

1988

EC88-220 1987-1988 Dairy Report

Follow this and additional works at: <http://digitalcommons.unl.edu/extensionhist>

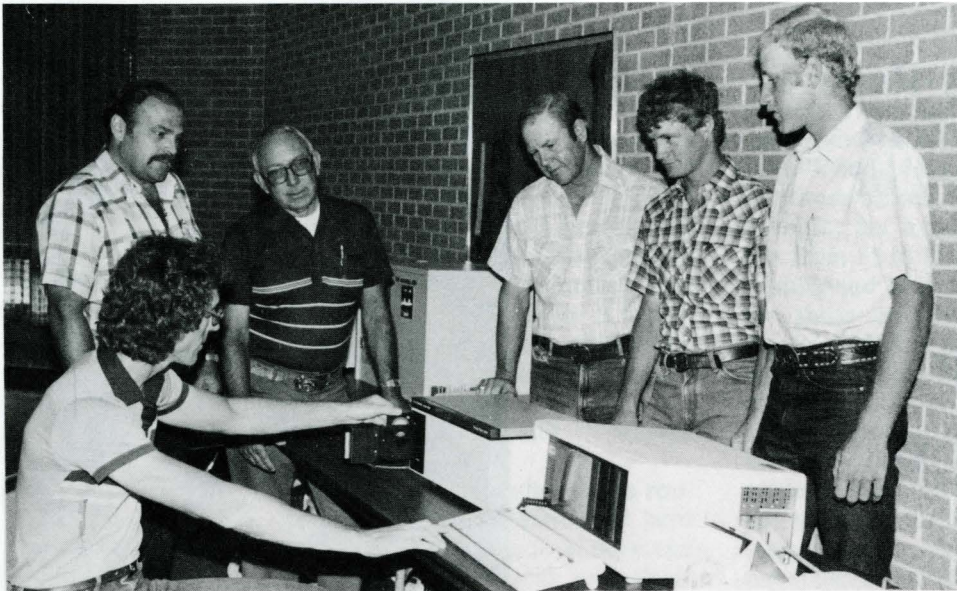
"EC88-220 1987-1988 Dairy Report" (1988). *Historical Materials from University of Nebraska-Lincoln Extension*. 4614.
<http://digitalcommons.unl.edu/extensionhist/4614>

This Article is brought to you for free and open access by the Extension at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Historical Materials from University of Nebraska-Lincoln Extension by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

C47
3
85
E7

NEBRASKA

Nebraska Cooperative Extension Service EC 88-220



UNIVERSITY OF NEBRASKA - LINCOLN LIBRARY

1987-1988

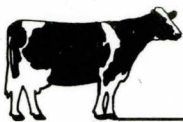
DAIRY REPORT

CONTENTS

Dedication	2
Nine-State Management Survey	3
Midwest Survey Suggests Needs to Improve Feeding	4
Using NIR to Test Feeds	5
Demonstration Herds Strive for Maximum Feed Efficiency	7
Calf Workshops Reduce Calf Losses	8
Saving from Improving Reproductive Performance	10
Sorghum Grain in Dairy Rations	11
A Semen Selection Plan that Makes Sense	12
How Much Does a Herd Sire Cost?	13
Hominy Feed in Lactation Rations	13
Progesterone Therapy and Reproduction in Holstein Cows and Heifers	14
Dietary Protein Level and Reproductive Performance	15
Distillers Grains in Dairy Rations	16
Soyhulls in Dairy Rations	18
Tired Cows Like Tires	20
Extraneous Voltage—A Review	21
Free-Stall Design and Management	23
UNL Veterinary Diagnostic Laboratories	25
Acknowledgments	28

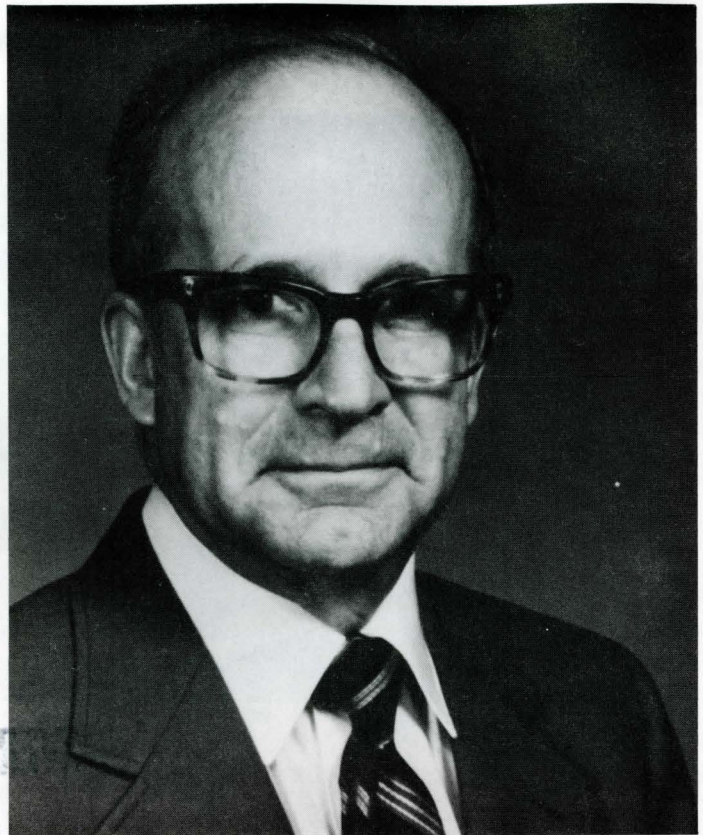


University of Nebraska
Cooperative Extension Service



This Dairy Report
is dedicated to
the memory of

PHILIP HILLIER COLE



Philip H. Cole passed away at his home in Lincoln, Nebraska, on February 17, 1987, at the age of 64.

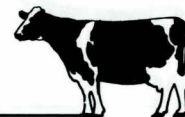
Cole, professor emeritus, retired from the Department of Animal Science on August 1, 1984, after 34 years of service to the University of Nebraska—the last 28 years as an extension dairy specialist. During his time on the University of Nebraska faculty, Cole established an impressive record of service to the university and to the Nebraska dairy industry.

Cole was instrumental in forming the Dairy Herd Improvement Association in Nebraska in 1968. In 1978, he helped establish a central DHIA testing laboratory to process Nebraska DHIA samples. He provided leadership to transfer responsibility for day-to-day management of the Nebraska DHIA program to a state manager and the state board as the role of extension in the DHIA program changed from management to education. Cole established a state mastitis committee responsible for selection of demonstration herds in which the importance of regular health maintenance was demonstrated. Mastitis-related problems decreased in Nebraska as a result of this program. He assisted dairy herd managers in developing and improving their facilities through participation in the Professional Dairyman's Association formed under his leadership. This organization has helped managers become aware of new concepts through their tours of other facilities.

He served as extension leader for the 4-H dairy program in the state. He generated increased participation in the program through addition of the Junior 4-H Herd Program with special recognition at all junior shows. His catalog system for 4-H teaching aids has received national recognition.

He devoted considerable effort to promotion of dairy management principles by collection of information from top milk-producing herds and dissemination of this information to other dairymen in Nebraska.

Philip Cole was a leader in dairy extension for many years. His innovative programs and service to the industry won the respect and gratitude of dairy farmers throughout the state.



Nine State Management Survey

Jeffrey F. Keown¹

A comprehensive survey was conducted to better evaluate the management practices for dairy herds in the nine states that process Dairy Herd Improvement Records at the Midstates Dairy Records Processing Center (DRPC) in Ames, IA. The nine states in the survey were: Arkansas, Illinois, Iowa, Kansas, Missouri, Nebraska, North Dakota, Oklahoma and South Dakota.

DHIA herds were selected because these herds have production data available for research investigation. It was also felt the survey response from DHIA herds would be higher than non-DHIA herds since the DHIA supervisors could help collect the data. The project was a joint undertaking between the state extension dairy specialists and the supervisors.

The main reasons for conducting the survey were:

- 1) to quantify management practices associated with Midwest dairying and to determine those practices associated with higher herd average yields for milk and fat.

- 2) to spot potential and actual problem areas that need intensive extension efforts.

- 3) to use these results as a basis for directing research and extension efforts, and

- 4) to define extension and research goals in management areas that can be addressed on a state and regional basis.

There were a total of 57 questions in the survey with 254 possible responses. The survey response was excellent with 54 percent or 4221 surveys returned. The survey results were merged with the 1985 herd production averages for milk and fat on 2,684 official (DHIA, DHIR and A/P) herds. This merged data set was then statistically analyzed to identify any association between management practices and herd production levels. It would be impossible to present all the results in the Dairy Report and, therefore, an extension circular has been published which covers all 254 management practices. The total results can be

found in EC87-262 "Profitable Midwest Dairy Practices".

We feel that results from three areas should be included in the Dairy Report. These three are use of DHIA, A.I. and herd health programs. These three management practices should be an integral part of any production system if a producer is to be profitable and build a solid future in the dairy business.

Herd Health

Those producers who used a routine herd health program had herd averages of 471 pounds of milk and 24 pounds of fat higher than those not following this program. A herd health program is important for two reasons:

- 1) Having a routine monthly visit by a veterinarian will help you to spot potential problems before they become serious enough to jeopardize herd profitability.

- 2) You will have an expert in your herd on a routine basis to help you with your reproductive and health problems. The veterinarian can offer you help in modifying your management practices to improve herd health.

A good herd health program will return you benefits worth far more than the cost.

DHIA

One question asked on the survey was "How long have you been enrolled in DHIA"? The response was interesting and encouraging for those on DHIA. It showed an increase in herd production level for

each five years a producer remained on test. Herd averages for those on test from 6 to 10 years were 446 lbs of milk and 14 lbs of fat higher than for those on test from 1 to 5 years. Likewise her averages for those on test from 11 to 25 years were 260 lbs of milk and 11 lbs of fat higher than for those on test 6 to 10 years. Again, DHIA is another herd management option that continues to increase profits over time. If you are not on DHIA just think of the extra income you can gain by having your cattle produce an extra 400-500 lbs per year. Again DHIA is another management program that, even in the short term, does not cost — it pays to be a member of DHIA.

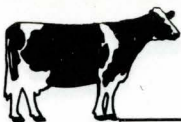
One interesting response in herd production levels was associated with the length of time a producer had been in the dairy business. Our results showed a slight decrease in milk and fat production over time. This may point out the need for dairy producers to continue to grow in knowledge of new technology as they remain in the business. With the advancements forthcoming in biotechnology, it will be even more important in the future to keep abreast of technological and scientific changes. It will be even more challenging for Extension to provide educational materials and information on a timely basis.

Artificial Insemination

We asked dairy producers to show how much they used A.I. in their breeding program. Table 1 shows the responses we received along with the corresponding herd

Table 1. Responses to Select Questions From Nine-State Survey

Observations	Herd averages, lb	
	Milk	Fat
I. Do you use A.I.?		
Yes, totally	1813	488
Yes, milking herd only	398	464
Yes, bull as clean up	708	466
No, dairy bull	243	466
No, beef bull	29	442
No, beef & dairy bull	54	462



averages associated with each category.

The table shows that those producers who used a total A.I. program had substantially higher herd averages for both milk and fat than all the other categories. Cows in those herds that used A.I. only on the milking herd produced 687 lbs of milk and 24 lbs of fat less than those in herds with a total A.I. program. This certainly points out the need to use A.I. on your heifers. Your heifers offer you the best opportunity to increase genetic potential. They should be out of better A.I. sires than the cows in your herd and represent the leading edge of your breeding program. Therefore, if they are bred to top sires you are greatly accelerating genetic potential. Many producers neglect this important part of their breeding program. Do not neglect your heifers — they are your future. Consequently, neglecting your heifers is a sure way to jeopardize your herd's future.

We have only covered three areas of management that were addressed in the 57-question survey. These are certainly three areas that deserve close attention and should be a viable component of any sound dairy herd program. These three options are available to most every producer — to join DHIA all it takes is a call — to start an A.I. program only requires a call to any major A.I. organization and to be enrolled in a herd health program entails working closely with your local veterinarian. As the dairy industry enters the 1990's, producers are going to need the help of trained professionals. The help is there, all it takes is a willingness to change and a clear sense of direction on where you plan to be ten years from today. If your plan is to remain in the dairy industry, then you must accept all the help and advice that you can obtain.

¹Jeffrey F. Keown is an Extension Dairy Specialist, Department of Animal Science, University of Nebraska.

Midwest Survey Suggests Needs to Improve Feeding

Foster G. Owen
Jeff Keown¹

A survey of DHIA member herds in the Midwest provides a great amount of data on feeding. The analyses of this data determined the herd milk yields associated with the use of specific feeds and feeding procedures. This information gives us ideas on where we can improve.

What about forages? For the winter feeding program herds using alfalfa haylage or silage have higher milk yields than those feeding sorgo silage or prairie hay. Alfalfa hay was the most popular forage. It was used by 44 percent of the herds responding and was associated with almost as high milk yields as were the ensiled alfalfas. In the summer, herds fed the alfalfa as hay produced more than those using ensiled alfalfa. This may be due to the poorer preservation conditions in the summer required to keep silage from heating and molding.

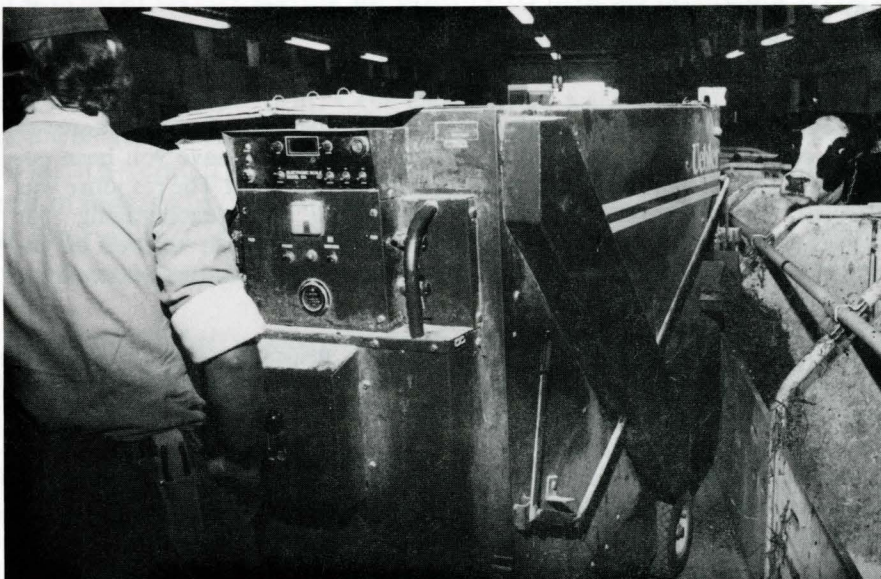
Ensiling forage in a conventional concrete store silo was related to considerably higher milk yields than for storing silage in a stack on the ground. Feeding forage on the ground or from a stack feeder during the summer was associated with lower milk yields than for feeding in

the free-stall barn or from a feed wagon.

Conclusion: These data indicate that sorgo silage and prairie hay are generally too low in quality to maintain desirable milk yields and that hay may be preferable to ensiled alfalfa for summer forage. It also may be difficult to maintain highest milk yields with silage stored in stacks or when hay is fed on the ground or in a stack feeder.

Improving grain feeding. This study suggest that milo and oats are superior to dry shelled corn grain in dairy rations in herd average fat yields. Milk yield differences were smaller. Although dry shelled corn was definitely the most popular grain, these data indicate that milk production can be equally well maintained when including in the ration dry or high moisture ear corn, oats, barley or wheat. Those feeding cottonseed and distillers grains had both higher milk and fat yields than those fed other by-products. The major protein supplements fed did not differ appreciably as related to milk and fat yields.

The method of feeding grain appeared to be an important consider-



Feeding rations that meet individual requirements will optimize production efficiency.



ation. The mixer wagon with weigh cells was associated with highest milk and fat yields. However, feeding in the parlor was more commonly used (877 dairies) than the mixer wagon with scales (231 dairies). Feeding grain more than twice daily was associated with more milk and fat yield than less frequent feeding.

Although 69 percent of the herds reporting fed home mixed concentrate rations, their milk yields were lower than for those feeding commercial or custom mixed rations.

Herds using buffers averaged 5.4 percent more milk than those not. (No other additives were included in the survey.)

Conclusion: Fortunately, the dairy cow is highly versatile in the kind of ingredients she can effectively use in her grain ration. The data of this study confirms this concept and suggest that dairy producers be alert to the possibility of using alternative grains, by-products and protein supplements when economics are favorable. These data as well as feeding experience commends the use of a mixer wagon with scales as an excellent feeding method for maximizing milk and minimizing nutritional problems. If grain rations are home mixed these data suggest that more care be given to ration balance. Although herds in this study that used buffers average higher production, they are not recommended as a routine additive, but only when conditions indicate their potential benefit.

This survey provides convincing incidence that we can improve production of both fat and milk by better attention to what and how we feed our dairy herds. The data also confirms what research tells us about the versatility of the dairy cow in her ability to use a wide variety of ingredients in the ration.

Using NIR to Test Dairy Feeds

Bruce Anderson¹

NIR forage testing has come to Nebraska. The Nebraska Cooperative Extension Service, Departments of Agronomy, and Animal Science recently purchased NIR equipment and have developed a program to encourage forage testing. The dairy program focuses on 28 dairy herds that will test all or nearly all their forages during the next 2 or 3 years and use the test results to develop rations and to target feed use.

The dairy program is led by Don Kubik and Foster Owen, Extension Dairy Specialists at UNL. They are developing detailed feeding plans for cooperating herds. Bruce Anderson, Extension Forage Specialist, is in charge of all sample analyses and will provide guidance on forage production and harvest. Dr. Duane Rice, Extension Veterinarian, is assisting with herd health related to forage.

Major goals for the Nebraska NIR program are to:

1. Stimulate increased forage testing.
2. Improve forage quality production practices.
3. Develop rations using results from forage analyses to both reduce feed costs and boost production.
4. Identify when specific forages should be fed during lactation.

spectroscopy) is a rapid, reliable and low cost computerized method to analyze forage crops for nutritive value. Instead of using chemical methods to determine protein, fiber, energy, and mineral content, NIR uses near infrared light.

Each major organic component of forage (such as protein) will absorb and reflect near infrared light differently. By measuring these different reflectance characteristics, the NIR and a computer can determine the quantity of these components in the forage. The procedure is similar to our ability to visually distinguish color—white light strikes a material that absorbs certain wavelengths and reflects other wavelengths. Reflected wavelengths are detected in the eye and sends signals to the brain to identify the color.

NIR results are based on known chemical analyses of similar forages. Before any forage can be analyzed using NIR, hundreds of samples of that feed must first be analyzed by standard laboratory chemical methods for all components to be measured. These analytical values and the near infrared wavelength reflections caused by these samples are programmed into the computer. When a similar forage sample is evaluated by NIR, the computer compares the wavelength reflections caused by that sample and matches them to previously tested samples.

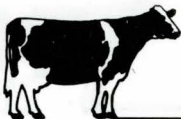
What Is NIR?

NIR (near infrared reflectance



Figure 1. NIR feed analysis equipment reduces "turn-around" time for results as well as cost of analyses compared with wet-lab methods.

¹Foster G. Owen and Jeffrey F. Keown are Extension Dairy Specialists, Department of Animal Science, University of Nebraska.



What Can Be Tested?

Most forages can be tested with NIR, including legume hays and haylage, legume-grass combinations, corn silage, small grain silage, and sorghum silage. Even most of our major feed grains - corn, wheat, milo, oats - can be analyzed for moisture, energy and protein using NIR. However, mixed feeds **cannot** be tested at this time.

Forages are tested for moisture content, crude protein, heat damaged protein (fermented forages only), acid detergent fiber, neutral detergent fiber, calcium, phosphorus, magnesium, and potassium. Energy values (TDN, ENE, NE_L , NE_M , NE_G), adjusted crude protein, and relative feed value are calculated. NIR values for organic compounds like protein, moisture, fiber, and energy are nearly identical to values obtained from chemical techniques when the equipment is properly operated and calibrated. Variation among NIR values when the same sample is analyzed more than once is as low or lower than from most chemical techniques. Compared to standard laboratory methods, NIR does not measure minerals as accurately as it measures organic compounds. However, the values obtained are usually closer to the true value than "book values" and are satisfactory for developing rations, except when mineral imbalances in the diet need to be corrected. When this occurs, determine mineral content using standard laboratory methods.

During the first six months of the Nebraska Dairy NIR program, the demonstration dairy herds have tested alfalfa ranging from 0.53 to 0.74 Mcal/lb for NE_L . These energy values are similar to values for late-cut grass hay and high-grain corn silage, respectively. Crude protein has ranged from 14 to 26 percent. When soybean meal is \$200/ton, the protein equivalent value of these alfalfas differed by \$48 per ton.

How Can You Test Your Forages?

A major goal of the Nebraska NIR program is to stimulate increased forage testing and use of

those tests. All extension offices have postage-paid mailers for sending samples and some have hay sampling probes. Mailers include a plastic bag to hold the sample, sampling instructions, and a record form to identify your sample and on which we print the results. Mailers are also available from Nebraska DHIA.

Many commercial labs in Nebraska test forages using standard laboratory methods. If you already test with one of them and are satisfied with your results and service, keep using them. However, if you want to give NIR a try, the University of Nebraska NIR Feed Test Laboratory will serve your needs. Pick up a mailer at your extension office and follow the instructions inside.

Application of Forage Test Results

Ration balancing. Values for CP, ADF (used to calculate energy values), Ca and P are frequently used to develop rations for most livestock. NDF is also useful in dairy rations because of its close relationship to intake.

Forage test results allow targeting specific forages for special use. High quality forage can be fed to the most productive livestock or when nutrient needs are highest. Low quality feed can be fed when nutrient needs are lower.

With feed analysis, least cost supplements can be developed that will allow maximum use of nutrients in forage and reduce costs of purchased, higher cost feeds.

Hay marketing. Organoleptic

characteristics such as color, odor, leafiness, maturity and mold have long been used to evaluate cash hay. This method alone, can give misleading information on feed value. Lab tests provide unbiased, objective measures of feed value. These values together with certain organoleptic qualities serve as realistic measures of feed value for marketing.

Improving forage production.

Forage tests can be used to identify cultural practices that can be improved, or they can measure progress or changes in feed value resulting from modified production. Production and quality goals can thus be set that can be described and measured.

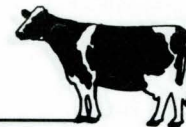
Laboratory Certification

The University of Nebraska NIR Feed Test Laboratory participates in a voluntary lab certification program. This program is managed by the National Alfalfa Hay Quality Testing Association. Samples are sent throughout the year to laboratories participating in the program. Lab results for dry matter, crude protein, and acid detergent fiber are compared among all labs. Because results from UNL compared well with labs across the country, the University of Nebraska NIR Feed Test Laboratory is a certified laboratory for 1988.

¹Bruce Anderson is an Associate Professor of Agronomy and Extension Forage Specialist, Department of Agronomy, University of Nebraska.



Figure 2. Results of NIR analyses must be studied and properly interpreted for use in ration formulation or marketing of hay.



Demonstration Herds Strive for Maximum Feed Efficiency

Don J. Kubik¹

Feeding efficiency is the primary goal of the 28 demonstration herds in a new extension project. They will be cooperating with University of Nebraska extension staff and their milk market fieldmen for the next two years. Decreasing feed cost per cow, while obtaining the maximum profitable milk production, is the goal.

Even with today's lower feed costs, it is still important to closely balance rations as in times of higher priced feeds. However, lower milk prices and the prospect for higher feed prices in the near future makes it very important to start improving efficiency.

Feeding the lowest cost, balanced rations is much more than just mathematical calculations. Every cow in the herd must be fed and eat a balanced ration for a feeding program to be the most cost effective. Many dairies in Nebraska, like the demonstration herds, are not currently set up to accomplish this.

Feeding Efficiency Guides

To obtain maximum feeding efficiency:

1. Excellent forage must be selected, harvested, preserved and fed.
2. All forages must be properly sampled and analyzed.

3) Rations must be balanced using feed analysis and fortified with the proper minerals and vitamins and appropriate additives.

4. Feeds are weighed, measured and mixed correctly.

5. Rations and amounts are fed according to production, age, body condition and environment.

6. A good heifer-raising and dry cow-feeding program is maintained.

7. Most economical supplements are selected.

8. Overformulation and unnecessary additives are avoided.

These necessary steps were accomplished in most of the demonstration herds within the first six months with little or no added expense. A few herds still need to group their cows by production, buy a weighing device or fix parlor grain feeders to accomplish maximum efficiency.

Problem Areas

Silos full of low quality forage is one problem which exists this year at three dairies. These include low quality haylage and hail-damaged corn silage. This problem can be avoided next year with planning and a little luck.

One farming decision which becomes a limiting factor for milk production is the production of sor-

ghum silage for the milking herd. This decision greatly increases the cost of the grain ration when sorghum silage is the principal forage. It makes balancing a ration for the high producers and fresh cows nearly impossible. There are two ways to minimize the effect of this low quality forage. First, feed a high percentage of high quality alfalfa with the sorghum silage. Second, add fat to these rations. However, this increases the cost and is difficult to handle on the farm.

Two other situations which present real problems in balancing rations are running the milking herd on corn stalks and/or pasture. Both of these sources of feed vary greatly in quality so rations must be overformulated and still may not provide a balanced ration much of the time the cows are on these feeds.

Another problem situation is grinding, storing and handling hay, unprotected, outside. Wind, rain and snow cause deterioration of feed quality and reduces intake.

Changes Made for Better Feeding

Below are some simple, low-cost or no-cost adjustments that the demonstration herds have made to improve their feeding efficiency.

Roughages

- Bought excellent alfalfa hay and sold their poor hay.
- Tested and selected silage bags with the best hay silage for high cows.
- Reduced the percent of sorghum silage fed to milking cows and other livestock and increased alfalfa hay.
- Fed hay stored outside before feeding that stored under cover.
- Blended hay with silage instead of feeding each free choice.
- Covered feed bunk.
- Tested and fed highest quality hay to the high producers where it is needed the most.
- Dry hay was blended into haylage daily to eliminate need for reconstituting into oxygen limiting structure.



Figure 1. Marking cows with various colored plastic tape is one method used to aid in regulating "feed to need".

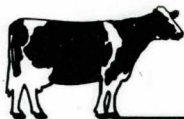


Figure 2. Good forage samples are essential for forage evaluation and sound ration formulation.

- Weigh cells were purchased for feed wagon.
- Baled hay was weighed to control intake.
- Loader bucket was calibrated for weight of different forages.
- Sampled all alfalfa hay before being purchased and bought only excellent quality.

Grain Rations

- Parlor grain feeders were calibrated by weighing dumps.
- Dump measures at grinder mixer were calibrated for adding supplements.
- Premixes were weighed and bagged for daily additions to roughages.
- A separate grain ration was balanced, mixed and fed to fresh cows to allow a better ration and make added niacin cost effective.
- Using colored plastic tape, cows were color-coded according to the amount of grain-to-feed, to allow feeding in the parlor without having to identify each cow while milking each day.
- Duplication of additives were eliminated where they were contained in more than one supplement.
- Non-proven additives were eliminated.
- Additives not cost effective were eliminated.

Feed Selections

- The following feeds were purchased or used by various herds to improve ration quality or reduce the cost: raw soybeans, soyhulls, wheat midds, ear corn, niacin, animal fat, meat & bone meal, distillers grains, dicalcium phosphate, limestone, and trace mineral salt.

Unfortunately for some producers, the area of the state makes a big difference as to which feeds can be delivered to the dairy farm and still be cost effective.

Feeding

Three herds have divided the milking herd into production groups and one has ceased feeding in the parlor. A number of herds are feeding silage before freshening to help the rumen adjust to fermented feeds.

The primary objective next year will be to obtain as much high quality forage and as high a percentage of alfalfa as possible for the milking herd. Maximum efficiency can only be obtained with adequate high quality forage.

¹Don Kubik is an Extension Dairy Specialist, Department of Animal Science, University of Nebraska.

Calf Workshops Reduce Calf Losses

Foster G. Owen
Duane N. Rice¹

Eight one-day Calf Workshops were held in 1984 at locations across Eastern Nebraska to help dairy producers become more successful in raising dairy replacements.

These workshops were conducted for three reasons. First, to reduce death losses and to promote increased use of semen from bulls with high genetic ability for milk. To improve dairy herd productivity we need to produce a maximum number of high quality heifers. About 10,000 heifer calves die yearly in Nebraska. These losses are costly and they also reduce opportunity for culling poor animals from the herd. This both reduces production level and slows genetic progress. Most heifers in Nebraska are not bred artificially (AI), and even the semen now being used is from bulls of lower genetic ability than those used in most other states.

Secondly, there is a need to reduce the cost of raising heifers. Raising replacement heifers is second only to feed cost as an expense item in the production of milk.

The third reason for the workshops was to make available to dairy producers current knowledge and technology needed to accomplish improvements in calf rearing while minimizing large expenses.

These one-day workshops included short lectures, exercises, quizzes, demonstrations and hands on work with calves made available by participants. All producers received an information packet with materials for use in the workshop and guides to use on the farm.

Survey

In 1986 a follow-up survey of workshop participants was conducted to help evaluate changes made in calf-raising practices following the workshop. The intent was to com-



pare calf performance following the 1984 workshops. Survey forms were completed by representatives of 84 herds during the workshops. In 1986, follow-up survey responses were obtained from 53 producers, about one and one-half years following the workshop.

Changes in Practices and Performance

Breeding of Heifers. A higher percentage of heifers are now bred by artificial insemination (Table 1). In the follow-up survey 58 percent of heifers were bred AI, with 46 percent of producers breeding 90 percent or more of their heifers AI. Before the workshops only 49 percent of heifers were being artificially inseminated. Herds **not** using AI for breeding decreased from 39 percent to 27 percent by 1986.

Table 1. Changes in Calf Breeding and Feeding

	1984 Survey	1986 Survey
Breeding		
A. Heifers bred AI	49%	58%
B. None bred AI	39%	27%

Housing. Housing environment is closely related to cow and calf health performance. Individual calf huts are usually superior to other housing methods in maintaining health of baby calves. Yet they are less expensive to acquire and maintain and are also more adaptable to changing herd sizes and hut locations. Consequently, huts are generally recommended. In the follow-up survey, 60 percent of the herds had huts for housing calves from birth to three months of age (Table 2). This contrasts with only 52 percent using them in 1984. Subsequent to the workshops 21 percent indicated changes were made in baby calf housing; many had built huts or improved hut management, whereas other dairymen had shifted from using group pens to using individual pens.

Only 50 percent of the heifers between 3 and 12 months of age were provided with sheds for housing according to the first survey, whereas 81 percent reported use of sheds in the follow-up survey. Those indicat-

Table 2. Changes in Calf Housing Following Workshops

	1984 Survey	1986 Survey
<i>Calf Housing (Birth 3 months)</i>		
A. Huts	52%	60%
B. Change in housing since workshop:		21%
• "Building more, better outside huts"		
• "Huts cleaned and limed after use"		
• "Zigzagged hutches through winter" (cut losses 98%)		
• "Use gravel base under huts"		
• "Block huts off ground in summer"		
• "Housing heifers separately"		
• "Shifted from group to individual pens"		
<i>Calf Housing (3-12 months)</i>		
A. Open shed	50%	81%
B. Changes since workshop		8%
• "Built new shed"		
• "Shed them in winter"		
• "Went to shelter, had them in the open"		

ing changes had constructed new sheds or provided other shelter during the winter rather than leaving heifers entirely in the open.

Feeding. Major changes were made in feeding, primarily related to reducing the cost of feeding (Table 2). Shifting from the use of saleable milk to using only unsaleable "waste milk" for baby calves can save about \$70 per calf. Following the workshops, use of excess colostrum increased from 26 percent to 75 percent and use of other "waste milks" (antibiotic treated milk and mastitis milk) from 24 percent to 69 percent. At the present time 56 percent are using no saleable milk for feeding their calves (some use milk replacer) and 32 percent feed only

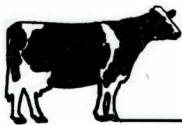
waste milks and excess colostrum. Reported weaning age and age when calves are shifted from starter to grower was much earlier than reported in a previous survey of DHIA members, suggesting that the workshop also may have produced this change.

Management. The workshop emphasis was directed toward colostrum feeding to optimize its effectiveness in preventing disease. Thirty percent of participants indicated they had made changes in colostrum feeding since the workshop (Table 3).

Thirty-eight percent indicated they had improved the extent or methods used for monitoring calf growth to provide data supporting



Figure 1. Freezing is an excellent method for saving excess colostrum for later use to replace saleable milk for feeding baby calves.



the goal for normal development. Thirty-four percent of participants made specific changes in calf management to reduce raising costs.

Following the workshops 32 percent of the respondents had revised their vaccination program, 32 percent had altered medical procedures and 34 percent had made improvements in housing and environment.

Health. A practical, yet attainable, goal in calf raising is to limit calf death losses to less than 5 percent. The average death loss reported by those at the workshops was 8 percent. The follow-up survey showed an average loss of only 5 percent, thus, a 40 percent reduction. In the first survey 55 percent reported losses of less than 5 percent. In the follow-up survey this had increased to 73 percent. Additionally, 52 percent indicated they had reduced scours problems and 42 percent reduced respiratory dis-

orders. Although many factors can affect health data, adoption of specific practices, as cited, is conducive to disease prevention.

Summary

This survey showed that dairy producers can make important improvements in calf raising by introducing the use of the latest proven practices. By greater attention to nutrition, genetics, and health management, those who attended these workshops reduced calf losses by 40 percent, reduced raising cost and initiated breeding for better genetic ability in their replacement animals.

¹Foster G. Owen is an Extension Dairy Specialist, Department of Animal Science; Duane N. Rice, is Extension Veterinarian, Department of Veterinary Science, University of Nebraska.

Table 3. Changes in Calf Health and Management Following Workshops

	1984 Survey	1986 Survey
<i>Changes in Management (following workshop)</i>		
Colostrum feeding		30%
Calving, birth process		13%
Vaccinations		32%
Medication		32%
Housing or environment		34%
Monitoring growth		38%
Specific changes to reduce costs		34%
Other changes		28%
<i>Calf Health</i>		
A. Death losses:		
Average	8%	5%
< 5%	55%	73%
B. Reduced problems with: (since workshop)		
Scours		58%
Pneumonia		42%

Saving From Improving Reproductive Performance

Jeffrey F. Keown¹

During December 1986 through March 1987, a Reproductive Workshop was held at 24 local DHIA annual meetings. The meeting consisted of a presentation indicating how better reproductive management of the herd could substantially increase income to the producer. The four major reproductive areas covered were:

- 1) Reducing calving interval
- 2) Reducing days dry
- 3) Improving A.I. performance (increasing conception rate)
- 4) Reduce the age at first calving

After the presentation producers present were given their reproductive statistical summary from the DHIA records. Each producer then calculated the cumulative losses encountered for his or her own operation compared with the Nebraska average. A NebGuide entitled "How to Estimate a Dairy Herd's Reproductive Losses" (G86-822) was used as a worksheet for estimating potential gains by changing various management practices. (Copies of this NebGuide are still available to any producer who would like to re-calculate losses using 1988 data.) Included in this NebGuide were the recommended guides for producers to take inventory of their own herd's reproductive performance and check areas that needed attention.

The various losses encountered in 1986 for Nebraska DHIA herds (530 herds) in the reproductive area are given in Table 1. These were used as a standard with which those attending the meeting could compare their own losses.



Table 1. Nebraska average herd reproductive statistics

Calving interval, days	398
Days dry	65
Service/conception	1.7
Age at first calving, mo	28
First lactation cows, no.	26
Total no. cows	75
Reproductive loss/cow	\$ 98
Reproductive loss/herd	\$7,350

Given the average loss of \$7,350 (ranges from \$0 to \$50,000), the 530 DHIA herds are losing an estimated \$3.9 million per year. The total estimated loss for Nebraska can be conservatively estimated for the 2,000 dairy herds at approximately \$15 million (\$7,400 x 2000). The potential gain in improving the income potential to Nebraska producers is substantial.

The majority of producers attending the workshops indicated they were unaware of any reproductive losses since they judged their reproductive performance by the number of herd replacements. If they had enough replacements to maintain the same herd size and take care of voluntary and involuntary culling rates, they judged their herd's reproductive performance and their handling of all reproductive aspects of their herd as above average.

After the workshops, a questionnaire was presented to a random sample of those attending to gain information on their major reproductive problems and to obtain input into future planning. A few representative responses for the questions are listed below:

1. Were you aware of your potential reproductive dollar gains before the meeting?
Yes 37 percent No 63 percent

2. Do you plan to work on one or two areas more closely in the coming months?
Yes 81 percent No 19 percent

3. Which of the following changes will you consider making?

21 percent 1) Reducing Calving Interval

13 percent 2) Reduce Average Number of Days Dry

21 percent 3) Improve Heat Detection

4 percent 4) Use Heat Detection Aids

30 percent 5) Reduce Age at First Freshening

4. What are the major obstacles to improved reproductive performance in your herd?

"How does 3X milking effect my reproductive herd health?"

"Having trouble in A.I. technique"

"Poor owner motivation"

"Do not take time for heat detection"

"Need to reduce age of first calf heifers"

"Better heat detection"

"Need to record heat dates"

"Need better heifer growing rations"

"How does high energy feeding effect reproductive performance?"

"Need to take an A.I. course"

"Need to have heat detection as an assigned task"

5. What areas would you like to see discussed more in depth?

"Improved heat detection"

"Reduce age at first freshening"

"Having trouble with everything"

"Heifer rations"

"Actual production costs to produce 100 pounds of milk"

"How do feed costs relate to herd average and profitability"

"How will bovine growth hormone effect the small farmer?"

"Why does reproduction decrease as herd production increases?"

6. How do you feel DHIA could better help you in the reproductive area?

"Develop a reproductive worksheet similar to the one presented on a regular 6-month basis so that changes can be monitored"

"Buy my herd and let Extension run it so everything will be done perfectly"

"DHIA does a good job. I just need to work harder."

"DHIA is doing a good job in bringing in new management tools, now it is up to the farmers to use the tools"

"More workshops on reproduction"

"Information on calf raising"

These responses will be reviewed by the Extension dairy group and used as a basis for developing additional NebGuides and workshops

for future extension effort. We feel these comments will be an invaluable aid in meeting the needs of producers.

We thank everyone who responded to the survey. It is only by gaining input from you, the producer, that we are able to judge the effectiveness of our programs.

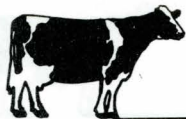
Jeffery F. Keown is an Extension Dairy Specialist, Department of Animal Science, University of Nebraska.

Sorghum Grain in Dairy Rations

The acceptance and use of sorghum grain in dairy rations is limited mainly for two reasons. One is prejudice against sorghum grain, most likely because of reports of its slightly lower nutritional value compared with corn in rations for other livestock and poultry. Although its protein varies more than corn, the average value for sorghum grain is higher than corn. The other factor limiting the use of sorghum grain in dairy rations is its density and dustiness. These factors tend to reduce rate of eating. Yet fine grinding is known to be necessary for good digestibility.

Most of our herds in the Midwest are fed their grain ration while being milked in a parlor-type system. In this system cows often have less time for eating their grain than is needed, especially for high ability cows. Therefore, we have conducted trials showing that we can improve rate of intake by reducing dustiness with added fat and by including bulky feeds such as oats. Next, we plan to compare sorghum grain and corn in both early and mid-lactation rations. These grains will also be compared in complete mixed rations (CMR) and in separate-fed grain and forage rations.

Foster G. Owen
Extension Dairy Specialist



A Semen Selection Plan That Makes Sense

Jeffrey F. Keown¹

Many producers become overwhelmed when looking at a sire catalog or when discussing bulls with an Artificial Insemination (A.I.) salesperson. The confusion is justified because it seems as if every A.I. organization has a minimum of 20 or more traits or characteristics listed as potential selection criteria. Selecting a group of sires to use in a sound, long term breeding program is not as complicated as you might think. There are a few basic rules, or guidelines, you can follow to wade through the voluminous data that each A.I. organization publishes.

The first important point to remember is that each organization is a sales business. Each company or cooperative needs to establish a market niche if it is to survive and prosper. Some go the route of offering evaluations on traits that others do not; thus, offering a unique sales approach that will help sell their product. Others offer a complete mating program so they can tie a producer to a given organization and, therefore, create an attachment to the organization and its personnel. These are all excellent methods of doing business. In fact, this is exactly what the soft drink, fast food chains and other companies do on a routine basis. Too often, however, when we become a long term user of any product, we fail to look at the entire picture and may become reluctant to reevaluate our basic goals to see if we are actually getting the best product for our herd's future profit potential.

All A.I. organizations do an excellent job in running top young sire programs. Obviously, there are differences among individual programs, but each A.I. unit has as its major goal that of providing top genetic potential sires to today's dairy producers. Each organization

also does an excellent job in evaluating the daughters of a young A.I. proven sire so they are confident that the production proofs are accurate and the sires are not transmitting any undesirable traits to their

offspring. Given these excellent programs how should one look at the figures presented to select the best among the best?

Select on PD\$

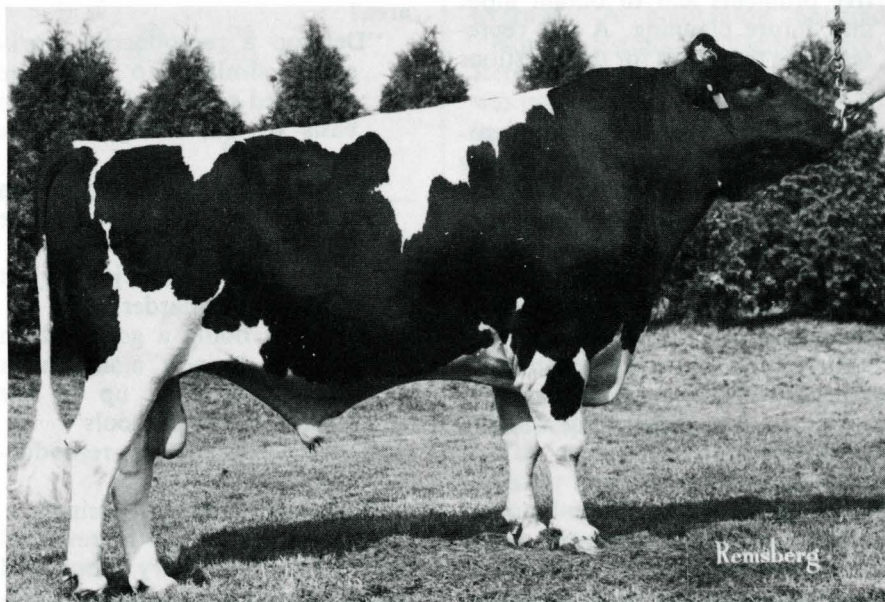
First, ask yourself what production traits are returning you the most income? In our state, dairy farm income comes mainly from the sale of milk, fat and solids non-fat. Very little farm income is generated from the sale of breeding stock (except bull calves and cull dairy cows) when compared with the sale of milk. **Therefore, you should select first on production.** The USDA Sire Evaluation System ranks sires based on PD\$. This figure tells you the dollar value of the sire's milk and fat production. Sires are ranked by percentile. If you want to stay with the top sires, select only those sires in the 90th percentile and higher. *Hoard's Dairyman*, as well as other dairy magazines, publish these rankings twice per year — this is an excellent source for production information. **Remember your primary basis for selecting sires should be to select from the top 90th percentile bulls with the highest PD\$.**

Repeatability

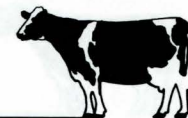
How should you use repeatability in a breeding program? One simple rule of thumb is to use only A.I. proven sires that are above 65 percent repeatability. By selecting at the 65 percent level or higher, you protect yourself against possible drastic drops in sire proofs when they obtain additional daughters. Also, do not use any one sire too heavily — select a group of sires. For a typical Nebraska herd a group of 7 to 10 is recommended. Every producer on test should use a group of young unproven sires and these should encompass no more than 15 percent of your breeding units in any given year. If you use sires below 65 percent repeatability, treat them as young unproven sires.

Mating Programs

Mating programs can be of some use in your breeding program if you follow one basic principle. **Select your group of sires on production traits first and then "trait mate" if you wish.** All too often we find producers selecting bulls on non-production traits without much em-



Choosing from among the top A.I. sires need not be confusing.



phasis on the production evaluations. Select on production (90th percentile and higher sires) and then, if you wish, differentially mate those sires to individual cows. The non-production traits are not as well evaluated as production traits and, therefore, should not be used as a primary selection trait — **they should only be used as secondary selection criteria.** If you are involved in an A.I. mating program, be certain you have selected your group of A.I. sires for production or put minimum standards on the sires you wish to use. Mating systems are an excellent way for A.I. organizations to promote the use of sires that otherwise are not top sellers. With the number of non-production traits evaluated on a sire, one can always find something good about each bull.

Semen Costs

The money you are willing to pay for semen is an important decision. It is difficult to justify paying more than \$20 per breeding unit if you are not merchandising breeding stock. Remember all sires are highly selected and will have offspring that are functionally sound. The cost of semen within a given production level is based primarily on the Predicted Difference Type (PDT) of the sire. The higher the PDT, the greater the cost. Look over your semen sales representatives' catalog carefully -- you will be certain to uncover some excellent buys. Each company has several high production sires which are reasonably priced. Always purchase the best production sires at the lowest cost you will then be maximizing your return over investment. You need not be concerned about losing functional type in your herd by solely selecting on PD\$. The A.I. organizations do an excellent job of weeding out the poor sires for non-production traits. Their entire future profitability rests on providing a good product.

Putting Everything Together

Let's put our recommendations in a simple outline form:

- 1) Always use groups of A.I.

proven sires (7 to 10 per herd per year).

- 2) Select from sires in the 90th percentile or higher (*Hoard's Dairyman* list).

- 3) Use sires with 65 percent repeatability or higher.

- 4) Non-production traits should be a secondary selection tool select on production first.

- 5) Use young sires as a group (15% of your semen purchases).

- 6) If using a mating service, select on production traits first, or put a minimum on the PD\$ you will accept.

- 7) Look for the best buys available.

Following these seven basic rules will yield you increased income and excellent returns over investment. Remember the genetic potential of your herd is your legacy. Why not pass on a superior genetic level herd to your family?

¹Jeffrey F. Keown is an Extension Dairy Specialist, Department of Animal Science, University of Nebraska.

Hominy Feed in Lactation Rations

In the dry milling of corn for the manufacture of pearl hominy, hominy grits (table meal) a by-product is produced called hominy feed.

Hominy feed contains a mixture of corn bran, corn germ and part of the starch portion of the corn kernel. The nutrient content of hominy feed suggests it may be even a more valuable ingredient for dairy rations than corn. It is higher in fat and in fiber than corn. However, little research data is available on the value of this by-product for dairy cattle. We have conducted research to compare hominy feed and corn in rations of milking cows. Data is now being summarized for analysis.

Foster G. Owen
Extension Dairy Specialist

How Much Does A Herd Sire Cost?

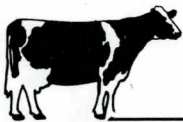
Jeffrey F. Keown¹

If we were to ask producers this question — "How much does a herd sire cost?" — what do you think the response would be? I am certain most dairy producers would respond "not much".

Recently a study was conducted at the University of Wisconsin (1) addressing this question. The figures they published might surprise you. The total cost of keeping a herd sire was \$1,211 per year on a 40-cow-15-heifer farm. This comes to \$22 per cow or breeding heifer.

Their study placed a value of \$10 per conception from the bull to offset the variable costs (feeding, bedding, veterinary and medical costs) and fixed costs (depreciation, interest, insurance on building and equipment and repair costs). This report is one of the most complete ever conducted on the subject and clearly points out the high costs associated with a herd sire.

The direct costs are substantial, but you should also consider the indirect costs associated with a herd sire. First, figure the income you could receive by replacing the bull with a producing female (about \$800) and add this to the \$1,211 yearly figure for keeping the sire. Your costs have already risen to near the \$2,000 figure. This raises the cost to \$36 per breeding age animal. The loss in genetic potential is also substantial. USDA data for January 1987 shows that an average herd sire has a PD\$ (Predicted Difference) value of \$126 less than an average A.I. sire. Remember, we are comparing averages. Your herd sire's genetic potential could be less than the average, whereas every producer has the opportunity to use A.I. sires which are much better than average sires. You also run the risk of transmitting reproductive diseases throughout your herd, as well as having a functional weakness show up in your herd when using a herd sire. We have only figured in the dollar losses — you can never



put a dollar figure on the injuries and fatalities that occur each year when handling herd sires.

Every time you look at your herd sire, remember what he is costing you. You can breed to the nation's best sires for the same as it costs to use a herd sire.

Considering the many obvious advantages in using A.I., why not switch or at least give it a good try. Call your local A.I. representative and register for a training course. The time and money spent will certainly be worth it. Your herd will perform better you will generate more milk income and your cattle will be worth more. Let's make this the year you change one management option in your herd and let it be to replace the herd sire.

(1.) Johnston, R.P., Jr., A.G. Sendelbach and W.T. Howard. 1987. The annual cost of a herd sire. University of Wisconsin. A3022.

¹Jeffrey F. Keown is an Extension Dairy Specialist, Department of Animal Science, University of Nebraska.

Progesterone Therapy and Reproduction in Holstein Cows and Heifers

Gregory E. Weaver
Larry L. Larson¹

Economic losses due to poor reproductive efficiency are potentially great. Current annual losses have been estimated at \$83 per cow. In a herd of 150 cows, this loss equals \$12,450. Not only does poor reproductive efficiency reduce current income, but it also slows the genetic progress of the herd. Therefore, profitability is greatly influenced by the level of reproductive performance in a herd.

Since hormones have become commercially available, many potential uses in management have been examined. Progesterone is a steroid hormone produced in the ovary. A minimum concentration of progesterone in the blood is necessary for a cow to maintain a pregnancy. Knowing this, injections of progesterone have been administered to repeat breeder cows and cows with a history of abortions to artificially elevate the circulating concentrations of progesterone in the blood.

Some investigators have suggested that artificially-elevated progesterone levels during one estrous cycle might depress concentrations of progesterone produced naturally by the ovary during the next estrous cycle. If this is true, injections of progesterone given to an animal that is not pregnant or suffers early embryo loss could reduce the chance of conception and maintenance of pregnancy at future breedings. Therefore, we conducted two trials to examine the effect of giving injections of progesterone in the muscle on circulating concentrations of progesterone in the blood.

In the first trial we used 26 lactating Holstein cows to determine the influence of progesterone injections, cow age and ration protein (14% vs 20%) on concentrations of progesterone in the blood. The high protein diet elevated serum urea

nitrogen from 11.33 mg/dl in the cows on the low protein diet to 26.18 mg/dl in cows on the high protein diet. The intramuscular injection of progesterone on day 4 of the estrous cycle elevated circulating concentrations of progesterone in the blood compared to the control cows for 48 hours after the injection. However, progesterone concentrations in the blood on day 11 of the cycle during which the injection was given and on day 11 of the subsequent estrous cycle were not affected by any of the factors. Neither was the length of the estrous cycle affected. The injection of progesterone into the muscle elevated the blood progesterone concentrations more in the younger compared to the older cows. No differences were found due to the level of protein in the diet.

In the second trial we used 25 cycling Holstein heifers. Each received an intramuscular injection on day 8 and day 15 of the estrous cycle of saline or progesterone (50 mg/ml) at 1 ml per 100 lb body weight. Concentrations of progesterone in the blood were not significantly elevated following the injection of progesterone on day 8 compared to the saline-treated heifers. Although blood progesterone appeared to be elevated, the response was extremely variable and this difference was not statistically significant. Injecting progesterone into the

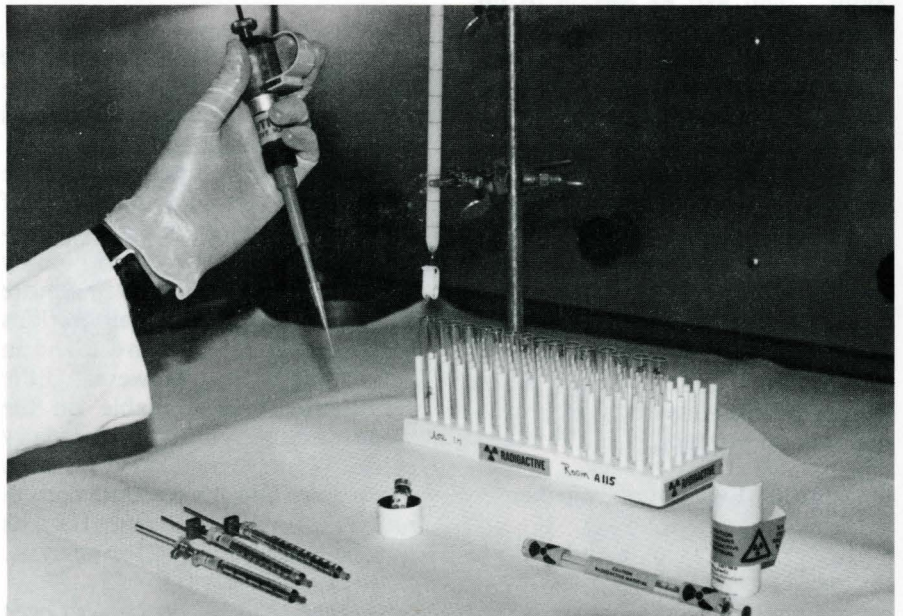
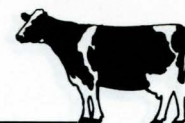


Figure 1. Researchers measure blood progesterone to evaluate the reproductive status of cows.



muscle on day 15 of the estrous cycle elevated concentrations of progesterone in the blood for only 2 hours following the injection. There was no difference in the length of the estrous cycle during which the injection was given. However, several heifers failed to initiate a new estrous cycle at the expected time and had a prolonged period of inactivity between cycles. The percentage of heifers in which the start of the next estrous cycle was delayed was: saline injections on days 8 and 15, 37.5 percent (3 of 8 heifers); progesterone injection on day 8 and saline on day 15, 66.7 percent (6 of 9 heifers); and progesterone injections on both days 8 and 15, 100 percent (8 of 8 heifers). Although the start of the subsequent cycle was delayed in the groups injected with progesterone, the concentrations of progesterone in the blood and the length of the subsequent cycle were not affected by the treatments.

In summary, the results show that injections of progesterone into the muscle elevates the concentrations of progesterone in the blood for only a short period (48 hours in cows and 2 hours in heifers at the doses used in these trials). These injections of progesterone might delay the start of the next reproductive cycle in animals that are not pregnant depending on the time and number of injections given, but no long term detrimental effects were observed.

If intramuscular injections of progesterone promote the maintenance of pregnancy by elevating blood progesterone levels, the frequency of injection and dosage required to keep the blood levels elevated needs to be determined.

¹Gregory E. Weaver is a graduate student, and Larry L. Larson is an Associate Professor, Department of Animal Science, University of Nebraska.

Dietary Protein Level and Reproductive Performance

John P. Sonderman
Larry L. Larson¹

Reproductive performance in dairy herds has declined over the years. This decline appears to be due to changes in management practices in an attempt to increase milk production per cow. The major source of income for a commercial dairy farmer is sale of milk. In attempts to maximize their cow's milk production, dairymen have used artificial insemination to increase genetic ability for milk production, improved nutrition and developed new feeding techniques. With the increase in genetic ability for milk secretion, satisfying nutritional requirements for both maximum milk production and optimum reproductive performance has become more difficult.

Several studies indicated that excessive or high dietary protein levels were detrimental to reproduction, while little relationship was found in other studies. Some of the differences in response might be due to the proportion of rumen degradable

and undegradable protein fed, the relative energy balance of the diet, and the feeding method (i.e., a complete mixed ration or concentrate and forage fed separately).

The reason excessive dietary protein might be detrimental to reproduction and the specific sites of action are not known. Two possibilities are: (a) excess ammonia absorbed from the rumen alters biochemical, hormonal or tissue function; or (b) additional absorbed protein alters the balance of net protein and net energy to cause a relative energy deficiency.

Swedish and German workers have reported increases in days open and services per conception when ammonia levels in blood increased. An increase in ammonia levels may be due to increases in level of dietary protein, increases in rumen degradability of protein or decreased usable energy in the diet.

One possible mechanism by which increased blood ammonia levels

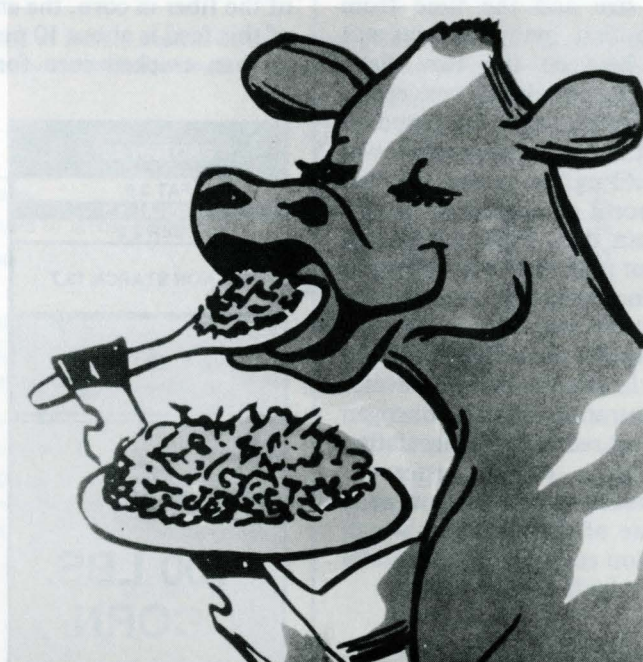
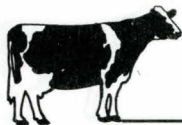


Figure 1. Does the amount and type of protein in a cow's diet interfere with normal reproduction?



could be detrimental to fertility is by decreasing the circulating concentrations of progesterone in the blood. North Carolina researchers reported that conception at first insemination postpartum increased in proportion to concentration of progesterone in the blood during the luteal phase of the estrous cycle preceding insemination. Oregon workers reported concentrations of progesterone in the blood decreased when increasing levels of dietary protein were fed.

In a University of Nebraska trial, 63 Holstein cows were used to determine effect of dietary protein level on recovery of the reproductive tract following calving and milking performance. Blood samples were collected from 34 of these cows to determine the effect of the dietary protein level on circulating concentrations of progesterone in the blood. The experimental diets were fed during the first 14 weeks of lactation and contained either 14 percent or 20 percent crude protein (dry matter basis).

Urea nitrogen concentrations in the blood serum were higher (29.3 vs 12.7 mg/dl) in cows fed the diet containing 20 percent crude protein, confirming that the dietary treatments affected nitrogen metabolism. The number of days required for the uterus to return to its non-pregnant size and the time from calving to first ovulation was not different between the two diets. However, the circulating concentration of progesterone in the blood on day 12 of the estrous cycle was lower (3.33 vs 4.61 ng/ml) in the cows fed the 20 percent compared to 14 percent protein diet. Feed intake was greater, but milk yield was not significantly increased by feeding the higher protein diet.

These results show that feeding a diet high in protein which elevates the concentration of urea nitrogen in the blood reduces the circulating concentrations of progesterone. Thus, reduced blood progesterone may be one of the means by which reproduction could be detrimentally affected by high dietary protein.

¹John P. Sonderman is a graduate student, and Larry L. Larson is an Associate Professor, Department of Animal Science, University of Nebraska.

Distillers Grains in Dairy Rations

Foster Owen
Larry Larson¹

Dairy producers should be aware that distillers grains is an excellent feed ingredient which is now available in Nebraska for dairy rations. A new alcohol plant at Hastings, Nebraska, is producing large quantities of this by-product. There are also plants at Hamburg, Iowa, and Atchison, Kansas that are even closer to our dairy producers in southeast Nebraska.

In processing grains for alcohol production, about one-third of the original dry grain is recovered as residue, 20 percent of which is recovered as distillers grains and 13 percent as distillers solubles. The product usually marketed for livestock feeding is a dried mixture of the distillers grains and solubles. This is called distillers dried grains with solubles.

Table 1 shows that corn distillers dried grains contain about three times as much protein, fat and fiber as the corn grain from which it was produced. Removing starch during processing increases the proportions of these nutrients. Because of the higher fat and the excellent quality of the fiber in corn, the energy value of this feed is about 10 percent higher than cracked corn for the dairy cow.

Table 1. Composition of Distillers Dried Grains and Corn Grain

	Corn grain	Distillers dried grains plus solubles
	(%, dry basis)	
Protein, %	10	30
Fat, %	3.3	10.0
Crude fiber, %	2.6	10.0
Net energy, lactation, Mcal/lb	.84	.92
Total Digestible Nutrients, %	80	88
Starch, %	72	<5

A common problem in formulating rations for high producing dairy cows is providing both adequate energy and fiber, while avoiding excessive starch. Distillers grains is one of only a few feeds which contain both high energy and fiber and are also practically devoid of starch.

A number of experiments were conducted in the 1950's to evaluate distillers grains in dairy rations. Results showed that including distillers grains as a protein source gave higher milk yields than cottonseed meal, linseed meal, corn gluten feed, urea or soybean meal. The difference in yield from soybean meal was small (.5 lb milk/day). However, this research was done before

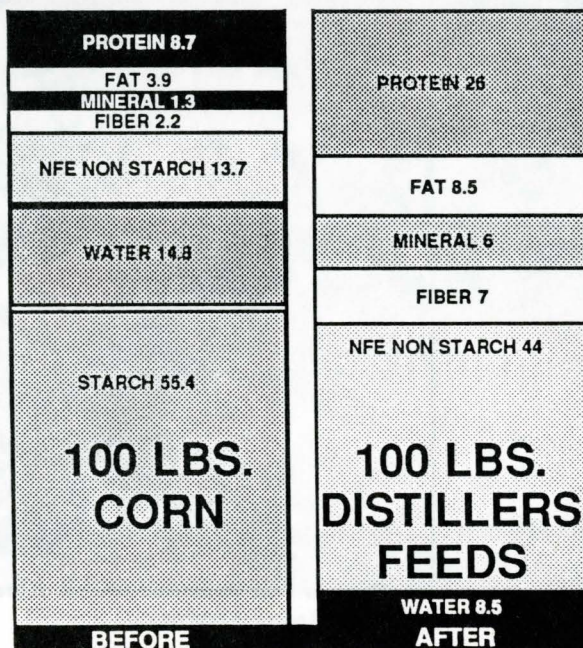


Figure 1. Distillers feeds, resulting from processing corn through a distillery, are a more valuable feed than the corn itself.



the importance of protein resistance to rumen breakdown was recognized. Also, milk yields were much lower than current production levels.

Consequently, we have completed an experiment to compare distillers grains with soybean meal as a protein source.

Experiment

Five rations were fed during this experiment (Table 2). The forage was ammoniated corn silage fed at 50 percent of ration dry matter. The remainder of the ration consisted of one of the concentrate mixtures. The forage and concentrate mixtures were blended together and full-fed as complete mixed rations. The lower level (14.5 percent) of crude protein (CP) was below the 16 percent level recommended for high-producing cows by the National Research Council. This lower level was used to permit expression of any quality difference within the two protein sources. The 18 percent CP rations were included to assure maximum responses to protein and to assess whether the lower levels were below the requirement for protein. These higher levels were also included to determine whether high protein levels and protein quality would influence reproductive performance.

Cows were fed the experimental rations for 12 weeks, starting 2 weeks after freshening.

Results

Milk Yields. Yields of milk, 3.5 percent fat-corrected milk (FCM), fat, protein, lactose and solids-not-fat were not significantly different between the soybean meal and distillers grains 14.5 percent CP diets (Table 3). However, compared with the urea basal diet, cows fed the distillers grains 14.5 percent CP diet produced 4.2 lbs daily more FCM, a difference approaching significance; whereas, FCM yields of cows fed the soybean meal 14.5 percent CP diet exceeded the negative control by only 2.3 lbs daily. The distillers diet with 14.5 percent CP, produced yields of milk essentially equal to the soybean diet with 18 percent CP. Cows fed the 14.5 percent CP soy-

Table 2. Concentrate Mixtures

Protein, %	Basal 14.5	SBM 14.5	DDG 14.5	SBM 18.0	DDG 18.0
Ingredients	(%)	(%)	(%)	(%)	(%)
Corn, rolled	55.0	36.5	19.8	17.8	—
Oats	30.8	30.8	30.8	30.0	16.6
Dical	2.43	2.06	2.24	1.77	2.13
Limestone	2.19	2.29	2.26	2.33	2.31
Molasses	3.50	3.50	3.50	3.50	3.50
Urea	2.45	—	—	—	—
Min premix ¹	2.45	2.45	2.45	2.46	2.45
Vit premix	.30	.30	.30	.30	.30
Ca(SO ₄) ²	1.00	1.00	1.00	1.00	1.00
Soybean meal	21.2	40.95	—	—	—
Distillers dried grains	—	—	37.5	—	71.6

¹Protein levels for which rations were formulated. Actual levels (%) were: 13.7, 15.0, 14.3, 17.2 and 17.2, respectively.

²Includes buffers.

Table 3. Comparison of Distillers Grains and Soybean Meal for Lactating Cows

	Diets				
	BASAL 14.5% CP	DDG 14.5% CP	SBM 14.5% CP	SBM 18% CP	DDG 18% CP
Milk yield, lb/day	72.5	75.6 ^a	74.3	74.4	62.5 ^b
3.5% Fat-corrected milk (FCM) lb/day	73.2	77.4 ^a	75.5	77.1	63.9 ^b
Milk fat, %	3.50	3.61	3.61	3.69	3.76
Milk protein, %	2.86	2.76	2.96	2.99	2.79
Lactose, %	5.06 ^b	5.24 ^a	5.11 ^b	5.02 ^b	5.24
Solids-not-fat, %	8.64	8.70	8.76	8.70	8.76
Somatic cells, 1,000/ml	215	314	624	379	299
Feed intake, as fed, lb	88	97	92	93	87
Dry matter intake, lb	49 ^b	55 ^a	52	53	50
FCM/dry matter intake, lb	1.52	1.40	1.48	1.53	1.34
Protein efficiency ¹ , %	31.3	25.8	30.9	25.6	20.0

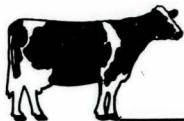
^{a,b}Data with different superscripts differ ($P < .05$) from the DDG 14.5% CP diet.

¹Protein efficiency, % = Yield of milk protein ÷ dietary protein intake x 100.

Table 4. Effect of Dietary Protein on Reproductive Performance (Preliminary Data)

	Diets				
	BASAL 14.5% CP	DDG 14.5% CP	SBM 14.5% CP	SBM 18% CP	DDG 18% CP
Number of cows	16	15	15	16	11
Days postpartum to uterine involution	32	31	38	36	34
First ovulation	33	29	26	42	37
First estrus	41	27	39	36	30
Uterine infection, %	13	20	40	13	27
Ovarian cysts, %	22	7	23	27	18
Pregnant by 98 d, % all cows assigned	38	47	33	31	18
Cows inseminated	55	64	63	51	33
Services/conception	1.5	1.8	2.3	1.8	1.7
BUN ^a , mg/100 ml	12.5	13.0	10.5	18.0	14.5

^aBlood urea nitrogen.



bean meal diet peaked in milk yield earlier than cows fed the 14.5 percent CP distillers grain diet. However, this distillers diet maintained a higher production curve thereafter, resulting in 1.9 lbs more daily FCM yields.

The 18 percent CP distillers grains diet was less effective in supporting lactation than the 14.5 percent CP distillers grains diet, as well as other diets. However, the level of distillers grains included in this grain diet (72 percent) greatly exceeded the levels commonly recommended (33 percent).

Milk Composition. The components of milk (percent fat, percent protein, percent lactose, percent solids-not-fat) differed little among diets. All mean values were within the normal range for Holsteins. However, percentage lactose was higher for the distillers grain diets.

Somatic cells in milk are generally a reflection of the degree of udder infection (mastitis). These data suggest that cows fed distillers grains may be better protected from mastitis, however, these results varied greatly and differences were not significant.

Intake and efficiency. Voluntary intakes of all rations were very good, representing intakes of dry matter of about 4 percent of body weight. Dry matter and "as fed" intakes were highest for the 14.5 percent CP distillers diet. These were significantly greater than intake of the urea basal ration. Efficiency of dry matter conversion to FCM was similar for the distillers grains and soybean meal diets at 14.5 percent CP. Protein efficiency (milk protein yield/protein consumed) appeared to be somewhat lower for the distillers grains diet (14.5 percent CP), but the difference was not statistically significant. In conclusion, in 14.5 percent CP diets, distillers dried grains was equal or superior to soybean meal in supporting dry matter intake, milk yield and fat-corrected milk yield. Performance on the 14.5 percent CP distillers diet was essentially similar to that for the 18 percent SBM diet. Only small differences were noted in milk composition and feed efficiency.

Reproduction. Level of protein in the ration did not appear to be detrimental to reproduction, as has been

reported in some earlier research studies. Neither did the slowly degradable protein source, distillers grains, benefit reproduction as was suggested by certain previous research. The interval from calving to first estrus, as well as the number of services for conception were similar for soybean meal (1.8) and distillers grain treatments (2.0). The percent of cows pregnant at 98 days following calving, however, was smallest for the 18 percent CP distillers grains treatment (18 percent vs 31 to 47 percent for other treatments).

Recommendations

1. Dairy producers can include distillers dried grains in amounts up to 18 percent of the total ration dry matter, or about 35 percent of the concentrate ration and possibly more. However, ration levels of 36 percent distillers grains in total ration dry matter appears to be excessive. They can be used to replace all or part of the supplemental protein needed in milking rations.

2. Distillers dried grains also are effective in increasing ration fiber and lowering the starch level of the ration. Therefore, they may help maintain normal fat tests of herds fed high levels of grain. Lowering the starch is especially important if the grain mixture is pelleted. They are also a good source of slowly degradable protein and may be beneficial to add to a ration of otherwise highly degradable protein. Since corn is relatively lower in lysine than most feeds, greater benefits would be expected from distillers grain when supplementing rations with alfalfa as a major forage, rather than corn silage.

3. Before purchasing, distillers dried grains should be checked for overheating in processing. High quality grains are an amber color, whereas overheated material is brownish in color.

¹Foster Owen is an Extension Dairy Specialist, and Larry Larson is Associate Professor, Department of Animal Science, University of Nebraska.

Soyhulls in Dairy Rations

T. Nakamura
F. G. Owen¹

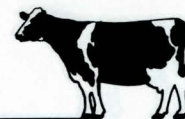
The cows on today's better dairy farms have tremendous ability to produce milk. Through the years, as this increase has occurred we have continually increased the level of grain feeding. With this heavier grain feeding has come a higher incidence of digestive problems, including off-feed condition, indicative of mild acidosis, and depression in fiber digestion, resulting in lowered milk fat test. These problems are strongly related to excessive starch, as well as low fiber in the ration.

How can this problem be avoided? One approach is to locate ingredients which are high in fiber, low in starch and have a high energy value and substitute them for at least part of the grains in the ration. Soyhulls appear to meet this objective very well. Previous experiments at Nebraska showed that soyhulls can be substituted for up to half of the grain ration without decreasing milk production.

Dairy concentrate rations are often prepared as pellets. One reason for pellets is to increase rate of intake by parlor-fed cows. Generally cows do not have enough time for eating when fed in the parlor. Pelleting rations which are high in corn or sorghum grain often cause low milk fat tests. Because of this we decided to test the idea at Nebraska that including soyhulls in pelleted rations may eliminate or minimize the problem of milk fat depression.

Experiment

Three concentrate rations were formulated for testing (Table 1). One contained 90 percent corn, one contained 95 percent soyhulls (no corn), and the other 50 percent soyhulls and 43 percent corn. These mixtures were balanced and fed supplemental to alfalfa silage in a complete mixed ration. Mid-lactation cows (Holstein) were full-fed one of the mixtures for a 4-week period,



then changed to another ration for a second period. Therefore, the 12 cows used in the study were involved in two 4-week trials each, making a total of 24 trials set up to provide a sensitive measure of production differences.

Results

Milk Yields. Daily milk yields were 5.5 lb higher for cows fed the 90 percent corn ration compared with the 95 percent soyhulls ration (Table 2). Cows fed the 50 percent soyhulls ration were not significantly lower in milk yield (2.0 lb) than those fed the 90 percent corn ration. As expected, the soyhulls ration maintained milk fat test significantly better than the corn ration. The 3.49 percent fat in the milk of cows fed the soyhulls ration is near normal for Holsteins, whereas the 3.13 percent for the corn ration is distinctly low. This suggests that pelleting of the high corn diet lowered fat test as a number of previous experiments also showed. Rather than raising the fat test, the soyhulls ration appeared to minimize or prevent a depression from pelleting. The fat test effect on the corn ration resulted in similar 3.5 percent fat-corrected milk (FCM) yields for the three rations. This means that these rations resulted in about the same milk energy yields. Generally these yields correspond to milk income. Using current 1988 milk prices (\$12/100 lb and \$.16 per point of fat), the relative value of milk produced on the corn ration, 50 percent soyhull ration and soyhulls ration was 99 percent, 100 percent, and 98 percent, respectively.

Although the effect of soyhulls on milk fat percent was positive, it had a depressing effect on milk protein. The net effect, however, for the soyhulls ration on milk composition was a slight improvement in percentage of total solids.

Digestibility and efficiency. The digestion of ration dry matter (DM) was depressed as the level of soyhulls in the ration increased. Protein (CP) digestibility was also lower for the soyhulls rations. The drop in digestibility for both DM and CP were primarily with the high soyhulls ration. At this high level the

Table 1. Ingredient Composition of Pelleted Concentrates¹

Ingredients	Rations		
	Corn	Corn/soyhulls	Soyhulls
	----- (% of concentrate) -----		
Corn	90.1	42.9	—
Soyhulls	—	50.0	95.3
Soybean meal	6.34	3.60	1.18
Dicalcium phosphate	1.78	1.47	.70
Monosodium phosphate	—	.63	1.51
Limestone	.35	—	—
Salt	.92	.90	.88
Min./Vit. ²	.52	.51	.49

¹Expressed on dry matter basis.

²Includes trace minerals, vitamin ADE and antibiotic.

Table 2. Performance of Milking Cows Fed Soyhulls

	Ration		
	Corn	Corn/Soyhulls	Soyhulls
Milk yield, lb/day	65.6 ^a	63.6 ^{ab}	60.1 ^b
Fat corrected milk (FCM) lb/day	61.2	61.8	59.6
Dry matter intake (DM) lb/day	51.5	52.4	52.8
FCM/DMI	1.20	1.18	1.15
Milk fat, %	3.13 ^a	3.33 ^{ab}	3.49 ^b
Milk protein, %	3.08 ^a	3.00 ^a	2.84 ^b
Total solids, %	11.95 ^c	11.96 ^{cd}	12.17 ^d
DM digestibility, %	69.9 ^a	68.6 ^{abc}	61.3 ^{bd}
Protein digestibility, %	66.1 ^c	64.1 ^{cd}	59.4 ^d

^{ab}Values in the same row without a common letter differ ($P < .05$).

^{cd}Values in the same row without a common letter differ ($P < .10$).

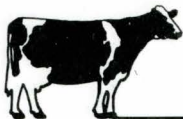
rate of passage from the rumen may have exceeded the rate at which soyhulls can be digested by rumen bacteria. The efficiency (FCM/DM intake) was similar, but slightly lower for the soyhulls rations; however, when efficiency was expressed as FCM/digestible DM intake, the soyhulls rations were somewhat superior.

Conclusion

Substitution of soyhulls for corn

in pelleted concentrate rations helped maintain a normal milk fat test. However milk yields were reduced at the 95 percent level of soyhulls, but still resulted in similar fat-corrected milk production. No problems were associated with feeding soyhulls in this study.

¹T. Nakamura is a graduate student, and F. G. Owen is an Extension Dairy Specialist, Department of Animal Science, University of Nebraska.



Tired Cows Like Tires

Larry L. Larson¹

Housing facilities should provide the cow a clean comfortable area to rest. Free-stalls can provide these desirable characteristics when properly constructed and maintained. One major problem with freestalls is that cows tend to dig them out. The holes which are produced are uncomfortable to the cow and the mud created by cows urinating in the stalls can be a health risk. Therefore, continual maintenance is needed to keep the stalls level and in good shape. Many combinations of stall surfaces and types of bedding have been tried. Unfortunately, the types of surfaces that require the least amount of maintenance (concrete or concrete with rubber mats) tend to be the least preferred by the cow.

Research at Washington State University indicated that discarded automobile tires could be successfully used in free-stalls. When they compared different stall surfaces they found the frequency of stall usage by the cows was as follows: (1) rubber tires embedded in soil, (2) earth fill, (3) concrete half blocks embedded in soil, (4) concrete surface and (5) concrete overlaid with rubber mats.

At the University of Nebraska we compared cow preference for a clay-based stall with stalls having rubber tires embedded in the clay. Sixty free-stalls were renovated. Half of the stalls were randomly assigned to have discarded car tires (13- and 14-inch diameter) embedded in the clay while the other half served as control stalls with the clay fill only. Before placing tires in the stalls four 3-inch diameter holes were drilled in the sidewall of the tire carcass on the lower surface to allow for drainage. The tires were laid in the dug-out stall so they were in contact with each other. Usually six tires were used per stall. The stalls were dug so tires at the front of the stall were a few inches higher than those at the rear of the stall, giving the stall a slight rise from rear to front. Clay was packed in and around the tires



Figure 1. Placement of tires in a free-stall comforts "tired" cows.

until the top surface of the tire was slightly above the clay surface.

Cow preference was determined from the usage rate of the stalls. Cow usage was determined one day per week for a one-year period to permit determining any seasonal differences. For each daily observation the stalls occupied by cows were recorded at three time periods: (1) early morning, (2) mid-day and (3) evening. Average stall occupancy rates were 37 percent in the morning, 21 percent at mid-day and 28 percent in the evening. This indicates there usually were plenty of open stalls so cows did have a choice in the stall they used. Of the 2,895 times we observed a stall in use, 41 percent of the time it was a control stall and 59 percent an embedded-tire stall. Although total number of stalls in use varied with the time of day and season, the percentage of

times the two type stalls were used control vs embedded tire (41 percent vs 59 percent) remained consistent.

The process of preparing the tires and embedding them in the clay was time consuming and a laborious process. The tires have stayed in place and maintenance requirements for these stalls has been minimal. Limited straw was used as bedding during the trial. Sand is currently being used over the clay base with success.

This experiment shows that cows preferred the embedded-tire stalls compared to only clay-based stalls. Embedding discarded tires can be used successfully in freestalls to reduce "dig-out", minimize maintenance needs and improve cow comfort.

¹Larry L. Larson is an Associate Professor, Department of Animal Science, University of Nebraska.



Extraneous Voltage—A Review

Gerald R. Bodman¹

Much has been written about extraneous voltage. Despite numerous articles and reports, some disagreement exists regarding this phenomenon.

What Is It?

Extraneous voltage is defined as any out-of-place voltage within the animal environment regardless of cause, source, magnitude, or frequency of occurrence. Other common terms include stray voltage, neutral-to-earth voltage, and transient voltage.

Our work on nearly 500 farms indicates that voltages in the 0.2-0.3 Vac (volts, alternating current) range are present on nearly every farm. This is not unexpected given electrical engineering theory and principles. It is simply the result of having electrical energy available on the farm.

Problems occur when voltages in the animal environment get too high. The generally accepted limit of acceptability—that is, the level at which cow behavior and/or performance begin to be affected—is 0.5 Vac. Voltage levels above 0.5 Vac are cause for concern and justify efforts to eliminate the source or prevent it from occurring in the animal contact area. Voltages can also be dc (direct current). Generally, dc voltages are not a problem unless they exceed 1 Vdc.

Recognizing that some readers might not be familiar with electrical terminology, let's consider several analogies. Voltage is like water pressure—it is the "force" that causes current flow. Current is the rate of flow of electrically-charged particles or electrons. Current is measured in amperes and is equivalent to water flowrate in terms such as gallons per minute. Resistance is a measure of the extent to which a material limits the flow of electricity. Materials with a relatively low resistance are considered conductors while those with a high resistance are called insulators. As a com-

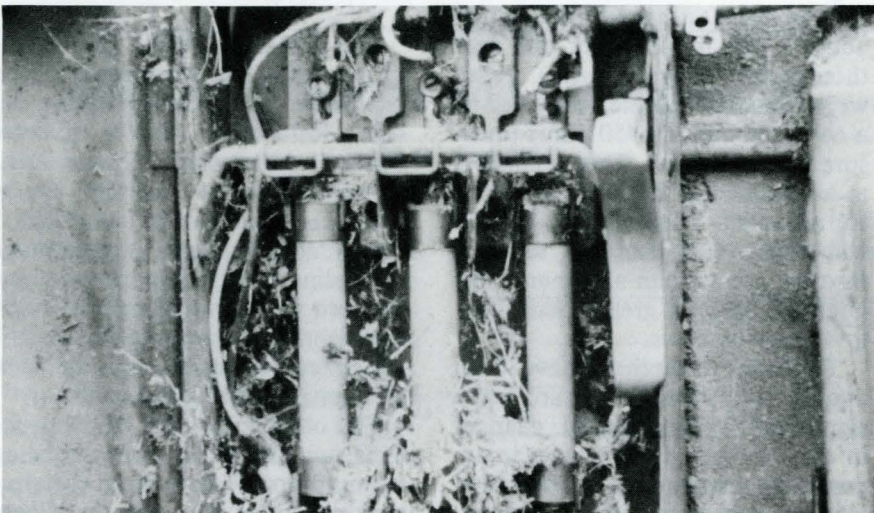


Figure 1. Keep electrical boxes closed and clean. Dirt and debris can cause extraneous voltage, especially during damp or rainy weather.

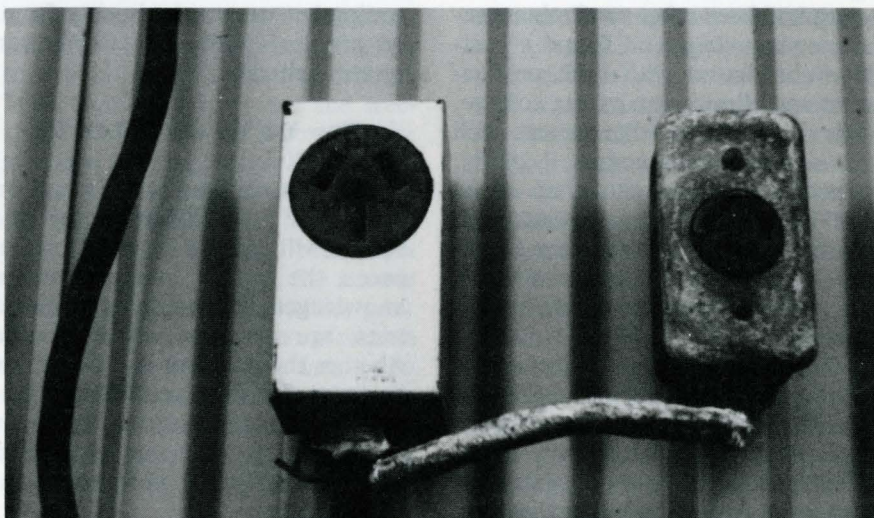


Figure 2. Improperly installed wiring and receptacles can cause extraneous voltage. Use only corrosion-resistant, weather-tight and dust-tight electrical boxes.

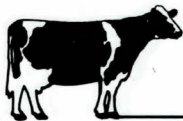
parison, pulling a loaded sled on snow or ice requires less force than pulling the same sled on bare ground; that is, the bare soil has a higher resistance to movement of the sled.

What We Know.

The basic phenomenon of extraneous voltage is easy to understand. A rule of electricity (Ohm's Law) states that if a current is passed through a material with a resistance, a voltage will develop. Since all

materials have a resistance to electrical current, a voltage develops any time there is a flow of current. Conversely, the rule also states that any voltage between two points will cause a current to flow through the material connecting the two points. Problems arise when the path of current flow is through an animal or human. If the current is sufficient and is applied long enough, burns or electrocution occur. At lower current levels, cow behavior and performance can be adversely affected.

During the past five years, several



researchers have tried to determine how and why cows are affected by extraneous voltage. These researchers have determined that a cow's sensitivity to current is similar to a human's sensitivity, that is, we begin to see a reaction in some cows (or humans) at a current flow rate of about 1 mA (milliamp or one one-thousandths of an ampere). Also, we've learned that the resistance of a cow is about 350-450 ohms (measure of resistance). That compares to a resistance of 2,000-10,000 ohms for a human. Thus, a given voltage will cause more current to flow through a cow than a human. This might be called a greater sensitivity to voltage by cows.

To date, researchers have been unable to identify "statistically significant" physiological changes in cows subjected to voltages in experiments conducted in modified laboratory-style facilities. However, Minnesota researchers evaluated the DHIA records of 84 farms where steps had been taken to eliminate extraneous voltage and found a positive correlation with milk production and elimination of the voltage. The responses in other factors such as somatic cell counts, culling, breeding problems, etc. were varied and inconsistent. This suggests such problems can be made worse by extraneous voltage, but it is difficult to predict which herd will be affected.

On about 40 farms where we've conducted extensive evaluations to identify and correct voltage problems, we've found that only about 50 percent experience noticeable improvement in overall herd performance after elimination of voltages. This suggests some other management factor was the "weak link in the management chain." Our results suggest that herds differ in their reaction to voltages. This is consistent with the Minnesota findings. These variations are possibly due to where voltages occur, time of exposure, magnitude of voltage and similar factors. For example, only two herds experienced substantial improvement in butterfat levels (up 1.1% in four days on one farm), several others experienced great improvement in reproductive performance (cows demonstrating estrus and settling on first service), and

several others reported more consistent, rapid, and uniform milkout. Nearly 50 percent saw increased milk production and a decrease in somatic cell counts.

Where Does It Come From?

Our work has shown that about 85 percent of the extraneous voltage problems are the result of the design, installation and/or maintenance of the on-farm wiring system. Common causes include faulty equipment, undersized conductors, poor connections, inadequate grounding, improper connections between grounds and neutrals, dirt and debris accumulations in electrical boxes, rodent damage, and use of improper wiring materials.

The other 15 percent of the problems are caused by voltages being imposed on the farm from the electrical distribution system. These voltages can be the result of loads on the distribution system, faulty equipment on a neighboring farm, or problems with the distribution system neutral.

How Do We Get Rid Of It?

The best solution will depend on the cause. Identification of the source will require cooperation between the power company and a knowledgeable electrician. Several tests are required to determine whether the problem is off-farm or on-farm. Off-farm problems will require corrective actions by your power company. Your electrician will need to identify and correct on-farm sources.

Off-farm sources can be eliminated by separating the primary and secondary neutrals at the transformer. Several techniques are available to achieve this. The actual separation must be done by the power company. Separation of neutrals is not recommended unless appropriate and properly conducted tests have clearly shown that voltage is coming from the power distribution system.

Most on-farm sources can be eliminated by assuring that **all on-farm wiring is installed in accordance with requirements of the National Electrical Code**—which is part of Nebraska state law. The

Code sets forth specific minimum requirements for wiring and equipment in agricultural buildings (Article 547). Most wiring methods and materials used to wire residences are not satisfactory for use in agricultural buildings.

An equipotential plane can be used to reduce the risk of problems in the milking area. This involves bonding all metallic equipment and in-floor steel to the service entrance neutral. An equipotential plane will not eliminate the cause of a voltage problem—it merely minimizes voltages between contact points. A voltage ramp is required at all entrances and exits to allow a gradual transition between surfaces at different voltages.

Do I Have an Extraneous Voltage Problem?

Mastitis, low production, non-uniform milkout, breeding problems, and similar difficulties in a dairy herd are seldom the result of a single factor. Of all the dairymen we've helped, we've never found a situation where correction of one item would correct all production-related difficulties. At the same time, extraneous voltage has been a contributing factor to many problems. There is no set of signs or symptoms unique to extraneous voltage problems, and the indicators of problems will vary from farm to farm. Likewise, the possible signs listed can easily indicate problems other than extraneous voltage. Signs of a possible extraneous voltage problem include:

Personnel get shocks

Decreased production (milk or butterfat)

Excessive urination and/or manure in milking area

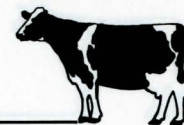
Reluctance of cows to enter the milking area

Cows jumping across door thresholds (either entrance or exit)

Nervousness, steppiness and kicking milkers off

Unexplained and repeated failure of electronic milking or feeding system components

Sore teats, especially around orifice (reddening and radial cracks justify special attention)



Sore feet, hocks, knees, etc.
 Lapping at water or reduced water intake
 Increased SCC and mastitis (clinical and subclinical)
 Refusal to eat grain, forages, etc.
 Abortions and difficulty getting cows to cycle and/or settle

What do I do about it?

If you suspect an extraneous voltage problem, list the things that lead you to believe you have a problem. If they vary with time of day, season, etc., document that, too. Such information will help correlate possible problems with the operation of certain equipment, electrical system loads, soil conditions, etc. Contact your milking equipment dealer, power supplier, and electrician. Ask them for help and request an extraneous voltage survey. Share your notes with them to help identify possible problem sources.

Before taking voltage readings, determine that your voltmeter can differentiate between ac and dc voltages. Set the meter to read dc. Place the probes across a 1.5 Vdc flashlight battery. The meter should read about 1.5 Vdc. With the probes still contacting the battery, switch to the ac scale. The meter should read zero. (In this configuration, many meters will read from 1.5 to 3.0 V!) If it doesn't, get a meter which will read zero on the ac scale before proceeding.

Use caution when troubleshooting all electrical problems. The risk of shock is always present. Use proper safety procedures.

A systematic approach is always beneficial. Both cow contact point and readings to a reference ground rod are used in troubleshooting extraneous voltage problems. Keep a log of time, loads, and voltage measurements. A good record facilitates evaluation of findings and identification of sources and possible solutions. Seek additional help through your Extension office if necessary.

The Future?

Extraneous voltage will remain a concern. Electrical equipment and wiring systems will continue to age and periodically fail or require

maintenance. An awareness of the possibility of extraneous voltage and its potential effects on cows will help you identify problems as soon as possible and minimize adverse effects on your dairy operation. Maintaining your farm wiring system and

using good wiring practices will reduce the risk of problems.

¹Gerald R. Bodman is Associate Professor and Extension Agricultural Engineer, Department of Agricultural Engineering, University of Nebraska.

Free-Stall Design and Management

Gerald R. Bodman¹

What's in a name? Or, stated in reverse, what's not in a name? The answer? Plenty, especially when discussing free-stalls. We've all seen the cartoons about free-stalls being "free," inferring no cost. My experience and observations suggest many builders and producers have applied other meanings to the term free-stall. The result is often free-stalls that are "free" of design; "free" of good construction; poorly maintained, i.e., "free" of maintenance; and "free" of cows. This in turn leads to still other questions: Why won't my cows use the free-stalls? Or, what can I do to make my cows use the free-stalls?

I am an avid believer in the principle promoted by the old Carnation Milk Company slogan: "Milk from contented cows." Thus, the answer to the last question is: Make your free-stalls the most comfortable resting area on your farm. To achieve this, you must provide stalls that are properly sized; clean, dry and well-maintained; and well-ventilated, but free of drafts.

Free-Stall Design

Recommendations for free-stall sizing are given in Table 1. Lengths are from the front of the free-stall to the alley side of the curb. Widths are center-to-center of pipe partitions (dividers). Make appropriate adjustments for wood dividers which reduce the effective clear width of free-stalls. Stalls that are too small make it difficult for cows to get up or lie down and decrease usage.

Curbs should be 8-12 inches high and 6 inches wide. The cow or stall side of the curb should be chamfered and rounded to reduce risk of pin bone injury.

Table 1. Recommended free-stall sizes for cows.

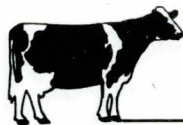
Breed	Stall Size (width x length)
Holstein/Brown Swiss	4'0" x 7'6"
Guernsey/Ayrshire	3'9" x 7'0"
Jerseys	3'6" x 6'10"

Select a free-stall divider that is rugged enough to withstand abuse from cows. Dividers made of 1 1/2-inch diameter standard weight pipe are less expensive initially, but will require substantially more maintenance. Stalls made of thin wall high tensile strength steel tend to break off instead of bending. Stall dividers with the rear post set into the curb are more durable than suspended or loop dividers. Rear post-style dividers with a double pipe or stainless steel sleeve set into the curb are very serviceable.

Shoulder, neck or back-up rails across the top of the free-stalls add stiffness and reduce maintenance by helping to assure that cows step back when they stand up. The exact location depends upon divider height, but the general range is 12-24 inches from the front. Rails set too far back will reduce stall usage because cows will have difficulty getting up. Adjustable rails are required to allow matching rail position to cow size and stall divider height.

Bedding boards (Figure 1) reduce stall maintenance by preventing gouging and development of holes. Bedding boards also help some cows in getting up by giving them a place to brace their feet. Some dairymen have experienced a reduced incidence of udder/teat injuries after installing bedding boards.

Alleys between two rows of free-stalls should be at least 8 ft. wide. A



minimum alley width of 10 ft. is required where free-stalls open to a dual-purpose feeding/free-stall alley.

Free-Stall Maintenance

Daily maintenance of the stall to remove manure and wet bedding is required to keep stalls clean and comfortable and to encourage cow usage. Time spent maintaining free-stalls will be recovered manifold through reducing labor during milking since cows will be cleaner. Several herds have reduced mastitis and reproductive tract disorders after initiating more stringent stall maintenance. Stall bases should be leveled and bedding should be replenished at least weekly.

A good question to ask yourself as you walk through your barn is: Would I be willing to lie down in that stall? If your answer is "no," you can be reasonably sure your cows will respond similarly. Stall bases should be free of lumps and holes. A compacted clay base that slopes 2-4 inches from front to rear and is 2-3 inches lower than the rear curb is recommended. Fill the stall with a soft overlay such as chopped straw or corn stover, sawdust, shavings, sand, etc. The best product for you will depend upon cost, availability and your manure handling system. The key is enough clean, dry bedding added often enough.

Yes, some mastitis-causing pathogens such as *Klebsiella* have been found in free-stall bedding. Mud, manure, and other bedding materials are also sources of other disease-causing organisms. Most disease problems will be minimized by keeping stalls clean and dry.

Free-Stall Ventilation

Ventilation assures good air quality in the animal zone. In a dairy barn, that's the space from 0-4 ft. above the floor. Most dairy barns, except tie-stall barns, are non-mechanically ventilated.

Many barns have inadequate sidewall openings—both number and size—for across-the-barn warm and hot weather ventilation and those which are provided are frequently too high. Installing sidewall panels 6-8 ft. above the floor might make



Figure 1. Bedding boards are effective in reducing free-stall maintenance.

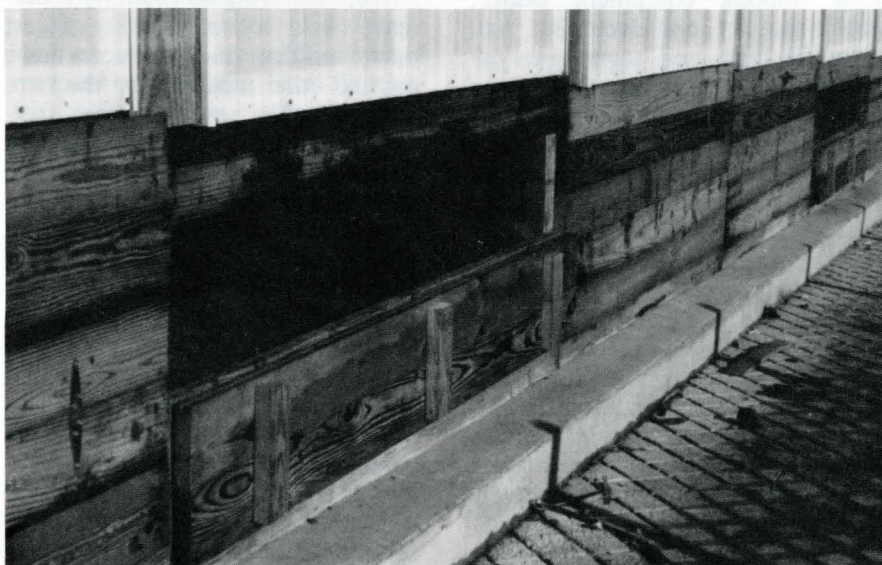
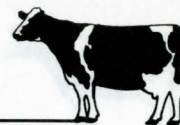


Figure 2. Sidewall openings should be planned and installed to assure good airflow through the cow zone.



Figure 3. An open, unrestricted ridge opening is required to allow exit of heat and warm, moist air.



installation easier and reduce maintenance by preventing cow access, but that location will also reduce stall usage because of poor or inadequate airflow through the cow resting area. Figure 2 shows a vent panel installation which has worked well. The opening allows airflow directly across cows lying in the free-stalls.

Cold weather ventilation requires air inlets along all long sides of a barn (eave openings are most common) to let fresh air enter. An unrestricted ridge opening is required to allow warm, moist air to escape.

Some general building details to help assure good ventilation are:

1. Orientation—east-west (ridge direction) to intercept southerly summer breezes.

2. Siting—at least 100 ft. away from shelterbelts, tall crops like corn, silos, and other buildings.

3. Roof slope—4:12 (4 inches rise in roof height per 1 ft. of building width).

4. Ridge—continuous opening, full length of building; width = 2 inches per 10 ft. of building width (Figure 3).

5. Eaves—continuous opening, full length of building on all long sides; opening width/height = 1 inch per 10 ft. building width. Required on closed side of 3-sided buildings, too.

6. Sidewalls—continuous opening, full length, both sides; height = 6 inches per 10 ft. of building width with a minimum height of 2 ft.; bottom edge of opening within 4 ft. of floor (Figure 4).

Summary

Clean, dry, comfortable, and well-ventilated; these terms define the requirements for all livestock housing. Applied to free-stalls, they mean cleaner, more comfortable and healthier cows. Despite their name, free-stalls require work. Don't neglect this area of your dairy management program.

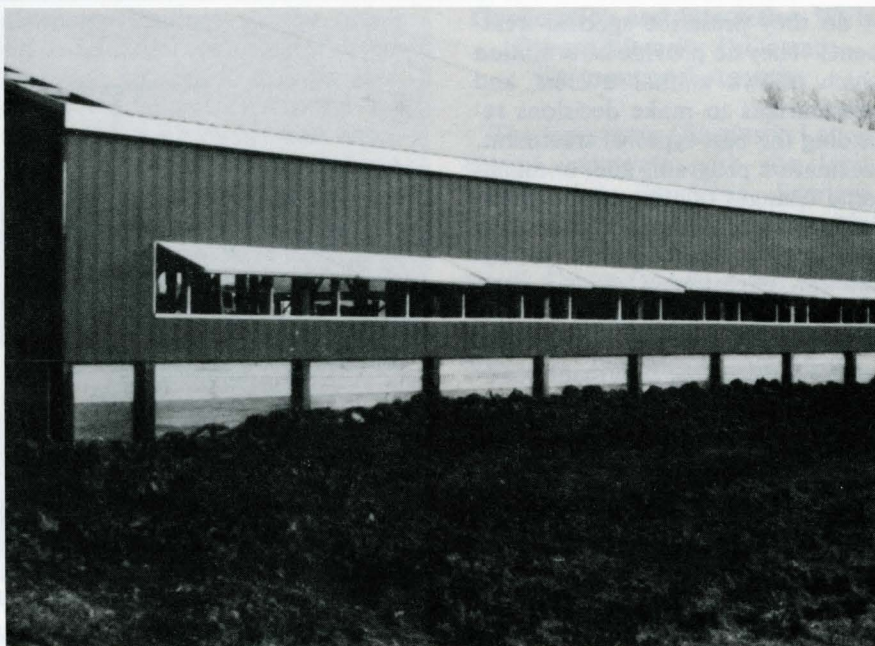


Figure 4. Sidewall openings should be continuous and low enough to assure good airflow through the cow zone.

UNL Veterinary Diagnostic Laboratories

Duane Rice¹

This section of the dairy report is important for dairy producers to be aware of because it simply is not possible to effectively prevent and/or treat disease unless accurate diagnosis occurs. A dairy producer's interest therefore would include all health areas of the dairy herd as well as laboratory capabilities for diagnosis of problems of other domestic animals owned and cared for.

The University of Nebraska Veterinary Diagnostic Laboratories in Lincoln, North Platte and Scottsbluff help veterinarians more consistently make accurate animal disease diagnoses, thus helping animal owners minimize disease losses. Services of the Veterinary Diagnostic Laboratories are available to all Nebraska citizens. Various species and types of specimens are received including carcasses submitted for post-mortem examination (necropsy), tissues from animals, milk or

blood samples from live animals, feed, water and other samples.

The Nebraska Veterinary Diagnostic Laboratories

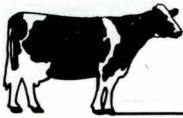
- (1) Aid in the diagnosis of disease problems so veterinarians and livestock owners can apply appropriate treatment, control procedures and/or preventive measures.

- (2) Serve as a source of information for identification of diseases which may be transmissible from animals to man, or conditions such as environmental toxins (poisons) that affect humans as well as animals.

- (3) Helps to identify emerging disease syndromes which may require further research, or may dictate possible quarantine or animal isolation follow-up by governmental agencies in some cases.

The laboratories do not provide clinical treatment, surgical services

¹Gerald R. Bodman is Associate Professor and Extension Agricultural Engineer, Department of Agricultural Engineering, University of Nebraska.



or do they prescribe specific treatments. They do provide information which allows animal owners and veterinarians to make decisions regarding the best types of treatment, vaccination programs and/or managerial changes relating to the specific disease problems encountered on individual farms or ranches. Producers are encouraged to use their local veterinarian for interpretation of laboratory reports, related preventive measures or treatment possibilities.

Each of the following categories relating to diagnosis can be associated with disease that occurs on the dairy farm. In times of disease crisis the producer feels negative. However, it should be reassuring to the dairy producer to realize the causes of many diseases such as mastitis, scours, and pneumonia can positively be identified. Timely, properly prepared specimens are an absolute prerequisite.

Laboratory Services Available Include

Bacteriology-Mycology. Bacterial and mycotic (mold and fungi) organisms are identified in animal specimens by cultures, direct staining, or blood tests. Antibiotic sensitivity tests are conducted on the bacterial pathogens that are isolated to help determine appropriate livestock treatment.

Parasitology. When suspected, external and internal parasites of animals are identified and quantified (counted) for disease-causing potential. Microscopic examinations are performed on fecal samples for worm eggs, coccidia, etc.; and skin scrapings or other samples for mange mites and other external parasites.

Pathology. If death occurs, post-mortem examinations (necropsies) on animals are conducted along with microscopic examination of tissues from these animals as a means of identifying the nature and possible causes of an animal's disease or death. These findings are evaluated and correlated with results of other laboratory tests and the case history. Tissue specimens collected surgically by practicing veterinarians are evaluated.

Serology. This term relates to

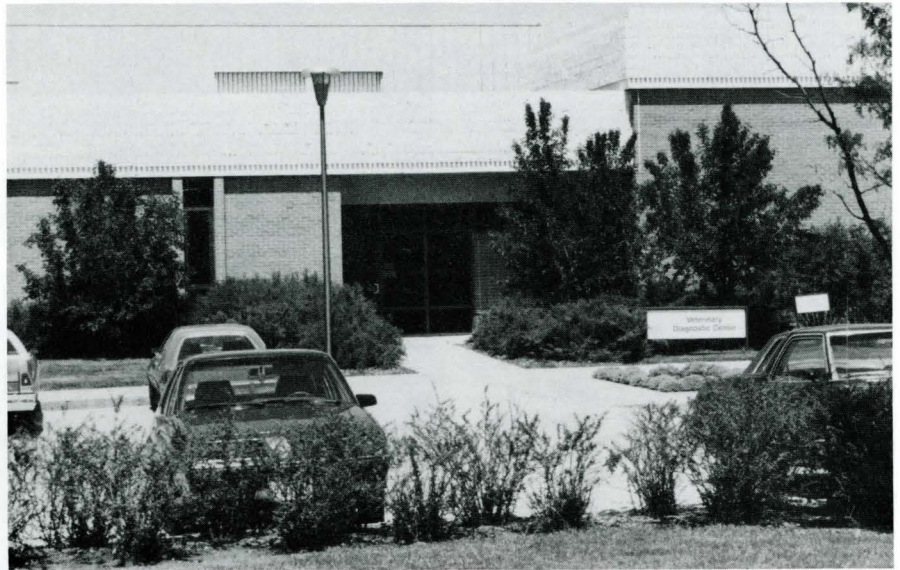


Figure 1. Veterinary Diagnostic Laboratory.

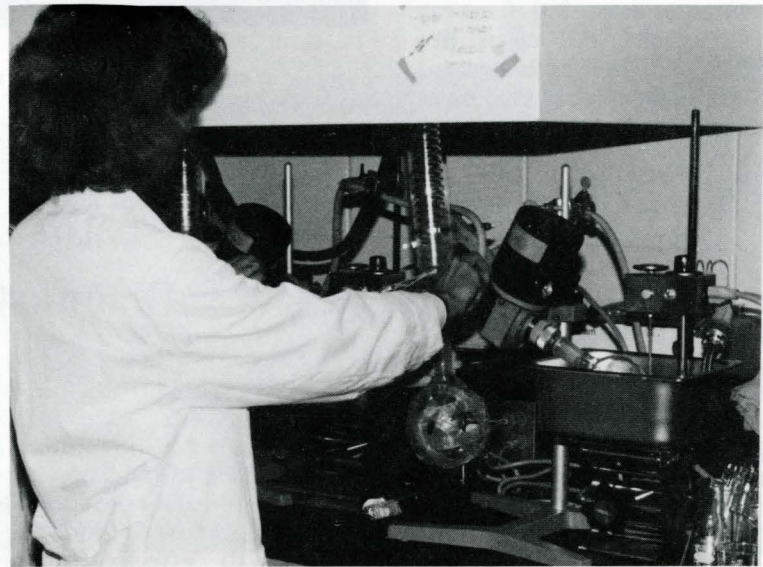
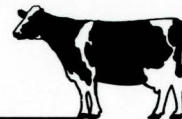


Figure 2. Toxicology Laboratory.



Figure 3. The Veterinary Science Complex - Lincoln.



blood and/or serum samples that are tested for presence and concentration of antibodies. High antibody levels aid in diagnosis of specific disease and identification of causative agents.

Toxicology/Analytical Chemistry. (Testing for Poisons): Biological specimens such as tissues or blood, feed, water, etc. are analyzed for the presence of chemicals or natural toxicants. Specimens may be submitted directly from the field or collected during necropsy. Some of the more frequently requested analyses include nitrate, trace elements (copper and selenium), mold toxins (mycotoxins), lead, and various insecticides. Blood (serum and plasma) samples are frequently analyzed for elements such as copper, selenium, magnesium, phosphorus and calcium to assess possible marginal dietary deficiencies that may affect animal performance and reproduction.

Virology. Viral diseases of domestic animals are diagnosed by viral isolation and subsequent identification of the agents. Tissue specimens, nasal swabs, or other body fluids are cultured or used in other viral diagnostic procedures to determine exact virus type.

Antidote Depot. The UNL Veterinary Diagnostic Laboratories maintain a well stocked repository of common antidotes which are used in treatment of accidental poisoning. Use of the depots is intended only for those disastrous incidents where a great number of livestock may be poisoned and the volume of antidotes necessary to treat affected animals is not otherwise available. Inventories of these antidotes are maintained at the University of Nebraska-Lincoln, North Platte and Panhandle Station Laboratories. The materials are available upon request by a referring veterinarian with a stipulation that the supplies are to be replenished by those who use the various antidote.

Use of Laboratory Services

The Veterinary Diagnostic Laboratories are available to provide services to all citizens of Nebraska. Specimens may be submitted directly by a producer or veterinarian. Every effort is made to coordinate

laboratory findings so the owner and veterinarian are aware of the information relating to a given case. Copies of laboratory reports are provided to both owner and veterinarian. The report will provide useful information so the veterinarian and the owner may proceed with the most effective treatment, vaccination, management changes, or other preventive measures.

Submission of Specimens

Specimens submitted to the Laboratories may be composed of one or more sick or dead animals for necropsy, selected tissues and/or fluids collected from field necropsies, blood or body fluids obtained from living animals or selected tissue samples collected by surgery. Producers should use the veterinarian for the selection, preparation, and shipment of specimens so those samples arrive refrigerated and in good condition at the laboratory. Quality and success of the diagnostic test is directly related to the quality of sample submitted. When good samples are used, even negative laboratory test results can be informative to the intuitive veterinarian or knowledgeable owner. Laboratory results are reported first by telephone and then by written report to the person submitting the samples.

There are times when laboratory work may not be absolutely necessary. Veterinary practitioners can often make diagnosis from clinical signs or during on-farm post-mortem examinations or at a local animal clinic. If accurate diagnosis can be made, this service saves the owner the cost of submitting specimens to the laboratory, as well as the laboratory fees. More importantly, he receives proper advice on treatment and prevention without waiting for laboratory tests

Fees for University of Nebraska services range from \$10 to \$45 per case depending on the number and type of laboratory tests required. The fees only partially pay for the total expenses that occur from the laboratory operation.

A schedule of the laboratory fees is available upon request.

Cooperation and Interaction With Other University Units and Governmental Agencies

The Veterinary Diagnostic Laboratories cooperate with the UNL Cooperative Extension Services, other University of Nebraska departments, U.S. Meat Animal Research Center (MARC), the Animal Industry Division of the State Department of Agriculture, the Nebraska Department of Health, and in some cases federal regulatory agencies.

Regulatory agencies provide rules and health regulations to control the spread of animal disease and disease problems which may be transmitted from animal to animal or from animals to humans. Diseases, for example, that can affect humans and animals include rabies, brucellosis, tuberculosis, tularemia and many others.

The goals of the three UNL Veterinary Diagnostic Laboratories is specific prevention of disease by working as a team with practicing veterinarians and livestock producers, to provide the best possible diagnostic assistance as rapidly as possible.

¹Duane Rice is an Extension Veterinarian, Department of Veterinary Science, University of Nebraska.



Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Leo E. Lucas, Director of Cooperative Extension Service, University of Nebraska, Institute of Agriculture and Natural Resources.

The Cooperative Extension Service provides information and educational programs to all people without regard to race, color, national origin, sex or handicap.

ACKNOWLEDGMENTS

Financial support from the following is gratefully acknowledged.

Nebraska Gasohol Committee,
Lincoln, NE
National DHIA, Columbus, OH
Nebraska DHIA, Beatrice, NE
Mid-America Dairymen,
Incorporated, Omaha, NE
Elanco Products Company,
Indianapolis, IN
Landoff Grain Company,
Danville, IL
Nebraska Grain Sorghum
Development, Utilization and
Marketing Board, Lincoln, NE