Division of Marketing
Agricultural Development and Diversification (ADD) Program

1995 Grant Final Report

Grant Number 10016

Grant Title Decontamination of B-Lactam Positive Milk

Amount Awarded $4,500.00

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Summary

In 1997 22,157,710 pounds of milk in Wisconsin became a liability because of antibiotic contamination.

Our interest was reduction of antibiotic level in the milk and the reduction of antibiotic resistant bacteria.

Leuther Laboratory received a grant to cover the costs of a project to determine if tanker or truck loads of milk contaminated with penicillin type antibiotics could be decontaminated easily and cost effectively using an enzyme. Most of the funds were used for enzyme, extra test kits and to reimburse truck drivers for their time. All laboratory labor and routine supplies were donated by the laboratory.

We worked on twelve loads. The antibiotics in five of these loads were reduced to below the limit of detection. The levels of antibiotics were reduced in five other loads, but not below the limit of detection. Two loads were not treated because one did not respond to the enzyme. In the other load, the penicillin concentration was so high that our field test did not identify this milk as decontaminatable. If we had attempted to treat that load, the laboratory stock of enzyme would have been depleted without making a significant reduction in antibiotic levels.

The process of treatment began with notification that a truck load of milk had tested positive for antibiotics. A laboratory microbiologist immediately went to the site and confirmed with a rapid test that the load was positive and could be decontaminated with the enzyme. A sample was then titrated to determine the amount of enzyme needed. The calculated amount was added to the truck through the top port. The truck was then driven to a manure slurry for disposal. Mid stream samples were taken at intervals while the milk was being dumped into the manure. The load was counted as a successful decontamination if antibiotic in these samples was below the limit of detection with the same type of test that originally identified the load as positive. The cost of the enzyme was $40.00 for a 40,000 pounds contaminated in the range of 5 ppm. If these samples remained positive, but the antibiotic could be reduced by the enzyme, the load was counted as a partial success.

Time and agitation are also factors in decontamination. An inverse correlation exists between time and amount of enzyme. I believe the five loads identified as partial successes and one of the loads identified as a failure could have been total successes with more time and enzyme, because the antibiotic could be completely inactivated in the laboratory. This milk, now a liability could become an asset if a use could be found for it that avoids using it as feed for humans or livestock.

This milk can not enter the market as food because the enzyme, b-lactamase, is not made for human consumption, so we worked on milk recipes for non food products. A paint recipe was located in an 1850 "handymans" type book, owned by Alan Peterson, Farmers Union representative. An acceptable paint was finally developed by Harold Schindler, a Chemistry graduate student from Germany, who lived with the Kenneth Kammel family for a year. The milk fat gives this paint some water resistance and the other ingredients, basically boric acid and barn lime are non toxic and odorless. This recipe is now the property of the Department of Agriculture and available to the public.

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This project developed the methodology needed to decontaminate the antibiotic contaminated milk by utilizing a titration of a smaller aliquot of milk with B-lactamase to determine if the enzyme would be effective. The enzyme was applied to the load and agitated. Decontamination was confirmed by the use of the SNAP B-Lactam Test Kit.

After attempting to decontaminate a couple loads, it was very evident there was great variation in the sensitivity of the SNAP B-Lactam Test Kits that occur from lot to lot. This led the research in the direction of finding a more consistently sensitive antibiotic testing method. After reviewing the old *Bacillus stearothermophilus* Disc Assay and modifying, experimenting, and testing developed a Modified *Bacillus stearothermophilus* Disc Assay (mod. BsDA). This (mod BsDA) has potential marketability for the following abilities:

1. It is more sensitive than the old BsDA allowing it to be a better companion to the SNAP. The (mod BsDA) level of detection is equal to the SNAP; 100% detection at 0.004 IU/ml penicillin G.
2. The (mod BsDA) has a useful shelf life of at least three months with no reduction in sensitivity.
3. The (mod BsDA) has a greater reproducibility than the old BsDA.
4. The (mod BsDA) is ideal for cow samples and is a broad-spectrum test.
5. No new supplies, incubators, or techniques are required. The prepared (mod BsDA) plates can be used with dairy laboratories existing supplies.
6. It is less expensive than any test on the market, even less expensive than the regular disk assay, because the long shelf life eliminates waste.

Over 1,700 comparison tests were done by 4 outside labs. They all found an average greater detection level with the (mod BsDA).

A final aspect which developed from this project was working out the milk paint formula and testing the production possibilities. The formula can utilize waste milk and cottage cheese to make a whip and frost proof, water soluble, and non-toxic flat wall paint for the environmentally and health conscious consumers. The prototype version yielded 0.5 gallons from 3 gallons of waste whole milk. It cost approximately $3.00 per gallon calculated on the basis of retail prices of the other components. The production of the paint utilizes the equipment already available in dairies.

The future development of this project is to investigate the feasibility of interest in the craft paint market or house paint market. By utilizing the contaminated loads from the area and the cottage cheese which would have been thrown out to produce, market, and sell an environmentally friendly paint alternative: the 14,000,000 pounds of antibiotic contaminated milk that was dumped in 1994 at a loss of income valued at approximately $1,800,000 could have yielded an income of approximately $1,950,000* as a house paint alternative or $11,310,000* in the craft paint market. The greater benefits

are environmental and clinical by reducing bacterial exposure to the antibiotics found in the contaminated milk.

*Projected production costs entail only the cost of other paint components and not labor, packaging, or overhead.

House Paint Estimates (1994)		Craft Paint Estimates (1994)
14,000,000 lbs. Milk dumped in 1994	----->	388,889 gal. Paint (390,000 gal. Paint)
390,000 gallons paint		390,000 gallons paint
$3.00/gallon cost to produce		$3.00/gallon cost to produce
Average retail price of house paint $8.00/gallon		Average retail price of craft paint $8.00/gallon
Projected Production Cost $1,170,000*		Projected Production Cost $1,170,000*
Projected Gross Sales $3,120,000		Projected Gross Sales $12,480,000
Projected Gross Margin $1,950,000*		Projected Gross Margin $11,310,000*

Coeur Valley, 01/23/1997

ENVIRONMENTALLY FRIENDLY INDOOR / OUTDOOR PAINT FROM WASTE OR SURPLUS MILK / COTTAGE CHEESE

by
Harald D Schindler

As an alternative to disposing of contaminated milk or cottage cheese, it could be utilized as a base for an environmentally friendly, whip and frost proof flat wall paint. Its low price, superb properties, and variety of applications could make it a product for environmentally and health conscious consumers.

The prototype version of the paint yielded 0.5 gallons from 3 gallons of whole milk and had a price of approximately $3.00 per gallon calculated on the basis of retail prices of the ingredients. Further variation of the composition of the paint, and the use of whole sale quantities of the ingredients could lower the price considerably.

Since the paint was made mostly of unpreserved natural products it is liable to decay. Therefore, the paint should either be made shortly before

use, or kept refrigerated. Preservation with benzoic acid or similar preservatives can also be taken into consideration.

Procedure: Citric acid (20g) was dissolved in 2 cups of hot water and added to 3 gallons of milk. The milk was heated to aprox. 50°C for 10 min. The precipitate was filtered off and excess water was removed by applying pressure. To the precipitated 10 g of household borax was added. Slowly, the white solid turned into a translucent slime. To the slime 3 quarts of lime (Dairy White II), 3/4 cup boiled linseed oil, and 1 1/2 cup of water were added and the mixture was stirred until a smooth consistency was reached.

The amount of linseed oil could probably be reduced, and parts of the lime could be substituted with chalk or pigments (preferably on titanium dioxide base). To add a special "natural touch" pigments could also consist of colored earth an clay pigments.

The production of this type of paint only uses equipment already available in Dairies. The paint is water soluble and non toxic. Further research will yield a method to produce a marketable product from contaminated or outdated dairy products which otherwise have to be disposed of.