The Effect of Calf Purchase Weight, Serum IG Level and Feeding Systems on the Incidence of Diarrhoea, Respiratory Disease and Mortality

R. J. Fallon, F. J. Harte *and* **D. Harrington**
An Foras Taluntais, Grange, Dunsany, Co. Meath, Ireland

Summary

A survey was conducted on 5100 purchased male Friesian calves in the period 1976 to 1985 to determine the effect of serum immuneglobulin (Ig) level (low 15 ZST units or high 15 ZST units), purchase weight (light 40 kg or heavy 40 kg) and feeding system (bucket or *ad libitum*) on the occurrence of diarrhoea, respiratory disease and mortality in the period 1 to 49 days following purchase. In the low and high Ig categories the respective proportions were 0.21 and 0.14, 0.6 and 0.28, 0.11 and 0.03 for diarrhoea, respiratory disease and mortality. The corresponding values for light and heavy calves were 0.26 and 0.14, 0.30 and 0.32, 0.09 and 0.04. Similarly for bucket and ad libitum calves the respective values were 0.15 and 0.17, 0.28 and 0.34, 0.05 and 0.06.

Introduction

Diarrhoea is one of the major causes of calf mortality, particularly in the first 3 weeks of life (1,2) thereafter respiratory disease usually accounts for the majority of calf losses (3,4). The incidence of diarrhoea has been associated with many factors including immuneglobin (Ig) status (5), a build up of infectious atnets in calf houses (6), over feeding of milk replacer (7), method of feeding (8), hygiene (1), group size (9) and calf source (10). Similarly the incidence of respiratory disease has been associated with many factors including Ig status (11), type of housing (12), type of concentrate diet offered (13) and method of weaning off milk (14).

A survey over a 10 year period was conducted to study the effect of calf purchase weight, serum Ig level and milk replacer feeding system on the incidence of diarrhoea, respiratory disease and mortality and on calf liveweight gain in the 42 day period following purchase.

Experimental Program

A total of 5,100 Friesian male calves were purchased by An Foras Taluntais Beef Research Centre, Grange in the period January 1976 to December 1985. On arrival (Day 1) the calves were allocated to various experiments. The following data were recorded (a) purchase weight, (b) serum Ig level on arrival, (c) incidence of diarrhoea, (d) respiratory disease and (e) mortality. On arrival calves were categorized into Light—those weighing 40 kg and Heavy—those weighing 40 kg.

Those calves which were individually penned on straw and offered restricted quantities of skim based milk replacer by bucket were termed bucket and those which were group penned on straw and offered ad libitum access to skim based milk were termed *ad libitum*. Blood serum Ig was determined using the Zinc Sulphate Turbidity (ZST) test (15). Calves with values of 0 to 15 ZST units were termed Low and values 15 as High. Diarrhoea was defined as non formed faeces for which medication was required. Respiratory disease was defined as elevated respiratory rate and rectal temperature necessitating antibiotic medication. For clarity of analyses, calves were recorded as having or not having diarrhoea and respiratory disease.

Results

Calf serum Ig

Calves with Low compared with High serum Ig had a higher (p 0.001) incidence of diarrhoea, respiratory disease and mortality (Table 1).

Purchase weight

Light compared with Heavy calves had a higher (p 0.001) incidence of diarrhoea and mortality (Table 2). However, purchase weight did not affect the incidence of respiratory disease.

Feeding systems

The feeding system used did not affect the incidence of diarrhoea (Table 3). Calves offered milk replacer *ad libitum* compared with bucket had the higher (p 0.005) incidence of respiratory disease and mortality.

TABLE 1. Effect of calf serum Ig level on the incidence of diarrhoea, respiratory disease and mortality (proportion of calves).

	Ig Status			
	Low	High	Chi2	Sign.
No. of calves	1376	3187		
Diarrhoea	0.21	0.14	40.9	***
Respiratory disease	0.36	0.28	28.3	***
Mortality	0.11	0.03	77.2	***

Paper presented at the 14th World Congress on Cattle Diseases, Dublin, Ireland, August, 1986.

TABLE 2. Effect of weight at purchase on the incidence of diarrhoea, respiratory disease and mortality (proportion of calves).

	Purchase Weight			
	Light	Heavy	Chi2	Sign.
No. of calves	924	3966		
Diarrhoea	0.26	0.14	83.4	***
Respiratory disease	0.30	0.32	0.0	NS
Mortality	0.09	0.04	28.8	***

TABLE 3. Effect of feeding system on the incidence of diarrhoea, respiratory disease and mortality (proportion of calves).

	Feeding Systems			
	Bucket	Ad libitum	Chi2	Sign
No. of calves	2895	1490		
Diarrhoea	0.15	0.17	3.1	NS
Respiratory disease	0.28	0.34	12.4	***
Mortality	0.05	0.06	4.1	*

Calf serum Ig and weight at purchase

Light calves with low Ig levels has the highest (p 0.001) incidence of diarrhoea and mortality when compared with any of the other three categories (Table 4). The heavy calves with high Ig levels had the lowest incidence of mortality and respiratory disease. Respiratory disease was highest (p 0.01) in the Low Ig categories and there was little interaction between Ig and purchase weight.

Calf serum Ig and feeding system

Serum Ig level had a much greater influence on the incidence of diarrhoea, mortality and respiratory disease than had method of feeding (Table 5). There was no apparent interaction between Ig level and method of feeding except for respiratory disease which was higher (p 0.01) for *ad libitum* compared with bucket fed calves in the Low Ig categories.

TABLE 4. Effect of calf serum Ig level and weight at purchase on the incidence of diarrhoea, respiratory disease and mortality (proportion of calves).

	Ig Status/Purchase Weight					
	Low/ Light	Low/ Heavy	High/ Light	High/ Heavy	Chi2	Sign.
No. of calves	298	1107	590	2687		
Diarrhoea	0.35	0.17	0.20	0.12	118.8	***
Respiratory disease	0.33	0.36	0.28	0.29	29.2	***
Mortality	0.17	0.08	0.04	0.03	122.4	***

TABLE 5. Effect of calf serum Ig level and feeding system on the incidence of diarrhoea, respiratory disease and mortality (proportion of calves).

	Ig status/feeding systems					
	Low/ Ad lib	Low/ Bucket	High/ Ad lib	High/ Bucket	Chi2	Sign.
No. of calves	403	565	780	1729		
Diarrhoea	0.19	0.20	0.15	0.13	32.0	***
Respiratory disease	0.42	0.33	0.29	0.27	49.5	***
Mortality	0.10	0.09	0.02	0.03	90.1	***

Purchase weight & feeding systems

Purchase weight had the greatest influence on incidence of diarrhoea and mortality while feeding systems had the greatest influence on the incidence of respiratory disease (Table 6). However, there appeared to be an interaction between purchase weight and feeding systems. Light calves fed *ad libitum* compared with bucket had a higher (p 0.01) incidence of diarrhoea and mortality.

TABLE 6. Effect of weight at purchase and feeding system on the incidence of diarrhoea, respiratory disease and mortality (proportion of calves).

	Purchase weight/feeding system					
	Light/ Ad lib	Light/ Bucket	Heavy/ Ad lib	Heavy/ Bucket	Chi2	Sign.
No. of calves	229	365	1013	2108		
Diarrhoea	0.29	0.23	0.13	0.13	88.3	***
Respiratory disease	0.32	0.28	0.34	0.28	13.2	***
Mortality	0.11	0.07	0.05	0.04	36.4	***
Liveweight gain						

Discussion

These results suggest that low serum Ig levels are associated with an increased incidence of diarrhoea, respiratory disease and mortality. This is in agreement with other studies where calves with low Ig levels had a high incidence of diarrhoea (16), respiratory disease (11), and calf mortality (4, 17). However, Gay et al. (17) found no relationship between Ig level and incidence of diarrhoea while others (4, 18) failed to show any relationship between Ig level and mortality. Calves with low purchase weights had the higher (p 0.01) incidence of diarrhoea and mortality (Table 2), however when calf weight was examined in association with Ig level (Table 4) it was evident that Light calves with Low Ig level were the most susceptible to diarrhoea and mortality. Mortality among calves with high Ig levels was similar for both Light and heavy calves. Barber (18) found no relationship between weight of calf at purchase and subsequent survival but he cites unpublished work which found that weight at purchase was an important factor influencing calf survival.

The feeding system used had little influence on calf mortality or morbidity except that the incidence of respiratory disease was greater among *ad libitum* fed calves (Table 3). It could be that this increase was due to group penning rather than to the feeding system (19). When the bucket and *ad libitum* fed calves were categorized according to purchase weight the incidence of diarrhoea and mortality among light calves was higher for the *ad libitum* compared with the bucket fed calves.

In general serum Ig levels had a greater effect on the parameters measured than had either purchase weight or feeding systems. Ensuring that all calves born obtain adequate levels of Ig from colostrum is therefore a most important factor in any calf health programme.

References

1. Bakheit, H.A., Green, H.J.: 1981 Vet. Rec., 108, 455. 2. Hamm, D., Hicks: 1975, Vet. Med. Small Anima. Clin., 70, 279. 3. Aalund, O. 1978 Respiratory Disease in Cattle. Publ. Martinus Nijhoff, The Hague 16. 4. Rosnoni, G. & Bersamaschi: A 1978 in Respiratory Disease in Cattle. Martinus Nijhoff, The Hague 39. 5. Stott, G.H.: 1980 J. Dairy Sci., 63, 681. 6. Drennan, M.J.: 1981 Calf to Beef, p. 4. An Foras Taluntais, Dublin. 7. Jenny, B.F., Mills, S.E., Johnston, W.E., O'Dell, G.D.: 1978 J. Dairy Science, 61: 765. 8. Appleman, R.D., Owen, F.G., 1975 J. Dairy Sci., 58: 447. 9. Kertz, A.F.: 1977 J. Dairy Sci., 60, 1006. 10. Veterinary Investigation Service, 1964 Vet. Rec., 76, 1139. 11. Williams, M.R., Spooner, R.L. & Thomas, L.H.: 1975 Vet. Rec. 96: 81. 12. Kelly, T.G.: 1983 Ph.D. Thesis, U.C.D. 13. Lacey, J.: 1968: J. Gen. Microbiol. 51: 173. 14. Roy, J.H.B., J. of Roy. Agric. Soc. 132: 81. 15. McEwan, A.D., Fisher, E.W., Selman, I.E., Penhale, W.J.: 1970 J. Comp. Pathol 80: 259. 16. Boyd, J.W.: 1974 Vet. Rec. 95: 310. 17. Gay, C.C., Anderson, N., Fisher, E.W., McEwan, A.D.: 1965 Vet. Rec. 77: 148. 18. Barber, D.M.L.: 1978 Vet. Rec. 102: 418. 19. Martin, H.: 1967. Vet Rec. 81: 225.

A Survey of Summer Fertility in Family-Sized Israeli Dairy Herds During a Four Year Period

G. Francos, I. Shamir and E. Mayer
Hachaklait Clinical Veterinary Services
P.O.B. 9610
Naifa, Israel

Summary

The differences in the response to moderate heat stress (Average THI 75-76) was studied in dairy herds of a cooperative village in the North of Israel. During a 4-year period, 4080 calvings and subsequent insemination periods were examined. Thirty nine herds had an Overall Conception Rate (OCR) of above 40% during the hot summer months (July-September) and were designated as H herds; in 56 herds the OCR was below 40% (L herds). Between the years 1980/81 and 1982/83 a significant decrease in the percentage of H herds, from 54.5% to 29.4%, was recorded. This coincided with a more than doubling of the amounts of silage in the ration and the cessation of green fodder feeding. The H and L herds had identical OCRs during the moderate period (October-June) of each year. During summer months, the H herds experienced only a 1-5% decrease in their OCR, in the L herds the decrease was between 24% and 29%. Milk production in both groups was identical. The herds feeding or not feeding green fodder had a summer OCR of 45.4% and 30.3% respectively. The herds located in barns exposed to free air movement of above 5 m/sec had a summer OCR of 43.3% and 48.5% compared to a summer OCR of 24.8% and 21.6% in herds exposed to an air velocity below 5 m/sec.

It is concluded that under conditions of moderate heat stress the summer OCR is very fragile; it may be quite satisfactory or very low. Environmental factors like exposure to free air movement of above 5 m/sec and the feeding of green fodder have a favourable effect. The feeding of silage in the summer is apparently detrimental and should be limited to small amounts only.

The Effect of Endotoxaemia on Luteal Function in Cows

R. O. Gilbert, W. T. K. Bosu* *and* A. T. Peter*
Department of Genesiology
Faculty of Veterinary Science
University of Pretoria, Private Bag XO4
Onderstepoort, 0110 South Africa
**School of Veterinary Medicine*
University of Wisconsin
Madison, WI 53706

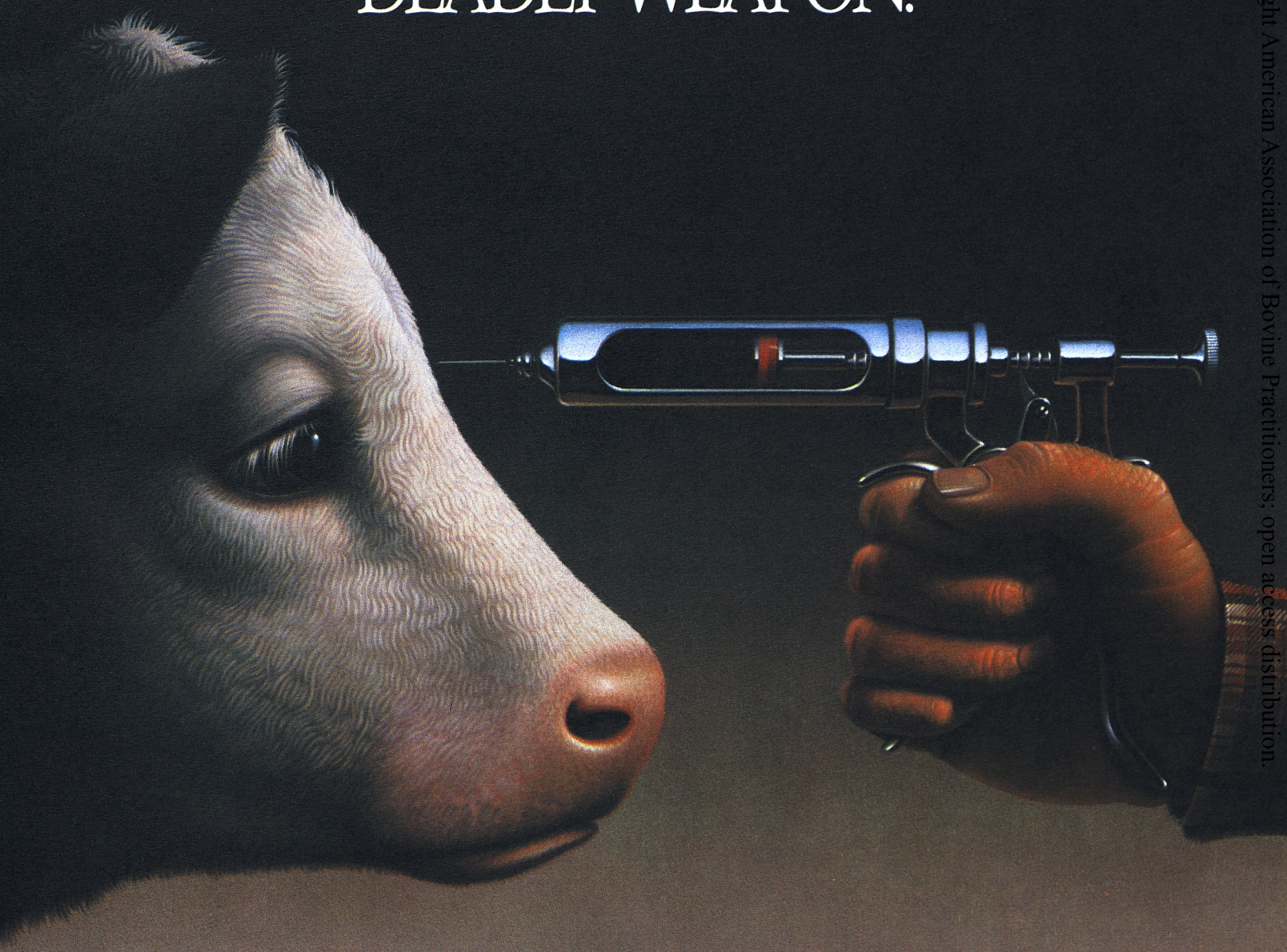
Summary

Four groups of 4 to 6 Holstein heifers received either: intrauterine infusion of sterile culture medium (Group I), intrauterine infusion of *E. coli* endotoxin (5 mcg/kg) in sterile culture medium (Group II), intrauterine administration of 10 ml of a 25 hour culture of a strain of *E. coli* isolated from the uterus of a cow with purulent endometritis and containing approximately 10^9 colony forming units /ml (Group III), or intravenous administration of *E. coli* endotoxin in sterile saline (5 mcg/kg) (Group IV) on Day 7, 8 or 9 of the oestrous cycle. No change in cycle length or endocrine profile was observed in Group I or II. In Group III, the duration of the luteal phase and the interoestrous interval were reduced. Intravenous administration of endotoxin (Group IV) provoked an acute increase in circulating progesterone concentration within 4 hours, followed by a significant decrease at 12 and 16 hours, after which luteal function apparently recovered in all but one animal. In Group IV an acute peak in prostaglandin F metabolite was also measured at 4 hours post-injection.

These findings suggest that endotoxin is not absorbed from the intact uterus of the cycling cow, but that intravenous administration of endotoxin has an acute effect on luteal function, potentially mediated by activation of prostaglandin synthesis or release.

Summaries of papers presented at the 14th World Congress on Cattle Diseases, Dublin, Ireland, August, 1986.

THE WRONG BVD VACCINE CAN BE A DEADLY WEAPON.



Vaccination is your strongest weapon against Bovine Viral Diarrhea. But independent researchers have discovered that *modified live* BVD virus vaccines can actually trigger a deadly form of BVD. That's why killed virus Triangle®-3 is your safest choice.

If a fetus survives a BVD attack before day 125, the animal may become persistently infected with *non-cytopathic* BVD virus and produce no antibody to it.[1,2,3] It may appear healthy, but can spread the virus.

When this animal is exposed to *cytopathic* virus—either from modified live BVD virus vaccine or natural exposure—it may develop mucosal disease syndrome. This form of BVD damages mucous membranes and often causes death.

Effective control of the disease requires a killed virus vaccine. Immunizing females with Triangle-3 prior to breeding will maintain high antibody levels throughout pregnancy, thus protecting the fetus.[4,5]

Triangle®-3 is safe for the whole herd, even pregnant cows. And Triangle-3 is the only killed virus BVD vaccine which also prevents IBR and PI-3. Ask your Fort Dodge representative for the right weapon, Triangle-3. ***Ask for the new 5cc dose.***

Triangle® 3

Killed virus BVD, IBR, PI-3 vaccine

FORT DODGE®

Fort Dodge Laboratories
Fort Dodge, Iowa 50501

Footnotes: *1. Production of Cattle Immunotolerant to Bovine Viral Diarrhea Virus. McClurkin et al. (National Animal Disease Center, Ames, Iowa.) Can. J. Comp. Med. 1984; 48: 156-161. *2. Mucosal Disease of Cattle: A Late Sequel to Fetal Infection. Roeder and Drew (Veterinary Investigation Centre, England). Veterinary Record, 1984; 114: 309-313. *3. Experimental Production of Fatal Mucosal Disease in Cattle. Brownlie, Clark and Howard. Veterinary Record, 1984; 114: 535-536. *4. "Safe vaccine for pregnant cows," Agricultural Research, September, 1976, Pg. 14. *5. "Evaluation of Acetylethyleneimine-Killed Bovine Viral Diarrhea—Mucosal Disease Virus (BVD) Vaccine for Prevention Of BVD Infection Of The Fetus." Proceedings of 79th Annual Meeting of the United States Animal Health Association, McClurkin et. al. (National Animal Disease Center, Ames, Iowa.) Nov. 2-7, 1975; 114-123.