8:45 am]
BILLING CODE 6560-50-S

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WORLD TRADE ORGANIZATION

G/SPS/N/USA/511/Add.1/Corr.1
1 July 2002

(02-3665)

Committee on Sanitary and Phytosanitary Measures

Original: English

NOTIFICATION

Corrigendum

The following communication, dated 20 June 2002, has been received from the United States.

Hydrogen Peroxide; An Amendment to an Exemption From the Requirement of a Tolerance; Technical Correction

In the Federal Register of 28 February 2002, EPA issued a revised exemption from the requirement of a tolerance for residues of the biochemical hydrogen peroxide (notified as Add.1 to G/SPS/N/USA/511). In the summary and the codified text, a phrase was inadvertently omitted. This document corrects those errors.

This document is effective 20 June 2002. The full text of this correction document is available from the address below.

United States SPS Enquiry Point/Notification Authority
USDA/FAS/FSTSD
ATTN: [redacted]
Room 5545 South Agriculture Building
Stop 1027
1400 Independence Avenue, S.W.
Washington, D.C. 20250
Phone (202) 720-2239
Fax (202) 690-0677
[redacted]

WORLD TRADE ORGANIZATION

G/SPS/N/USA/511/Add.1
11 March 2002

(02-1209)

Committee on Sanitary and Phytosanitary Measures

Original: English

NOTIFICATION

Addendum

The following communication by the United States is being circulated.

Hydrogen Peroxide - An Amendment to an Exemption from the Requirement of a Tolerance

This regulation establishes an amendment to an exemption from the requirement of a tolerance for residues of the biochemical hydrogen peroxide in or on all post-harvest agricultural food commodities when applied/used at the rate of 1% hydrogen peroxide per application. The petitioner submitted a petition to EPA under the Federal Food, Drug, and Cosmetic Act (FFDCA), as amended by the Food Quality Protection Act (FQPA) of 1996, requesting an exemption from the requirement of a tolerance. This regulation eliminates the need to establish a maximum permissible level for residues of hydrogen peroxide.

This regulation (final rule) is effective 28 February 2002. Objections and requests for hearings must be received by EPA, on or before 29 April 2002.

The full text of this addendum, including instructions for submitting objections and requests for hearings, is available from the address below.

United States SPS Enquiry Point/Notification Authority
USDA/FAS/FSTSD
Attn [redacted]
Room 5545 South Agriculture Building
Stop 1027
1400 Independence Avenue, S.W.
Washington, D.C. 20250
Tel: (202) 720-2239
Fax: (202) 690-0677
[redacted]

WORLD TRADE ORGANIZATION

G/SPS/N/USA/511
5 November 2001

(01-5429)

Committee on Sanitary and Phytosanitary Measures

Original: English

NOTIFICATION

1.	**Member to Agreement notifying:** UNITED STATES **If applicable, name of local government involved:**
2.	**Agency responsible:** Environmental Protection Agency – EPA
3.	**Products covered (provide tariff item number(s) as specified in national schedules deposited with the WTO; ICS numbers may be provided in addition, where applicable).** Pesticides **Regions or countries likely to be affected, to the extent relevant or practicable:**
4.	**Title and number of pages of the notified document:** Notice of Filing a Pesticide Petition to Establish a Tolerance (exemption from) for a Certain Pesticide Chemical in or on Food - Biochemical Pesticide Hydrogen Peroxide (4 pages)
5.	**Description of content:** This notice announces the initial filing of a pesticide petition proposing the establishment of regulations for residues of certain pesticide chemicals in or on various food commodities. EPA has received a pesticide petition proposing pursuant to section 408(d) of the Federal Food, Drug, and Cosmetic Act (FFDCA), 21 U.S.C. 346a(d), to amend 40 CFR part 180 to establish an amendment/expansion of an existing tolerance exemption for the biochemical pesticide hydrogen peroxide in or on all postharvest agricultural food commodities at the rate of 1% hydrogen peroxide per application. EPA has not fully evaluated the merits of the pesticide petition. The summary may have been edited by EPA if the terminology used was unclear, the summary contained extraneous material, or the summary unintentionally made the reader conclude that the findings reflected EPA's position and not the position of the petitioner.
6.	**Objective and rationale: [X] food safety, [ ] animal health, [ ] plant protection,** **[ ] protect humans from animal/plant pest or disease,** **[ ] protect territory from other damage from pests**
7.	**An international standard, guideline or recommendation does not exist [ ].** **If an international standard, guideline or recommendation exists, give the appropriate reference and briefly identify deviations:** There is no Codex Alimentarius Commission Maximum Residue Level (MRL) for hydrogen peroxide.
8.	**Relevant documents and language(s) in which these are available:** 66 FR 55175, 1 November 2001 (available in English)

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9.	**Proposed date of adoption:** To be determined
10.	**Proposed date of entry into force:** To be determined
11.	**Final date for comments:** Comments must be received on or before 3 December 2001 **Agency or authority designated to handle comments: [ ] National notification authority, [ ] National enquiry point, or address, fax number and E-mail address (if available) of other body:** Environmental Protection Agency Detailed instruction on where and how to send comments is in the body of the full text – which will be sent upon request to the address in paragraph 12
12.	**Texts available from: [ ] National notification authority, [ ] National enquiry point or address, fax number and E-mail address (if available) of other body:** United States SPS Enquiry Point/Notification Authority USDA/FAS/FSTSD ATTN: [redacted] Room 5545 South Agriculture Building Stop 1027 1400 Independence Avenue, S.W. Washington, D.C. 20250 Tel: (202) 720-2239 Fax: (202) 690-0677 [redacted]