

### Introduction

There have been numerous reports on the incidence of twinbirths in cattle. The short gestation, the increased incidence of retained foetal membranes and the subsequent effects on fertility are well recorded. However previous reports on the effect of twinbirths on herd performance have been limited in their scope and have considered only relatively small numbers of animals. In the UK induced twinning in cattle is now available (albeit in a small way) as a commercial service using embryos produced by in vitro fertilisation of oocytes collected and cultured from ovaries taken from beef heifers at the slaughterhouse. Such embryos are being implanted into both dairy and beef cows.

One side-effect of a veterinary practice offering a bureau computerised recording service to its dairy farmers is that a large database of health, fertility, and production is developed in relatively few years. It was the use of such a recording scheme, the DAISY system developed at the University of Reading and operated from a veterinary practice that provided the data for this study. The increasing use of such schemes by practitioners should lead to the creation of large quantities of data which should answer many questions relating to health, fertility, and production.

With the development of a commercial service offering to implant twin embryos into dairy cows it seemed opportune to measure the effect that twinbirths has on production in dairy cows using data from the practice recording scheme.

### Materials and Methods

Data was available from 37 dairy farms for cows calving from July 1, 1986 to June 30, 1989. Having identified all the cows that were recorded to have calved twins a contemporary was selected for each cow under the following criteria:- they were from the same farm, had had the same number of lactations, and calved within 14 days. The following information was extracted from the recording scheme for both twin bearing cows and their contemporaries:- lactation number, gestation length, the sex of the calf and whether they were born dead or alive. Problems at calving included calving assistance, milk fever, retention of foetal membranes for more than 24 hours, and any subsequent vulval discharges requiring treatment. Fertility information included interval to first service, the number of services, number of days open, the calving to conception interval, and the dates of culling. Milk production in the form of 305 day yields was available from 24 of the 37 herds as milk recording was not practised in the others. Where preceding lactation data was available milk production was compared in both the lactations preceding and following the twinbirths.

The normal fertility indices and culling rates were calculated for twin bearing cows and their contemporaries. Partial budgets were prepared and the performance in economic terms of twin bearing cows was compared to their contemporaries.

For the statistical comparison of two proportions, the  $\chi^2$  test with a continuity correction was used and for the comparison of two means, a t-test for two independent samples was used.

## Results

### Incidence

Data were available from 19,755 Friesian calvings, of which 503 produced twins, an incidence of 2.5 per cent. Month of calving had no significant effect on the incidence.

The incidence increased with parity. First lactation heifers had an incidence of 0.9 per cent which rose to 5.1 per cent on cows of 8th parity and above as is shown in Fig 1.

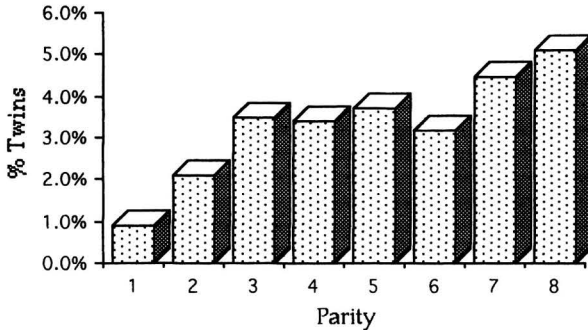


Fig 1: Incidence of twin calvings for each parity

### Gestation length (Fig 2)

Data were available for 169 twin bearing cows and their contemporaries. Twin-bearing cows having a mean gestation length of 277 days and their contemporaries 285 days. The difference was highly significant ( $P < 0.001$ ).

Of the 19,755 calvings the incidence of abortions (150 - 270 day) was 2.3 per cent compared with 8.3 per cent of twin bearing cows.

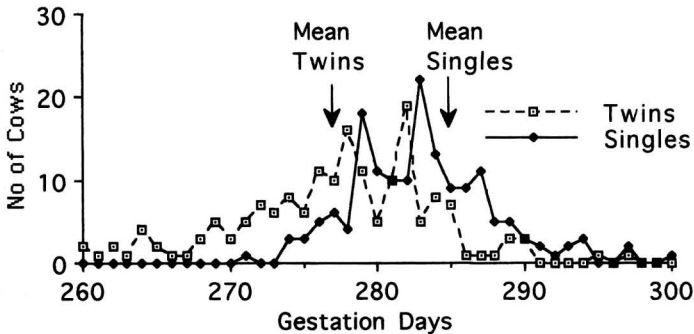


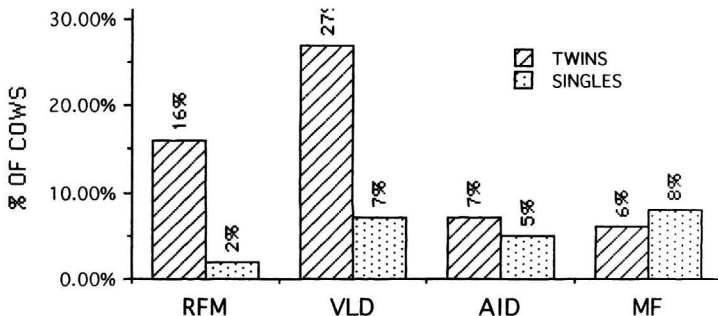
Fig 2: Gestation Length of Cows with Twins and Singles

### Stillbirths

Data were available from 239 twin bearing cows and their contemporaries. Of the 479 calves born as twins (including one set of triplets) 15.2 % were born dead compared to 5.4 % of single born calves ( $P < 0.001$ ).

**Calving Problems**

Data on problems associated with calving were available for 403 cows and their contemporaries and the results are shown in Fig 3. The incidence of retained foetal membranes (16 % v 2 %) and vulval discharge (27 % v 7 %) were significantly higher in twin bearing cows ( $P < 0.001$ ) but the incidence of milk fever and assistance at calving were not significantly different.



**Fig 3 Percentage of cows with retained foetal membranes(RFM), Vulval discharges (VLD), aid at calving (AID) & milk fever (MF)**

**Culling Rates**

Culling information was available on 284 twin-bearing cows and contemporaries. Of the twin-bearing cows 6 died and 93 were sold (% culled = 34.9 %) and of the contemporaries 2 died and 57 were sold(% culled = 20.8 %) This difference was significant ( $P < 0.001$ ).

**Fertility after calving**

Fertility data was available for 379 cows and their contemporaries and the indices are shown in Table 1. Six per cent fewer twin-bearing cows received a first service ( $P < 0.03$ ) and their interval to first service was 6 days longer, a non significant increase.

**Table 1: Fertility indices of twin bearing cows and their contemporaries.**

Fertility index	Twins	Singles	Difference
No. calved	379	379	
No. served	314	336	
No. conceived	246	293	
% served of calved	83	89	6 P<0.03
Int. to 1st service (days)	78	72	6 NS
% conceived of calved	65	77	12 P<0.001
Days open	222	170	52 P<0.001
Calv-conception (days)	125	92	33 P<0.01
PR to 1st service	41	51	10 P=0.013
PR to all services	46	49	9 NS
Serves per conception	2.2	1.7	0.5

Only 65 per cent of the twin-bearing cows re-conceived, compared with 77 per cent of the contemporaries ( $P < 0.001$ ). The twin-bearing cows that did conceive took, on average, 33 days longer, with a calving to conception interval of 125 days which was largely due to a reduction in pregnancy rate to first service of 10 per cent ( $P = 0.013$ ).

#### *Milk Production after calving*

Milk production data were available for 171 cows and their contemporaries. The 305-day yield for twin-bearing cows was 5336 litres and for the contemporaries was 5101 litres. The difference of 235 litres was not statistically significant.

#### *Fertility and production performance before calving*

Fertility and production data was available for 83 cows plus contemporaries from their preceding lactation. The results are shown in Table 2 and indicate that the fertility of the twin-bearing cows was depressed yet the 305-day milk yields were 263 litres higher than their contemporaries. The differences were not statistically significant.

Table 2: Fertility and milk yields in the preceding lactation of 83 twin bearing cows and their contemporaries.

	Twins	Singles	Difference
Number of cows	83	83	
Calving to 1st service(days)	71	66	5
Calving to conception (days)	93	79	14
Serves to conception	1.8	1.4	0.4
305-day milk yield (litres)	5797	5534	263

#### *Economics*

The losses associated with cows bearing twins arise from a number of factors. First, their increased calving to conception interval (slightly compensated by their shorter gestations). The current estimate in the UK for this loss is £3-00 for each day the calving to conception interval is extended beyond 85 days. Secondly there are increased insemination charges. Thirdly and the biggest loss is the increased culling rate. This involves the difference between the value of cull cows and the replacements and that heifers only produce 75 per cent of the milk yield of mature cows. Currently in the UK this loss is estimated to be £590-00 for each animal culled. Finally there are extra veterinary costs associated with treating the problems associated with calving.

Against these losses there are gains from the increased milk yield of twin-bearing cows and the extra calves available for sale. The margin of milk price over variable costs is estimated to be 12 pence per litre and the average sale price for calves is £150-00. However it is estimated that the value of a twin calf is only 75 per cent of a single born calf.

These gains and losses have been calculated and are shown in Table 3.

There were gains from calf sales and higher milk yields which amounted to £75-32 per cow however the losses at £168-68 per cow exceeded the gains by £93-36.

It is concluded therefore that on average a cow bearing twin calves results in an economic loss to the farmer of £93-36.

Table 3: Economic assessment of the effect of twinbirths on subsequent performance.

	Losses or gains/cow producing twins
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Losses due to	
33 days increase in calving to conception less 8 day shorter gestation 25 days at £3-00 per day	£75.00
Extra serves /conception: 0.5 services at £8-00	£ 4.00
Culling rate increased by 14 % at a cost of £590-00 per cow replaced. £590 X 14 %	£82.60
Veterinary costs for treating 14 % more cows for RFM at £22 20 % more cows for VLD at £20	£ 3.08 £ 4.00
<u>Total losses</u>	<u>£168.68</u>
Gains due to	
235 litres extra milk at a margin of 12P per litre Extra calf sales- calf value £145	£28.20
Twins 1.7 calves per cow for sale Singles 0.95 calves per cow for sale Twins valued at 75% of single born calves	£47.12
<u>Total gains</u>	<u>£ 75.32</u>
<u>Net losses per cow</u>	<u>£ 93.36</u>
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### Discussion

Most dairy farmers would not argue with these findings as the problems associated with twinbirths in dairy cows are well recognised.

There is a suggestion that twinning may be a feature of higher yielding cows as cows that produced twins did have higher yields in both preceding and subsequent lactations. Although these yield differences were not statistically significant the number of cows with yield data were too few. This would be worthy of further study.

If twinning were induced by implantation of twin embryos the economic loss

would be:- £93-36 + £28-20 = £121-56 because it can be assumed that the milk yield benefit would not be present.

Sreenan and Diskin (1982) estimated that induced twinning could increase revenue by 12 per cent, however they did not take into account depressed fertility and increased culling rate which were the main cause of the economic loss in this study.

Although induced twinning using beef breed embryos produced by in-vitro fertilisation is now commercially available in the UK it is suggested that this technique should not be used in Dairy cows until it is known how to manage them without depressing their fertility.

### References

Sreenan, J. M., Diskin, M. G. (1982) Irish Veterinary Journal **36**:138

## Summary

Data from 19,755 calvings which occurred in three years on 37 farms was analysed to measure the effect of twinbirths on the subsequent health, reproduction and production of British Dairy cattle. The herds were recorded with the computerised Dairy Herd Recording Scheme, DAISY, operated from the veterinary practice as a part of a herd health scheme.

The average twinning rate was 2.5 per cent. For first lactation heifers the incidence was 0.9 per cent and the rate increased as parity increased to over 5 per cent in cows calving in their sixth or subsequent lactation.

Although they produced more milk than their contemporaries twin-bearing cows suffered an increased incidence of retained foetal membranes and vulval discharges and their calving to conception interval was extended by 33 days. Gestation length was 8 days shorter.

The culling rate was 35 per cent for twin-bearing cows compared with 21 per cent for the contemporaries. The benefit of having more calves for sale was reduced because 15 per cent were born dead. It is calculated, using partial budgets, that the production of twins results in an average loss of income of £93-36 per cow.

Before the induction of twinning is adopted in dairy cows more research is required to determine whether the problems of reduced fertility and high culling rates can be overcome by improved management or nutritional techniques.