BRIEF COMMUNICATION: The use of milking intervals of individual cows in assessing herd test milk production data

AJ Molenaar[a]*, HV Henderson[a], ML Burgess[b], WG Burgess[b], DL Johnson[c] and K Singh[a]

[a]AgResearch Ruakura, Private Bag 3123, Hamilton 3240, New Zealand; [b]480 Ruakura Road, RD 6, Hamilton 3286, New Zealand; [c]Livestock Improvement Corporation, Private Bag 3016, Hamilton 3240, New Zealand
**Corresponding author. Email: adrian.molenaar@agresearch.co.nz*

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Introduction

Herd testing is a significant expense for dairy farmers but it gives important information about individual cow yields and contributes to the genetic worth status of the cows. While every effort is made to maximise the value of the tests to the farmer there are still opportunities to increase this value further. Estimations of milk yield from herd tests, whether from one or two milkings, rely on the generally held assumption that animals come in to the parlour in a similar order at each milking (DairyNZ 2011) and so the values obtained reflect a nominal 24 hour yield. A number of reports support this notion (Kilgour & Scott 1959; Dietrich et al. 1965; Dickson et al. 1967), but others do not (Guhl & Atkeson 1959). Systematic observations show that while this may be the case for leading and trailing cows, it is not for the rest (Soffié et al. 1976; Gadbury 1975).

This paper shows that there is considerable variation in milking order and that the use of recorded milking sampling time or milking parlour exit times allows the derivation of more accurate milking intervals. The adjustment of the nominal 24 hour milk yields to 24 hour interval-corrected milk yields provides a more accurate assessment of cow performance.

Materials and methods

Two seasons of herd test data from a mixed age, mixed Jersey Friesian breed, split herd farm where cows had access to feed before and immediately after milking, and which used a 20 aside herringbone milking parlour, were analysed. Time of sampling was extracted from activity reports obtained by the farmers for the Livestock Improvement Corporation herd tests and the morning (AM) versus the preceding afternoon (PM) sampling times were plotted. The September 2011 herd test milkings were on a 9 hour schedule during the day and a 15 hour schedule during the night. Using time of sampling information for two successive herd test milkings, the PM to AM interval for each cow was calculated, and the AM milk yield corrected to a standard 15 hour milking interval by calculating (AM milk yield) x 15/(AM milking interval). Using cow exit times from the milking parlour for the previous AM milking, contained in automatically recorded data from a Protrack™ system (Livestock Improvement Corporation, Hamilton, New Zealand), allowed the correction of the PM yield to a standard nine hour yield by calculating (PM milk yield) x 9/(PM milking interval). Total milk yields were reported as 24 hour interval-corrected milk yields by calculating (AM + PM milk yield) x 24/(AM + PM milking interval).

Results and discussion

If the time of sampling is recorded during herd testing then the cow's individual milking order can be derived. If animals do come in to the parlour in a similar order at each milking, a tight relationship about a straight line is expected when the time of day of milking in one session is plotted against that in another session. The scatter-plots of all the individual herd tests that were compared indicated that cows varied considerably in their milking order and with each milking taking around two and a half hours, there was the potential for up to a five hour spread in individual intervals between consecutive milkings. This range will depend on the time taken to milk each herd. As an example the September 2011 herd test data for 615 cows run as two herds is presented in Fig. 1. Approximately 95% of the cows were within a

Figure 1 Comparison of order of cow milking between two consecutive Herd Test milkings, from a 20 aside herringbone milking parlour milking 615 cows run as two herds (Herd 1 = O, Herd 2 = ×).

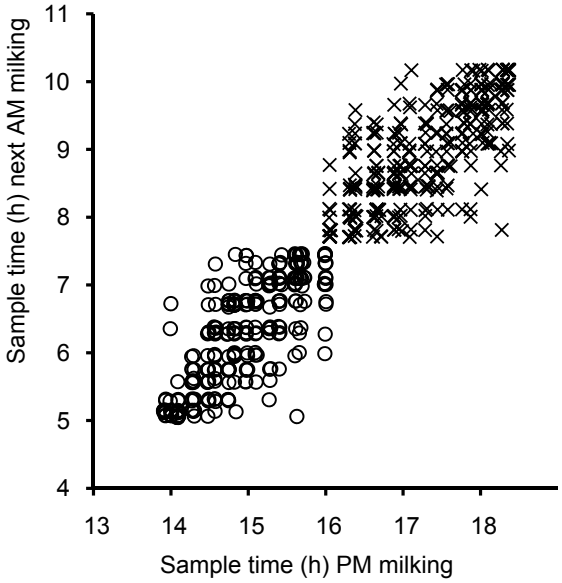

Table 1 Descriptive statistics for September 2011 Herd Test. Corresponding milking interval from the prior morning (AM) milking to the Herd Test AM with the Herd Test report total milk yield milking which were used to calculate the 24 hour interval-corrected milk yield. The correction factor is the ratio (Herd test report total milk yield)/(24 hour interval-corrected milk yield) expressed as a percentage.

Parameter	Milking interval between AM and next AM (h)	Herd test report - Total milk yield (L)	24 hour interval-corrected milk yield (L)	Correction factor (%)
Number of records	610	615	610	610
Mean	24.1	28.5	28.5	101%
Minimum	21.7	2.6	2.7	90%
Maximum	26.0	48.6	50.1	108%
Range	4.3	46.0	47.4	18%
Standard deviation	0.61	7.89	7.94	3%

2.2 hour range for the interval from the evening to the following morning milking.

Using Protrack milking times, the nominal 24 hour intervals ranged from 22 to 26 hours. This error is compounded if a single test is used and the results of that test are extrapolated for the whole day. McDaniel (1969), has commented that lactation milk yields based on one milking have a one-third larger error than those based on two. In our study, uncorrected yields varied from 90 to 108% of the 24 hour interval-corrected milk yields. Hence there could be a significant error in the estimation of yields for some cows (Table 1). Consequently, when a farmer is considering milk yield information for identifying cows to cull, errors could occur. Adjusting for actual milking intervals in herd test reports for individual cows should give greater accuracy of individual lactation yield and may increase the accuracy of herd culling decisions. The effect of these errors, when accumulated over several tests within a season requires further investigation. This study attempts to quantify the errors in milk yield calculations when milking interval is not taken into account.

Comparing the average rate of milk accumulation of the shorter AM to PM interval and the longer PM to AM interval milkings may give information about udder capacity and lactation persistency. In the current study, comparing milk yields of the evening and morning milkings suggests that the secretion rate was reduced in longer milking intervals. Milkings on a nine and 15 hour schedule showed that the apparent rate of milk synthesis was higher in the morning to evening time (9 hour) period by up to 1 L/hour (AJ Molenaar, Unpublished data). That differential milk secretion rates occur with different milking intervals is controversial (Ragsdale et al. 1924 (cited by Wheelock 1966); Turner 1955; Elliott & Brumby 1955; Ouweltjes 1998; Ayadi et al. 2003). More investigation is required.

This study indicates that if milk yield estimations are not corrected for milking intervals then these estimations will be less accurate. The ratio of hourly milk synthesis for PM–AM versus AM–PM intervals may give some information on lactation persistency and udder capacity. Cows with low ratios may tolerate longer milking intervals; presumably by being able to store larger amounts of milk without reducing milk yields. They may also be more lactationally persistent by being more resistant to inhibitory influences and may be more suitable for once a day milking than those with high ratios (Knight & Dewhurst 1994).

In conclusion, incorporation of herd test sampling times and pre-test milking intervals and adjustment of the nominal 24 hour yield to interval-corrected 24 hour yields would allow better estimates of individual cow yields, animal evaluations and better culling decisions. Thus over time and assuming a link between herd genetic merit and profitability, will improve farm profitability.

It remains to be determined whether more herd tests may reduce this error. Future work will involve a similar analysis with a greater number of farms using ProTrack™ to see if this is a general phenomenon.

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