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Twelfth Annual

Beef Cattle Day

Special Report 292 May 1970

Agricultural Experiment Station • Oregon State University • Corvallis

Contents

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Oregon Beef Improvement Committee
Oregon Beef Council
Oregon Cattlemen's Association
Oregon Angus Association
Oregon Charolais Association
Oregon Devon Association
Oregon Hereford Association
Oregon Polled Hereford Association
Western Oregon Polled Hereford Association
Pacific Slope Red Angus Association
Western Oregon and Western Washington Shorthorn Breeders
Western Oregon Livestock Association

Profit-Centered Beef Improvement Programs of the 70's

Frank H. Baker

The American beef industry is strong and viable at the beginning of the 70's. Beef is being consumed at a record level. In fact the consumption of beef has essentially doubled in the last quarter century. Consumers are buying beef at a price level that permits profits in the industry. This is a welcome change from recent periods of low prices, adverse weather conditions, and extreme competition from imports. History no doubt will repeat itself to some degree in the future and beef producers will face problems. However, the outlook for effective demand for beef is good; many experts suggest a need for a 25% increase in available beef by the end of the 70's. In the absence of future inflation, the application of technology available from research laboratories can prevent rises in production costs and may permit actual reduction in costs. This maintenance of low costs can permit the industry to deal with competition from meats of other countries, meats from other species of animals, or with plant proteins in the form of meat substitutes.

Beef producers need to examine the role and functions of each of their institutions and organizations in maintaining and increasing the strength of the industry in the 70's. These producer groups must have clearly defined programs oriented to the needs of the members for improved profits and to the needs of the industry for a key position in world food production. Strong effective representation by the producer organizations will be more vital on the state and national scene in the future than in the past. These organizations must establish a climate for cooperation and progress throughout the industry.

As the beef industry enters the 70's, slightly more than half of the consumer's meat dollar finds its way to the hands of the meat producers. Traditionally this share of the income from consumers has been subdivided among four groups of beef producers. The approximate shares of gross income and the responsibility of these groups have been:

1. Purebred breeders have received 2% of the income and have been responsible for maintaining and improving the genetic composition of the cattle used in the industry.
2. Commercial cow men have received 43% of the income and have been responsible for supervising and managing the reproduction of the industry's cow herds.
3. Feeder stocker operators have received 22% of the income and have been responsible for the management of the growth of the young cattle between weaning and entry into the finishing lots.
4. Feedlot operators or the farmer feeders have received 33% of the income and have been responsible for the supervision of the finishing of the cattle to the consumer-preferred market.

Effective improvement of the industry through development of profit-centered beef production systems during the 70's will depend upon improvement in management and direction of

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the processes in the life cycle of the beef animal. These are:

✓ The union of genetically superior sperm and egg cells within the reproductive tract of the cow.

✓ The optimum development and nourishment of the fetus in the cow's uterus and the birth of normal healthy calves.

✓ The normal growth of the calf with maximum muscle development during the first 12 to 18 months of its life.

✓ The development of the optimum level and the optimum dispersion of the intramuscular fat in the beef animal at the consumer-preferred market age and weight.

Cattlemen themselves may not be consciously thinking about these individual processes as stated. Cattlemen will, however, develop improvement programs during the 70's to achieve the desired goals in each process. This might be stated another way by saying that scientists develop and identify new information concerning the processes in the life cycle of cattle through research. With assistance from scientists, cattlemen utilize this new information to improve programs or systems of cattle production. There is essentially no limit to the progress that can be made in the cattle industry of a state or nation when cattlemen and scientists are working effectively in a team effort. Cattlemen assist scientists by identifying problems and providing research funds. Scientists assist cattlemen by finding solutions to problems and earning profits so as to permit payment of research costs.

At least five types of beef cattle improvement programs can be visualized through the progressive efforts of cattlemen-scientist teams for the 70's. In each case it is assumed that appropriate emphasis will be given to optimum forage production, herd nutrition, and herd health. These suggested improvement programs are: Purebred or registered herd performance testing; commercial herd sampling and testing; commercial production systems testing; breed sampling and testing; and national sire evaluation and testing.

Purebred herd performance testing

Performance testing programs of purebred herds are designed to identify the superior germ plasm that exists within these seed stock herds. Furthermore, these programs are designed to utilize this superior germ plasm effectively in improving these registered herds with the resulting effect of improving the breed. *During the 70's these herd improvement or testing programs will be the real "bread and butter" of the registered cattle business.* It will be nearly impossible for a breeder to maintain an effective cattle promotion, distribution, and sales program for the produce of his registered herd in the 70's without an effective herd testing program and without using the information from this program in actually improving his herd and improving the breed. The industry may find it necessary to assign more than 2% of the gross income to the purebred breeders to permit more testing and record keeping. This will be done through higher prices for bulls or semen.

Recent announcements from most of the national breed associations and from Performance Registry International indicate the availability of performance pedigrees. All signs of the times point toward the fact that the only meaningful pedigree of the future will be the one that provides evidence of the excellence of the individual animal in the key traits of economic importance. And, of course, in the beef business these are the traits that are related to reproductive rate, growth rate, and carcass excellence.

Herd sampling and testing

Herd sampling programs are designed to characterize the genetic composition of commercial herds for the traits controlling feedlot performance and the carcass characteristics of the cattle. Information generated from such a testing program is useful to cattlemen in several ways. The individual herd owner will use the data in planning his breeding program and in selecting herd bulls for future improvement of his herd. The program will serve purebred breeders in developing a market for registered bulls with evidence of superior performance in the key traits needed in the commercial herds. Cattlemen's associations can use the data from a large number of commercial herds in this program in a geographic area as the basis for promotional programs for the sale of feeder cattle. Reliable evidence for the excellence of cattle in carcass merit and feedlot performance will be essential in sales programs of the 70's.

Testing production systems

Programs for testing commercial production systems are designed to identify the economic potential of the various production systems that may be important in planning profitable beef production. This type of testing or evaluation is particularly important in relation to the introduction of new technology in the industry, such as the application of principles of crossbreeding in commercial beef production.

Systems testing programs could be approached from several different points of view. First, theoretical program analysis can be made by feeding all of the known production technology through a computer and asking the computer to present the best theoretical commercial production system for utilizing the technology available.

A second approach is analysis of programs that are now in operation on farms and ranches. If these programs involve the types of technology of greatest interest to the industry, this approach has the advantage of utilizing field-tested information rather than presenting a pure theoretical program analysis. One of the problems that exists with this approach is that experience in applying the technology to its fullest advantage often is lacking when the analysis of the systems is needed. For example, very limited experience exists in the beef industry at this time in the application of several types of crossbreeding systems.

A third approach to achieving this objective is the development of specific research projects involving several types of beef production systems to be analyzed through all phases of economic considerations. This approach may provide the best long-range answers if experiments are properly designed and conducted and if industry needs can be anticipated sufficiently in advance to permit the research to be completed. This approach requires more time and more public investment for arriving at the answers. *These system evaluations will be essential* in the 70's for determination of the cost benefit ratio of making farm and ranch operation adjustments based on the application of new technology.

Breed sampling programs

Breed sampling programs are designed for objective appraisal of the strengths and weaknesses of breeds of cattle for commercial production with particular reference to the most desired production systems. At the present time there is much interest on the part of cattlemen in the use of the various breeds in crossbreeding systems. These sampling and evaluation programs can be accomplished through the special efforts of commercial cattlemen utilizing several breeds within a commercial production setting. Another approach is to utilize the resources of the artificial insemination companies which provide the semen from several breeds of bulls in commercial production systems. A third approach is comparison of the various breeds in the research projects conducted by the university experiment station or the U.S. Department of Agriculture.

A fourth approach might be cooperative studies among the breed associations or other organizations to determine combinations of breeds that make most effective use of strengths and weaknesses in production systems. For example, two or three breed associations might cooperate in the development of a production system using inputs from all of their respective breeds. The 70's will be the beginning of a period of struggle for survival by beef breeds. *Evaluation and rapid improvement will be essential to survival of a breed.*

National sire evaluation programs

The purpose of national sire evaluation programs is to identify the genetically superior sires of the entire beef industry and utilize these sires to their maximum capability in improving the nation's cattle in the economically important traits. Such an approach will require the cooperative involvement of breed associations, artificial insemination companies, individual breeders, the U.S. Department of Agriculture, and universities. A plan for the evaluation of sires is simple to develop but rather difficult to implement when it requires contemporary comparisons of bulls used in several herds. Such comparisons are essential to assure that the bulls categorized as outstanding sires are truly genetically superior. The implementation of national sire evaluation programs is being explored by a number of organizations.

The Beef Improvement Federation is making a serious effort to assist organizations in exchanging ideas and in encouraging their members to move forward in this area of work. Progressive planning by organizations often requires some adjustment in attitudes of individual breeders within the organization, particularly the breeders who are members of the governing board. Utilization of the potential of national sire evaluation programs requires breeders to look into the future further than they have dreamed was possible in the past.

The profit-centered beef industry of the future will be a "Beef Production and Distribution System." Essentials for its development will be:

- ✓ Genetically superior cattle
- ✓ Imaginative cattlemen-scientist teams
- ✓ Aggressive, well-informed bankers and investment firms
- ✓ Innovative processing and service firms
- ✓ Progressive institutions and organizations for developing research, educational, and promotional activities.

A proper mix of these essentials spiced with an overall active national economy will make the 70's the greatest and most exciting decade in the history of the beef cattle business.

Wheat—A Cattle Feed

A. T. Ralston

For many years the pendulum of popularity has swung from one feed grain to another, not always following the economic advantage a certain grain might have. There are two major reasons that the feeder of livestock does not always use the cheapest source of energy available. First, many have a favorite grain that when fed to animals has produced dependable results over a long period of time. Examples of this might be oats for horses and lambs, or corn for swine. Second, the actual value of a feed grain as an energy source may vary somewhat in the use to which it is put. The combination of other feed ingredients used may either increase or decrease a grain's productivity. For example, oats of high fiber content might have a higher energy value when mixed with a low fiber grain in an all-concentrate diet than when used in a predominantly roughage ration. Varietal differences are great when hard dark Northern spring wheat is compared with a soft, white wheat grown in the Pacific Northwest. This gives rise to errors in selecting the right energy value for a feed, making an accurate economic comparison impossible.

Relative value of wheat

A review of research summarized in Tables 1, 2, 3, and 4 points out the lack of uniformity in published values for barley, corn, or wheat. When these values are averaged, they tell a story that undoubtedly has affected the popularity of wheat as a feed grain for ruminants. During the time that conventional diets were used (up to 1956), wheat produced slightly greater gains than barley and, although the animal consumption of wheat was only 95% of those fed barley, an overall comparison showed that a pound of wheat would replace 1.16 pounds of barley. The advent of the high energy ration changed the value of wheat somewhat in that the average daily gains on wheat were only 96% of those on barley and the animal intake of wheat was only 91% of barley, but one pound of wheat would still replace 1.08 pounds of barley. This change in value can be partially explained by the fiber content of the two grains. The fiber content of barley (5-6%) has a digestibility coefficient of about 56%, which adds to the diluting effect of some 25% roughage. On the other hand, the fiber content of wheat is 2 to 3% and has a digestibility coefficient of 70% which contributes considerably less to reducing the concentration of energy of the ration. In changing to an all-concentrate diet, perhaps some of the trials conducted failed to add sufficient fiber to the wheat diets to provide an optimum physical environment for the microorganisms of the rumen, or to promote proper stimulation of the rumen epithelial lining. The granular nature and solubility of starch as well as the relative solubility of grain proteins also may be contributing to the differences reported.

The changes in the value of wheat in relation to corn cannot be explained in the same manner, but may be due to new and improved strains of wheat. Dyer (1965) compared Gaines with

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Table 1. Comparison of wheat and barley for fattening cattle

Station	Year	Average daily gain	Intake	Lbs. of barley replaced by 1 lb. of wheat
		Percent of barley	Percent of barley	
Kansas	1904	96	86	1.27
Montana	1928	113	100	1.20
	1929	102	101	1.04
	1930	96	92	1.15
	1931	109	101	1.20
North Carolina	1932	91	91	1.05
Idaho	1931	123	97	1.22
AVERAGE		104	95	1.16

Table 2. Comparison of wheat and barley for fattening cattle with high energy rations

Station	Year	Average daily gain	Intake	Lbs. of barley replaced by 1 lb. of wheat
		Percent of barley	Percent of barley	
Idaho	1964	87	84	1.05
	1965	87	80	1.11
	1965	103	96	1.12
Washington	1965	103	96	1.10
	1965	89	90	1.00
	1965	85	85	1.00
Oregon	1964	103	96	1.10
	1964	105	91	1.22
	1964	93	91	1.03
	1964	103	99	1.06
	1965	93	89	1.05
AVERAGE		96	91	1.08

Burt wheat and reported average daily gains of 2.73 and 2.35 lbs., daily intake of 20.8 and 19.6 lbs., and pounds of feed per pound of gain of 7.6 and 8.35, respectively. Earlier work of Gramlich and Thalman (1930) demonstrated some varietal differences among Turkey, Jenkins, and Baart wheats.

Fiber source

Anthony *et al.* (1960) and Rowden and Ingalls (1962) have shown there is a definite need for limited amounts of crude fiber in high energy diets. Under these conditions, the fiber slows down rate of passage and stimulates rumination, which probably contributes to greater utilization of the digestible portions. Guerin *et al.* (1959) and Ralston *et al.* (1962) reported that a reduction in crude fiber of the conventional diet (15-20%) increased feedlot gains and feed conversion and improved carcass characteristics.

The source of fiber added to a high wheat diet was shown to be important

Table 3. Comparison of wheat and corn for fattening cattle

Station	Year	Average daily gain	Intake	Lbs. of corn replaced by 1 lb. of wheat
		Percent of corn	Percent of corn	
Ohio	1895	87	92	.95
Kansas	1904	84	76	1.16
	1905	80	84	.88
	1932	88	87	1.02
	1932	99	96	1.05
Kentucky	1931	112	100	1.12
Missouri	1930	78	73	1.10
	1930	83	76	1.09
Oklahoma	1924	92	81	1.18
	1931	87	84	1.11
	1943	99	95	1.07
	1943	93	93	1.02
	1944	100	98	1.04
	1944	101	100	1.01
	1944	96	94	1.03
	1945	94	92	1.03
	1946	96	95	1.05
Washington	1942	100	95	1.12
	1942	107	99	1.22
	1942	103	100	1.12
	1942	96	98	.91
AVERAGE		94	91	1.06

Table 4. Comparison of wheat and corn for fattening cattle with high energy rations

Station	Year	Average daily gain	Intake	Lbs. of corn replaced by 1 lb. of wheat
		Percent of corn	Percent of corn	
Nebraska	1958	94	90	1.08
	1958	94	92	1.02
	1956	94	93	1.06
	1957	101	86	1.18
	1957	106	95	1.16
	1957	103	95	1.10
	1958	87	80	1.07
	1958	94	94	1.02
Oregon	1964	102	95	1.10
	1964	108	93	1.23
	1964	107	99	1.12
AVERAGE		99	92	1.10

Table 5. Feedlot performance on wheat diets and two levels of roughage

	10% roughage			20% roughage		
	Fiber[1]	Average daily gain	Lbs. of feed/ lb. of gain	Fiber[1]	Average daily gain	Lbs. of feed/ lb. of gain
	%	*lbs.*	*lbs.*	%	*lbs.*	*lbs.*
Beet pulp	3.9	2.87	8.14	5.4	3.08	8.05
Alfalfa	5.4	3.09	8.34	8.1	3.05	8.52
Corn silage	5.1	2.83	7.96	7.0	2.80	7.98
Wheat straw	6.4	3.01	8.59	10.6	2.71	10.05
Beet pulp[2]	6.7	3.08	8.31	7.7	2.99	8.40

[1] Digestible coefficient of fiber; Beet pulp = 75%, alfalfa = 45%, corn silage = 65%, and wheat straw 40%.
[2] Beet pulp added to a barley ration.

Table 6. Contribution of nondigestible fiber from various sources

	10% added roughage		20% added roughage	
	Fiber added	Nondigestible fiber	Fiber added	Nondigestible fiber
	%	%	%	%
Beet pulp	1.96	.49	3.92	.98
Alfalfa	2.86	1.57	5.72	3.14
Corn silage	2.21	.77	4.42	1.54
Wheat straw	3.70	2.22	7.40	4.44

by Ralston *et al.* (1964). This work is summarized in Table 5. The digestibilities of the fiber used determine what level would be optimum for best animal performance.

A change of 10% in the amount of added roughage from beet pulp make a much smaller contribution to the nondigestible fiber than a comparable one from wheat straw (Table 6). This is, at least, a possible explanation why an increase of beet pulp resulted in an increase in gains, whereas an increase in wheat straw resulted in a decided drop in gains and in increase in the amount of feed per unit of gain.

Energy concentration

Historically, feeders have blamed the reduced intake of wheat on lower palatability, commenting that upon chewing wheat forms a "doughy," "chewy" mass. Another generalization that has been accepted by many is that animals eat more of a low energy feed than one of greater energy concentration. This could explain the differences in wheat and corn intake. However, an experiment conducted by Ralston *et al.* (1965) indicated that animal intake was not totally controlled by energy concentration. Wheat diets were supplemented with three levels of fat and three roughages at a level of 10%. The average daily intake of feed, the percent total digestible nutrients of the rations, and the average daily intake of total digestible nutrients are summarized in Table 7. In this trial, wheat made up 76% of the diet in the 7%

Table 7. Summary of feed and energy intake and energy concentration

Percent fat		Alfalfa	Beet pulp	Corn silage
0	1[1]	23.3	22.7	23.3
	2	77.0	78.3	77.3
	3	18.0	17.8	18.0
3.5	1	24.0	22.4	23.5
	2	80.7	82.6	80.8
	3	19.4	18.5	18.9
7.0	1	21.1	21.1	22.7
	2	84.5	86.6	83.4
	3	17.8	18.3	18.9

[1] 1 = pounds of daily intake per steer; 2 = percent of total digestible nutrients in complete ration; and 3 = pounds of total digestible nutrient intake per head daily.

added fat ration to a high of 83% in the control diet. Some of the steers were fed for 140 days (average of all steers was 123 days) without an animal going off feed. However, it took about 45 days to bring the steers to full feed. Feedlot gains and carcass characteristics are summarized in Table 8.

Mixtures to improve intake

Work at the Eastern Oregon Experiment Station by Richards (1940) failed to show any real advantage to adding molasses to a predominantly wheat diet. Although intake may be increased slightly, efficiency seems to decrease.

The addition of up to 50% of some other grain generally has increased intake but has had little effect upon feed efficiency. Baker and Baker (1960) of Nebraska conducted six trials comparing a 50:50 mixture of cold rolled wheat and corn with cold rolled wheat or corn. A summary of these trials shows a 57% increase in average daily gains, a 10% increase in intake, but a slight advantage to the straight wheat diet in efficiency (Table 9).

The work in Oregon comparing mixed grains has been quite variable in animal gain and intake response, but in all cases wheat was the most efficient in producing gains.

Summary

Most sources underestimate the amount of energy in Pacific Northwest soft white wheats. In modern rations that are properly supplemented with fiber, vitamins, and minerals, wheat is worth about 3% more than corn or barley. Although it is easier to feed in combination with other grains, wheat can be used quite effectively as the only grain in a fattening ration. Greater care must be exercised in bringing animals to full feed on wheat alone. The wheat kernel must be broken up to allow for adequate rumen fermentation, but whether this is done by grinding, steam rolling, or cold rolling seems unimportant as long as the particle size is not too fine or flour-like. The type of roughage added to wheat diets is not important as long as the crude fiber content falls in the desirable range of 5 to 10%.

Table 8. Feedlot performance and carcass characteristics

10 percent roughage	Percent fat	Average daily gain	Lbs. feed/ lb. of gain	Lbs. of TDN/ lb. of gain	Marble score[2]	Backfat	USDA grade[3]	Trim cut yield[4]
	%	*lbs.*	*lbs.*	*lbs.*		*mm*		%
Alfalfa	0	3.23	7.46	5.75	14	14	16	48.9
	3.5	3.50	7.14	5.76	14	14	16	48.5
	7.0	3.32	6.63	5.60	13	13	16	48.9
Beet pulp	0	3.26	7.22	5.66	14	14	16	48.9
	3.5	3.45	6.74	5.56	15	14	17	49.0
	7.0	3.10	7.05	6.11	15	14	17	48.4
Corn silage	0	3.28	7.40	5.72	14	14	15	48.5
	3.5	3.63	6.73	5.44	15	14	16	48.3
	7.0	3.21	7.23	6.03	14	17	16	48.4
Beet pulp[1]	0	3.50	7.55	5.71	16	17	17	48.0
AVERAGE		3.34	7.12	5.73	14	14.5	16	48.6
Average fat	0	3.26	7.36	5.71	14	14	16	48.8
	3.5	3.52*	6.87	5.59	15	14	16	48.6
	7.0	3.21	6.97	5.91	14	15	16	48.6
Average alfalfa		3.34	7.08	5.70	14	14	16	48.8
Average beet pulp		3.28	7.00	5.78	14	14	17	48.8
Average corn silage		3.37	7.12	5.73	14	15	16	48.4

* Significantly different ($P < .01$)
[1] Barley.
[2] 12 = small, 15 = modest.
[3] 15 = good, 17 = choice.
[4] Percent of carcass in boneless, closely trimmed retail cuts from round, loin, rib, and chuck.

Table 9. Summary of average daily gains, feed intake, and feed efficiency in six Nebraska trials

	Cold rolled corn	Cold rolled corn:wheat	Cold rolled wheat
	lbs.	*lbs.*	*lbs.*
Average daily gain	1.98	2.03	1.92
Feed intake	22.30	21.67	19.79
Pounds of feed per pound of gain	11.42	10.82	10.38

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Eye Lesions in Cattle

JACK N. ARMSTRONG

Examination of the eyes in cattle often can give information relative to the health status of the individual animal or the herd. An abnormal appearance to the eye may be due to an eye disease, or it may represent a sign of another disease. The normal eye also can yield information, such as disposition. Some people claim they can tell when a cow is going to calve by the look in her eye. The cow is supposed to have a startled look, similar to the look they have just before they send you to the top of the corral.

Observation of the eye may be divided into three phases: (1) examination of the eyelids and eye secretions; (2) examination of the eyeball; and (3) examination of the inner eye. Also to be considered is whether one or both eyes are involved.

Eyelids and eye secretions

The eyelids may be closed because of pain or because of sensitivity to

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light. The lids may be swollen because of an allergy or because of photosensitization. The cause here may be recent feed change, certain types of pasture, or recent drug administration. Hemorrhage in the eyelids may result from viral infection. Growths on the lower eyelid usually signal the onset of cancer eye. This condition does not involve the upper eyelid. The growth may have a wart-like appearance or cancer eye may start as a thickening of the lower eyelid. Thickening and cracking of the eyelids with yellow scurf formation may indicate BVD or Vitamin A deficiency. The third eyelid is a membrane that is seen at the inner corner of the eye. Quite often cancer eye will start as a growth on the third eyelid. This membrane may protrude in the case of tetanus. Foreign objects, such as seed awns, will lodge behind this membrane and cause eye irritation.

Sometimes the hair of the face beneath the eyes will be wet from eye secretions. Eye secretions will vary from a thin, watery discharge to a thick, yellow discharge. Usually the watery type discharge is an early sign of eye irritation which can be caused by wind, dust, foreign bodies, or an infection. As the irritation progresses into active infection, the eye discharge will become more yellowish. The start of pink eye is signaled by wet faces and watery eye discharge. Eye watering and conjunctivitis or reddening of the tissues beneath the eyelids may be associated with IBR.

Examination of the eyeball

The eyeball may protrude from the socket. This condition may be caused by a tumor, a deep-seated infection, just plain fat, or it may be the nature of the breed. When the eyeball sinks back into the head, it is usually a sign of dehydration or starvation. Dehydration can result from a fever, diarrhea, or lack of water.

Growths may occur on the eyeball itself. In the young animal this is a misplaced bit of embryonic tissue that has the appearance of skin with hair. In the older animal the growths resemble a wart. These types of growths may be removed surgically.

Flicking or rhythmic movement of the eyeball may indicate an infection of the brain, a nutritional deficiency, or a poisoning. This movement also is observed when the animal is going into surgical anesthesia.

The white part of the eye may have a yellow color, a muddy color, or be bleached out. These colors may be imparted to the eyeball because of diseases of the blood, liver, or kidneys. Blood loss due to disease, parasitism, or injury can cause the tissue surrounding the eyeball to appear colorless. The white part of the eyeball may be red streaked as a result of toxemia or eye irritation. A cloudy or milky color of the cornea may mean that an eye infection is starting. The milky color may progress to a salmon or red color. This is the usual picture with pink eye. Milky looking spots on the cornea are usually scar tissue remaining from an old infection.

Examination of the inner eye

Constriction of the pupil is usually the result of drug administration. The pupil also constricts when the animal is exposed to bright light. The drugs most commonly encountered in this case would be the organic-phosphates. These compounds are used for cattle parasite control. The pupil may be wide open as a result of drug administration, shock, lack of oxygen, poisoning, or brain infection. Looking directly into the eye, a yellow color may be observed. This indicates a brain infection has occurred and purulent material has appeared within the eye. Another condition seen is a pearly appearance deep in the eye. This means that the protein in the lens has coagulated. Cataracts appear in this fashion. The pearly eye is observed as a result of chilling of the animal following death, or merely as a sequel to death.

There are numerous other eye conditions that we have not covered. I have attempted to show you that eye examination can indicate disease processes not only of the eye itself but of the whole animal. The appearance of abnormal eyes, coupled with other signs, often can give you important information when establishing a disease diagnosis.

Progress in Calf Scours

DONALD MATTSON

The economic impact of losses due to calf scours ranks it as one of the most important diseases of cattle. The results of these losses are of particular concern to the cow-calf operator where calves are a direct income source. Likewise, it is becoming commonplace for dairy producers to report they are unable to raise calves at all due to this disease.

There is little hope in the near future for an adequate, complete control of this problem. Modern production methods demand that the producer increase productivity. From past experience we know as productivity increases, disease problems increase correspondingly.

In 1965 the eleven Western states joined together in a Western Regional Research Project to coordinate and intensify research on this disease. Although calf scours was an old disease and has been a problem since cattle have been confined and domesticated, we only understood a few of the many factors that were responsible for its initiation or that influenced disease severity.

Some investigators in this project established projects concerned with the physiological changes that occur in an animal undergoing diarrhea with its resultant fluid and electrolyte losses. Other scientists concentrated on understanding some of the substances in colostrum and its role in disease prevention. Other individuals directed their attention to the role of certain bacteria and their toxins in producing scours. Investigators from several experiment stations, including Oregon, were concerned with determining the significance of viruses as causes of this disease. One of the first items we felt must be resolved would be to determine precisely what factors cause calf scours before preventative and control procedures could be applied.

This Western Regional Committee has made its most significant impact in the area of virus isolation. We have succeeded in isolating from scouring calves a wide variety of viruses which we feel are important in this disease complex; these agents include bovine virus, diarrhea virus, bovine adeno-

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virus, bovine enterovirus, and bovine parvovirus. In addition, one investigator has shown another microorganism type, which has characteristics of both viruses and bacteria, to be an important enteric pathogen for the newborn calves (chlamydial agents).

We must consider these findings with what we already know about the causes of scours. Previous research conclusively indicates some types of scours are caused by various bacteria or their toxins (*Escherichia coli, Clostridium perfringens,* and Salmonella species).

Our current concept of this disease leads to only one conclusion—scours is indeed a complex disease problem with many causes. Diarrhea is a symptom of an upset intestine. This may be the result of invasion by a virus, a bacterium or related organism, or by the ingestion of too much milk. Weather condition undoubtedly greatly influences the disease expression.

The task which now presents itself is to determine the most important causes of the disease. It is very probable that certain types of calf scours are caused by just a few microorganism types. We must study each agent that is isolated in order to determine its significance. The details of each infection type must be completely understood before preventative procedures can be applied.

The value of colostrum in helping prevent certain forms of calfhood disease has long been recognized. The dam is able by this means to give her calf certain gamma-globulin material which she has produced in her blood serum. Once the colostrum is absorbed, the calf is provided with disease-resisting factors for some three to eight months or until it is able to produce its own gamma-globulin.

The maximum benefit of colostrum for the calf is provided within the first few hours of life as its intestinal bacteria establish themselves. These bacteria are normally considered as not being able to produce disease under ordinary circumstances. In an animal that is devoid of colostrum (and hence devoid of gamma-globulin) these bacteria are able to invade the tissue and gain access to the bloodstream. Here they may multiply and release toxic substances in a high concentration. This greatly weakens the calf and often is a significant predisposing cause of death. Colostrum's main benefit is to prevent this bacterial invasion. It may aid in preventing some types of calf scours, but in general it will not prevent most forms of the disease.

Most calves that die of scours do so as a result of dehydration or water loss. When water is depleted from the body in the form of diarrhea, various salts or electrolytes are expelled with it. Death losses can be prevented by restoring the water and some of these electrolytes. In treating cases of calf scours, do not give commercially available remedies such as pills, boluses, powders, or fluids that contain dry electrolyte salts or *concentrated* fluids unless the calf also is given several quarts of water by injection or stomach tube. A severely dehydrated animal is starving for water; if salts are given without adequate water, death will result.