THE CONTROL OF ANTIBIOTICS IN MILK THROUGH A SOUND TEST PROGRAM

FRANK V. KOSKOWSKI

Department of Dairy Industry
Cornell University, Ithaca, New York

(Received for publication April 17, 1960)

The application of a steady field test program along with proper fieldman supervision markedly reduced the antibiotic incidence in milk at one large New York State fluid milk and cream dairy firm. Using the simple Cornell field antibiotic test kit much of the time, approximately 10,000 milks were tested over a four-month period on about 4,000 farms. The incidence in milk from producer can farms dropped from 6.5 per cent to 0.45 per cent during this period. On producer bulk tank farms the rate of incidence dropped from 5.1 per cent to between 0 and 0.5 per cent. As a result of this significant drop, no over-the-road tanker of milk destined for metropolitan areas contained antibiotics within the sensitivity limits of the tests employed.

Control of the antibiotic contamination of milk apparently is only as effective as the testing program. Because cows are constantly being treated with antibiotics the incidence of these drugs in milk will be a reflection of the constancy of testing.

Ten years ago a survey of New York State milks indicated an incidence of antibiotic contamination of six per cent (4). A later nationwide survey in 1956 (7) showed a similar incidence. Relatively little progress has been made in the intervening decade toward significantly lowering the rate of incidence for a number of reasons.

One was the prevailing attitude that public health officials were not unduly concerned about the problem and were not insisting upon enforcement of adulteration laws concerned with chemical additives. This attitude underwent considerable revision when the position of Federal regulatory officials became better known to the industry in November, 1959 (2). Another equally important reason was that the dairy industry considered itself inadequately prepared to solve the problem. Education alone, through the written word to milk producers, was not accomplishing its objectives and direct testing of milk supplies was generally considered impractical. A quick detection test for antibiotics in milk was thought essential for control and no rapid test existed.

This writer has always considered the latter hypothesis invalid (3) because analytical laboratory methods currently available were sensitive and reliable, despite their three to six hour requirement for completion. What was needed was the wide application of testing regardless of the time element, and a strong follow-up program by field inspectors or supervisors. Actually, some dairy laboratories and health officials, in a limited way, for some time have followed this course of action to their satisfaction.

Some months ago an opportunity was presented to test this point on a large scale and with new and extremely simple test methods. A field antibiotic test kit developed at Cornell University in requiring three to six hours for completion was supplied in large numbers to one fluid milk and cream New York State dairy firm in an attempt to eradicate its antibiotic problem. The principle of this test was recently published (5). Detailed records were maintained of about 4,000 farms and approximately 10,000 samples of milk were tested during this period. The present paper deals with the results of this carefully observed study and the efforts to reduce the incidence of antibiotics.

Methods

Analytical methods for antibiotic detection in the present study included mainly the Cornell field test, but at times when supplies of such tests were exhausted the standard disc assay laboratory test using whey agar (1) was substituted. In mechanical operation the two methods have much in common. Both use Bacillus subtilis spores as test organisms and both depend on clear zones around discs for evidence of positive inhibition. Finally, both exhibit the same degree of sensitivity, 0.05 I. U. penicillin per ml. or lower. To insure that positive zones were in fact related to pharmaceutical antibiotics, all milks tested were heated to 180° for 5 mins. according to earlier recommendations (6). As an additional check for the presence of penicillin, frequent use was made of penicillinase discs on positive cases. Milks generally were brought to central testing sites and during transit were maintained cold.

Farmers delivering milk to this large New York dairy farm were instructed through printed notices delivered to them and posted on the barn to retain all milk from treated quarters of the animal and not allow any to enter the general milk supply.

1This work was supported in part by U. S. Public Health Grant No. E-2078.
Field inspectors for the company worked closely with the testing centers. Positive evidence of the existence of an antibiotic in a milk producer's supply initiated a visit by the field inspector to that farm within 24 hours. The test result was shown to the farmer and an explanation was asked regarding his positive milk. Other questions raised concerned how the cow or cows were treated, time of treatment, number of units in treatment and time when first milking from treated cow was put into the milk's supply. The farmer was informed of the consequences of antibiotic contaminations and precautions for avoiding future adulterations were carefully explained. A second offense carried with it the penalty of a three-day expulsion from the milk shed.

**Results**

A preliminary survey of a limited nature taken during the first period, November, 1959, showed an incidence of 6.5 per cent for producer can dairies and 5.1 per cent for producer bulk tank dairies, Table 1. This incidence was about normal for the United States in recent years.

In the second period of testing—January 1 to February 1—activities were resumed on a larger scale. A total of 1634 producer can dairies showed an incidence of 4.0 per cent and 158 producer bulk tank dairies displayed 1.3 per cent, Tables 1 and 2.

Between the beginning of the first period and the end of the second period the field inspector had paid many visits to farms and had attracted the notice of a large segment of the producers in this dairy's milk shed. Through such visits and by word of mouth, producers were aware that antibiotic testing was now a steady program of this company.

The surveys for the third and fourth periods in the months of March and April were far more ambitious than for the previous two periods. All producers' milks were checked at least once. The results for these periods showed a significant drop of positive samples. Of 3,054 producer can dairies tested in March, only 14 or 0.45% showed any evidence of antibiotics, Table 1. The concentrations of these positive dairies, milks were low, on the order of 0.005 I. U. penicillin per ml. milk. No positives were found among the 372 producer bulk tank farms, Table 2. On 3,491 producer can farms checked in April, a similar low incidence was observed; but two positive milks were found among 382 bulk farms. This was still tenfold lower than the percentage of positives at the beginning of the study.

Significant changes were also noted in the results from over-the-road tank truck milk destined for large metropolitan areas and from bulked tank milk coming from the farm, Table 3. After the testing program was in effect two months, only one bulk tank from 211 tested was positive, while milk from 203 large over-the-road milk tankers was negative to antibiotics during this same period.

**DISCUSSION**

It has been particularly gratifying to all persons involved in this study to note the marked improve-
CONTROL OF ANTIBIOTICS IN MILK

The eradication of antibiotic contamination among milk supplies after the installation of a basic testing program coupled with field inspector or supervisor follow-up.

This sharp reduction was made in the face of the facts that cows in this milk shed received antibiotics through a variety of channels, udder insertions, intramuscular injections, and through direct feeding. Also equally striking is the point that the incidence dropped more than fifteenfold despite the fact that the farmers were directed to retain milk only from treated quarters. Transfer of antibiotics from a treated to an untreated quarter may or may not be definitely proved from current research under way, but for this dairy firm such transfer, if any occurred, was not an important impediment to obtaining a good record.

Naturally, the present study has not indicated that this company's problems are solved. As long as cattle diseases are treated with antibiotics contamination problems will exist. Also, it is possible with new and more highly sensitive field tests now under development in the writer's laboratory to show an even greater incidence in this company's milk supply. But the survey has shown that through a proper test program, not necessarily dependent upon rapid tests, it was possible to reduce the problem significantly. Testing, however, must be steady and periodic, for as soon as testing stops the incidence will rise again.

Another factor for the marked success obtained by the present dairy company was the indirect psychological effect upon farmers and even upon suppliers of antibiotic preparations. Word of a steady test program in rural areas evidently did much to restrain producers from infecting their milk supplies with milk from treated udders and it even had a salutary effect upon indiscriminate sales of antibiotic preparations. One large feed dealer, correctly or incorrectly, withdrew all of his antibiotic-treated feeds during the period of testing.

Interestingly enough, the type of testing employed did not place any excessive burden on laboratory personnel engaged in testing. With simple field test kits no extra personnel was required as 400 to 600 samples of milk could be tested daily. Obtaining milk samples and their required heating were delaying factors in testing but heating of milks removes many false positives and thus is an extremely valuable adjunct to testing. This point was first brought up for attention in 1952 (6).

REFERENCES