per conception, days open, incidence of follicular or luteal cysts, incidence of repeat breeders or number of reproductive culls. It appeared that the treatments in this experiment would not be economically beneficial as long as cows with reproductive tract abnormalities were promptly diagnosed and treated.

Results of Oral Selenium Supplementation in Cattle:

Dr. Peter South,
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Moscow, Idaho 83843

Recent investigations by researchers at the University of Idaho Department of Veterinary Science have revealed extremely low tissue selenium levels in cattle maintained on forage grown on selenium deficient areas in Idaho and Washington. In these areas, white muscle disease is a yearly occurrence unless parenteral supplementation is administered to neonatal calves. The FDA has approved addition of selenium to feeds at the rate of 0.1 ppm and in salt at concentrations of no more than 20 ppm for cattle. We have placed pregnant cattle on oral selenium supplementation in salt at the rates of 20 ppm, 50 ppm, and 90 ppm, respectively, and monitored the whole blood selenium by using the glutathione peroxidase test prior to supplementation and at varying intervals thereafter. Significant elevations of tissue selenium were evident 60 days following initiation of selenium supplementation using levels of 50 ppm and 90 ppm. Very little or no response was seen at levels of 20 ppm. Calves from dams that had access to a 90-ppm selenium-salt mix were blood sampled within three days of birth and found to have adequate tissue selenium levels, suggesting that in the bovine animal, significant placental transfer occurs.

Our next research project will include monitoring calf weight gain and neonatal disease conditions associated with different levels of selenium supplementation.

Question: Were the blood levels measured beyond 6 months?
Dr. South: Yes, we have several herds on record and the blood levels tend to go down. Now, if you mean after the selenium is removed from the salt, they will peak regarding the consumption of salt but you can hold them practically at any level by this method — by either increasing or decreasing consumption.

Prevalence of Paratuberculosis (Johne's Disease) in Illinois Cattle Herds:

Dr. T. E. McPherson,
Department of Veterinary Clinical Medicine,
University of Illinois,
Urbana, Illinois

There has been an increasingly severe clinical problem with paratuberculosis for several purebred beef breeders who are clients of the Field Service Section, Department of Clinical Veterinary Medicine, College of Veterinary Medicine, University of Illinois. Several approaches have been made to estimate the significance of the disease and its impact on both management and health status of these herds. These methods include direct staining of feces, fecal culture, intravenous johnin testing, biopsy and culture of gastorintestinal tissues and mesenteric lymph nodes, serological procedures, and necropsy. Preliminary studies to assess the significance of paratuberculosis in Illinois in herds without previous history of clinical Johne's disease indicated one third (5/15) had one or more cows shedding the causative organism. Based on this finding, a statistically designed random sampling study was begun to assess the extent of the disease in Illinois cattle herds. Partial results at this time indicate approximately 31% of Illinois herds sampled have one or more cows shedding *Mycobacterium paratuberculosis.*

Weight Changes of Male Dairy Calves Following Zeranol Implants

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Abstract

In a trial to determine the effect of zeranol implants on weight gains from birth to 180 days of age, 269 male Holstein calves were assigned randomly to one of three groups: a) 56 intact calves, b) 106 castrated calves implanted at birth and again at 90 days with 36 mg zeranol, and c) 107 castrated controls. All calves were weighed at 0, 28, 56, 90, and 180 days of age. Zeranol implanted steers averaged 9.2% greater average daily gain at 90 days and 9.5% greater at the end of the trial than control steers. Intact male calves' weight gains were intermediate between the two steer groups. There was no correlation between implant status, total protein of blood serum, mortality, birth weight, or parity of the dam. During the first 180 days of age, implanting Holstein calves with zeranol at birth and repeated at 90 days can return upwards of $14.89 per dollar invested. (Key words: Zeranol, dairy beef, total serum protein, colostrum, mortality, weight gain.)

Introduction

Most newborn dairy bulls are sold to commercial veal growers within a week of birth. Others are fed milk or milk replacer for 4 to 8 weeks and then pastured and grain fed until slaughter. Dairy bulls can perform as well as beef calves in the feedlot (17). Because most bull calves do not stay in the herd, dairymen usually have little interest in them and their colostrum intake is often inadequate.

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documented (2,7). Naylor *et al* (10) showed that total protein of blood serum is an effective measure of immunoglobulin absorption of newborn calves. Significantly less morbidity and mortality ($P<.001$) occurred in calves with serum protein >5.5 g/dl as compared to calves with total protein <5.5 g/dl (11). Similar results also have been reported for serum immunoglobulin as the measure of passive antibody transfer (3).

To help maximize feed efficiency and rate of gain, the growth-promoting implant zeranol has been used in all stages of beef production. In 1973, a 10.7% increase in rate of gain was demonstrated when suckling steers were implanted with 36 mg zeranol at birth, and a further 3% increase occurred if the calves were reimplanted at 84 days (12). Weaning weights of intact calves with zeranol-implanted steers were compared, and although not statistically significant ($P>.05$), the steers showed a slight advantage (14).

In grazing steers implanted in the spring with 36 mg zeranol, pasture gain was 22% more than gain of control calves (6). Rate of gain in steers implanted with 12 mg Diethylstilbesterol (DES)[a] in the same trial was intermediate between that of zeranol-implanted and control calves.

A 14% and 15% increase in average daily gain (ADG) can be expected with 36 mg and 72 mg zeranol implants in feedlot finishing steers or heifers (13,15).

Over a combined growing-finishing period, zeranol was significantly better at increasing ADG than either 12 mg DES, 15 mg DES, 120 mg testosterone plus 24 mg DES or 200 mg progesterone and 20 mg estradiol benzoate (16).

Zeranol is not recommended for replacement heifers because it has been related to an increased incidence of mastitis at weaning and an unexplained decrease in perinatal survival of their calves (8). A decrease in libido and retardation of male characteristics results when intact male calves are implanted with zeranol (14).

This trial was designed to compare weight gains up to 180 days of age between zeranol-implanted Holstein steers, non-implanted steers and intact non-implanted Holstein bulls and to determine if any correlations exist between total protein of blood serum, mortality, birth weight, parity of the dam and weight gain.

Calf morbidity and feed conversion data were not available.

Materials and Methods

This trial was conducted from October, 1980 until June, 1981 on a large Holstein dairy that raised all heifer calves for replacements. Bull calves were raised for breeding or as steers for beef. These calves were left with their dams for the first 6-12 hours of life and were bottle-fed or force-fed, if necessary, pooled high-quality colostrum and their navels were dipped with iodine solution. They were then eartagged for identification and moved into individual hutches. During the first week, each calf was bled by jugular venipuncture into partially evacuated tubes[b] and their passive immune status acquired by colostrum absorption was evaluated by measuring total protein of blood serum using a refractometer as described by Naylor *et al* (10).

All male calves were assigned to one of three treatment groups. Approximately 20% (56) of male-calves born were reared as potential sires based on their dam's production in the previous lactation. They were double eartagged and remained as intact positive controls. Of the remaining male calves, 106 with even numbered eartags were implanted subcutaneously at the base of the ear with 36 mg zeranol[c] and 107 odd-numbered calves were designated as non-implanted controls.

All calves were housed and fed equally (tables 1 & 2). Castration was performed with a crushing instrument[d] at 4 weeks and the implanted group was re-implanted with 36 mg zeranol at 90 days. A simple rope harness and a spring scale[e] calibrated in .9kg increments were used for the 0, 28, and 56 day weighings. The 90 and 180 day weights were made using a walk-on chute scale.[f]

Mortality, identifiable causes of mortality, and parity of the dams were obtained from the farm records.

Statistical analysis was conducted using Analysis of Covariance to analyze weight gain and Step-wise Logistic Regression to analyze correlation (1).

Results

Table 3 lists the average weights, which are adjusted to a common birth weight, at specific ages. No significant weight gain advantages were observed until 56 days when the implanted calves gained 2.28 kg more than the two non-implanted groups. At 90 days, the intact and the implanted calves had outgained the control group by 2.49 kg and 5.1 kg respectively.

The implanted steers gained 15.66 kg more than the control steers over 180 days. The non-implanted bull group's total gain was between those of the steer group's.

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a) Diethylstilbesterol was banned for use in food producing animals in November, 1979.

b) Vacutainer, Becton-Dickinson & Co., Rutherford, N.J. 07070.

c) Ralgro, International Minerals & Chemical Corporation, Mundelein, Ill. 60060.

d) Bal-Zac Emasculatone, sold in the U.S. by Haver-Lockhart, Bayvet Division, Cutter Laboratories, Inc., Box 390, Shawnee, KS.

e) Viking Scale, Hanson Scale Co., Shubuia, Miss. 39360.

f) Paul Livestock Scale, Adrian J. Paul Co., Inc., Duncan, OK 73533

TABLE 1. Management Regime for Calves Up to Six Months-of-Age.

Day	Procedure
0	Blood collected for total serum protein determination.
	Injected with Vitamins A & D, Vitamin E and Selenium.
	Vaccinated with IBR/PI_3 intranasal vaccine.
	Assignment of calves to treatment group and appropriate calves implanted with 36 mg zeranol[a].
	All male calves weighed.
28	Dehorned (electric dehorner[b]).
	Vaccinated with multivalent Clostridium toxoid.
	Castrated the two steer groups.
	All calves weighed.
42	All calves weaned.
56	All calves weighed.
	Calves moved to group pens of 8-10 calves per pen.
90	All calves weighed.
	Implanted group re-implanted with 36 mg zeranol.
180	All calves weighed.
	End of trial.

a. Ralgro[R], International Minerals and Chemical Corp. Mundelein, Il. 60060

b. Rhinehart X50 dehorner, Rhinehart Manufacturing Company, Incorporated Spencerville, Indiana 46788

TABLE 2. Feeding Regime of All Calves.

Day	Feed
1-3	2 quarts pooled colostrum from nurse bottle twice daily.
4d-6wk	1½ quarts whole milk (3.3% MF) twice daily.
5d-8wk	Free-choice calf starter ration[a] not to exceed 9 lb/day. Free-choice water.
	MOVE TO GROUP PENS
8-11wk	Free-choice calf starter ration. Free-choice coastal bermuda hay. Free-choice water.
11-16wk	Fed ½ starter ration and ½ Home Mix[b] free-choice. Free-choice coastal bermuda hay. Free-choice water.
4-5 mo	Free-choice Home Mix. Free-choice coastal bermuda hay. Free-choice water.
>5mo	Free-choice 70% Home Mix plus 30% corn silage.[c] Free-choice water.

[a]Purina Startena, Ralston Purina Co., St. Louis, Missouri.

[b]Home Mix - 18.6% CP, 81.8% TDN dry matter basis
16.7% CP, 73.6% TDN as fed basis

[c]70:30 mix - 17.3% CP, 79.9% TDN dry matter basis

TABLE 3. Adjusted Weights in kg for Calves Which Survived up to 180 Days, By Group.

		Steers*	Steers + Implant*	Bulls
AGE (DAYS)	0	39.28	39.28	39.28
	28	47.14	47.59	46.42
	56	63.57^{b}	65.84^{a}	63.55^{b}
	90	97.73^{b}	102.83^{a}	100.22^{ab}
	180	210.22^{c}	225.88^{a}	220.84^{b}
Number		107	106	56
Treatment advantage(kg)		----	$^{+}15.66$	$^{+}10.62$
ADG (kg/d)		$.95^{b}$	1.04^{a}	1.01^{ab}

a,b,c values with uncommon superscripts within an age group are significantly difficult ($P<.05$).

*Steers were castrated at 4 weeks of age.

No correlations were found between total serum protein, mortality, birth weight or parity of the dam.

Fifty-two calves were removed from the trial for various reasons (table 4). Of the 35 calves that died, only 9 were necropsied. One calf was euthanized because of a debilitating congenital heart defect, 3 died of bloat and 5 from Salmonellosis. Most of the others that died were being treated for diarrhea at the time of death.

Sixteen calves were moved by mistake to a large pasture area off the main farm and were not weighed at 180 days. One control calf was admitted to the Veterinary Medical Teaching Hospital for corrective surgery on congenital contracted tendons and was removed from the trial.

Discussion

The implanted castrated calves outgained the intact bulls up to 56 days of age which indicates that either the anabolic effect of zeranol overcomes the stress of castration at 4 weeks of age, or this stress has no apparent deleterious effect on weight gain.

There was no statistical difference in weight gain between the implanted group and the intact bulls at 90 days. This may be a function of faster weight gain in bulls as they approach puberty (3).

The 15.66 kg extra weight gained by the zeranol-implanted steers when compared to the control calves is both statistically ($P<0.05$) and economically significant. At current prices (spring, 1982), one can accrue a $14.89 profit per dollar invested in zeranol implants under these management conditions (table 5).

The implanted group also outgained the intact non-implanted group by 5 kg at the end of the trial, indicating that early castration and implanting of dairy beef bulls is an economically advisable practice. Castration at or after 6 months may retard growth for a short period of time, thus

TABLE 4. Calves Removed From Trial

Treatment Group	Died	Missed*	Others	Total
I	15	4	-	19
K	8	5	-	13
C	12	7	1	20

*180 day weighing missed.

TABLE 5. Economic Benefits of Zeranol Implanting Young Dairy Steers.

Assume - one person being paid $5.00/hr. can implant 30 calves/hr.		
cost of 36 mg zeranol implant is:		$1.00
30 calves X $1.00/implant	=	30.00
1 hour X $5.00/hr.	=	5.00
		$35.00
Re-implant at 90 days	=	35.00
TOTAL COST		$70.00
Achieve 15.66 kg more growth in implanted steers.		
Current price of dairy steers (400-800 lbs.) is approximately $1.10/kg ($.50/lb.)		
30 calves X 15.66 kg X $1.00	=	$516.78
- initial cost	=	70.00
		$446.78
approximately $14.89 return/dollar invested.		($446.78/30)

creating a wider weight differential between these two groups.

Contrary to Naylor (11) and Davidson (4), no correlation was found between neonatal total serum protein and mortality. Salmonellosis was a problem on this farm during the heavy freshening months of October, November, and December. Since 56% (5/9) of identifiable causes of death were due to Salmonella, and most of the dead calves were being treated for diarrhea at the time of death, it may be safe to assume that half of the mortality could be attributed to this disease. Salmonella will affect calves regardless of passive immune status, or even if they have specific antibodies against Salmonella (5). The observations of Naylor and Davidson were made in calves with neonatal diseases other than Salmonellsis.

Because pooled colostrum was fed to each calf, their serum protein level did not reflect the quality of their dam's colostrum and no correlation between parity of the dam and neonatal serum total protein was demonstrable.

Acknowledgements

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References

1. Barr, A.J., H.H. Goodnight, J. Sall, and J. Helwig 1976. A user's guide to SAS76. Sparks Press, Raleigh, N.C. - 2. Blood, D.C., Henderson, J.A., and Radostits, O.M. Veterinary Medicine 1980. Lea and Febiger, Philadelphia, PA. - 3. Brannang, E., 1971. The effect of castration and age of castration on the development of single muscles, bones and special sex characteristics. Part II Swedish Journal of Agricultural Research 1 (2):69-78. - 4. Davidson, J.N., Yancey, S.P., Campbell, S.G., and Warner, R.G. 1981. Relationship between serum immunoglobulin values and incidence of respiratory disease in calves. J.Am.Vet.Med.Assoc. 179:708. - 5. Fisher, E.W., Martinez, A.A., Trainin, Z., and Meirom, R. 1976. Studies of neonatal calf diarrhea IV. Serum and fecal immune globulins in neonatal Salmonellosis. Br.Vet.J. 132:39. - 6. Fontenot, J.P., Kelly, R.F., and Webb, Jr., K.E. 1973. Zeranol implants in grazing and fattening steers. J.An.Sci. 36:217. - 7. Gay, C.C., Anderson, N., Fisher, E.W., and McEwan, A.D., 1965. Gamma globulin levels and neonatal mortality in market calves. Vet.Rec. 77, 248. - 8. Huston, J.E., Davis, D.I., Menzies, C.S., and Kraemer, D.C. 1980. Effects of zeranol on growth and reproduction in heifers. The Southwestern Veterinarian 33:209. - 9. Martin, T.A., Albright, J.L., and Stob, M. 1965. Comparison of growth rate and carcass traits of bulls, stilbesterol-treated bulls, and steers of the Holstein-Friesian breed. J.Dairy Sci. 48:813. - 10. Naylor, J.M., Kronfeld, D.D.S. 1977. Refractometry as a measure of the immunoglobulin status of the newborn dairy calf: Comparison with the zinc sulphate turbidity test and single radial immunodiffusion. Am.J.Vet.Res. 38:1331. - 11. Naylor, J.M., Kronfeld, D.S., Bech-Nielson, S. and Bartholemew, R.C. 1977. Plasma total protein measurement for prediction of disease and mortality in calves. J.Am.Vet.Med. Assoc. 171:635. - 12.Nichols, N.E., and Lesperance, A.L. 1973. Type, level and frequency of implant on suckling calves. J.An.Sci. 36:1206. - 13. Perry, T.W., Stob, M., Huber, D.A. and Peterson, R.C. 1970. Effect of subcutaneous implantation of resocyclic acid lactone on performance of growing and finishing beef cattle. J.An.Sci. 31:789. - 14. Ralston, A.T. 1978. Effect of Zearalanol on weaning weight of male calves. J.An.Sci. 47:1203. - 15. Sharp, G.D., Dyer, I.A. 1971. Effect of zearanol on the performance and carcass composition of growing-finishing ruminants. J.An.Sci. 33:865. - 16. Smithson, L.J., Essig, H.W., Rogers, R.W., Coats R.E., Ivy, R.L., Jr., Withers, F.T., Jr., and Morrison, E.G. 1973. Growth stimulants for finishing steers. J.An.Sci. 36:216. - 17. Van Groningen, J. 1982. Holsteins outperform Herefords in the feedlot. Hoards Dairyman Vol. 127, No. 3:164.