



FATS AND PROTEINS RESEARCH FOUNDATION, INC.

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TELEPHONE AREA CODE 312 827-0139

THE DIRECTOR'S DIGEST
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TECHNICAL DIRECTOR

February 17, 1969
No. 56

SALMONELLA ANTAGONIST STUDIES NEARING COMPLETION

One of the more practical and timely projects supported by FPRF is the study at Darling & Company on the development of a chemical or combination of chemicals that will destroy Salmonella in animal by-product meals and protect these products against recontamination. Promising preliminary results were reported in The Director's Digest, April, 1968.

During the past several months, several acids, alone and in combination, have been tested for their bactericidal effect on Salmonella. Acetic, propionic, butyric and phosphoric acids were all found to inhibit the growth of Salmonella on selective laboratory media (Table 1).

Table 1. Inhibitory Effect of Individual Acids on Growth of Salmonella by Sensitivity Method (Brilliant Green Agar)

Acid Concn., %:	Zone of Inhibition - mm.				
	5	10	15	20	25
Acetic	26.5	32.3	35.0	38.0	TPI
Propionic	26.0	30.7	34.5	38.5	TPI
Butyric	25.3	30.1	33.8	38.3	TPI
Phosphoric	24.0	29.8	32.8	35.8	38.3

TPI = Total Plate Inhibition

Although these acids when used individually at low concentrations did not destroy all Salmonella in heavily contaminated meat and bone meal (Table 2), combinations of these acids were very effective (Table 3).

Table 2. The Influence of Different Concentrations of Individual Acids on Viable Salmonella Organisms in Artificially Contaminated Meat and Bone Meal (Solutions applied at 5% level)

Acid	Soln. concn. %	Organisms/g.			
		24 hrs.	48 hrs.	72 hrs.	1 wk.
None	-	2,800	2,700	2,900	2,600
Propionic	5	1,600	1,300	1,700	1,400
	10	1,100	1,000	1,000	900
	25	200	250	200	100
	5	1,900	2,000	1,800	1,700
Acetic	10	1,500	1,600	1,300	900
	25	150	100	150	100
	5	2,500	2,000	2,300	2,100
Butyric	10	2,000	2,000	1,800	1,700
	25	500	600	200	300
	5	2,400	2,300	2,300	2,100
Phosphoric	10	2,600	1,900	2,100	2,000
	25	700	600	300	600

Table 3. Influence of Different Concentration of Acid Mixtures (Formula 94 and Formula 99) on Viable Salmonella Organisms in Artificially Contaminated Meat and Bone Meal

Acid Mixture	Concn. in M&B Meal	Organisms/g. (BG Agar)				
		0 hrs.	24 hrs.	48 hrs.	72 hrs.	1 week
Formula 94	0	1,800	1,700	1,500	2,000	1,900
	1	20	20	10	10	10
	3	10	10	0	0	0
	5	0	0	0	0	0
	7	0	0	0	0	0
	10	0	0	0	0	0
Formula 99	0	1,700	1,900	1,600	2,000	1,800
	1	30	30	20	20	20
	3	20	20	20	20	20
	5	0	0	0	0	0
	7	0	0	0	0	0
	10	0	0	0	0	0

Formula 94: 10% propionic, 10% acetic, 5% butyric, 75% water

Formula 99: 10% propionic, 10% acetic, 5% phosphoric, 75% water

Experiments have shown that the cidal effect of the acid combinations is not due to a simple change in acidity but to the specific action of the acids. Preliminary feeding trials with chicks have shown that the acid treatment of meat and bone meal has no adverse effect on acceptability or efficiency of rations containing meat and bone meal. Treatment of meat and bone meal with Formula 94 prevented recontamination with Salmonella when the treated meal was exposed to a contaminated environment.

The following activities are in progress to make it possible for producers of animal by-product meals to use the antagonist to protect against Salmonella contamination.

1. Preparation of a petition to the Food and Drug Administration requesting clearance for use.
2. Feeding trials with chicks and swine to confirm the preliminary tests with chicks. These trials will be cooperative with at least one large feed manufacturer.
3. Preparation and filing of a patent application to protect FPRF members who wish to use the antagonist.
4. Negotiations with companies that may wish to produce and distribute the antagonist to renderers that prefer not to formulate the mixture.