

Can first milk recording parameters be used to warn of metabolic stress?

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Method

Data from over 7,000 heifers and 18,000 cows that calved from 1st September to 31st December 2010 were analysed with the aim of identifying whether parameters measured at the first milk recording (FMR) after calving:

1. were associated with subsequent cow lactation yields and fertility outcomes, and;
2. could be useful as indicators of recently calved cows suffering metabolic stress.

In addition to “raw” measures of milk, fat and protein, the study examined deviations from a cow’s individually adjusted “expected” kg yield of milk, fat and protein as generated routinely from a herd’s past milk records by InterHerd/InterHerd+.

The study also tested FMR parameters from the **PREVIOUS** lactation as possible predictors of problems in the **NEXT** lactation, including early culling, failure to re-breed or delayed conception.

Table 1: Fertility performance according to [fat:protein ratio] and [kg yield compared with expected] at FMR in the SAME lactation

FMR Category [‡]	n cows	%that did not re-conceive	Of conceived: %with Ca:Co> 150d
Normal	18,609	20.1%	29.2%
FPR>1.5	3,623	23.7%	33.6%
yield <exp	2,557	28.2%	36.8%
Both	694	31.4%	43.2%
Overall	25,483	21.7%	30.8%
Chi-square p-value		<0.0001	<0.0001

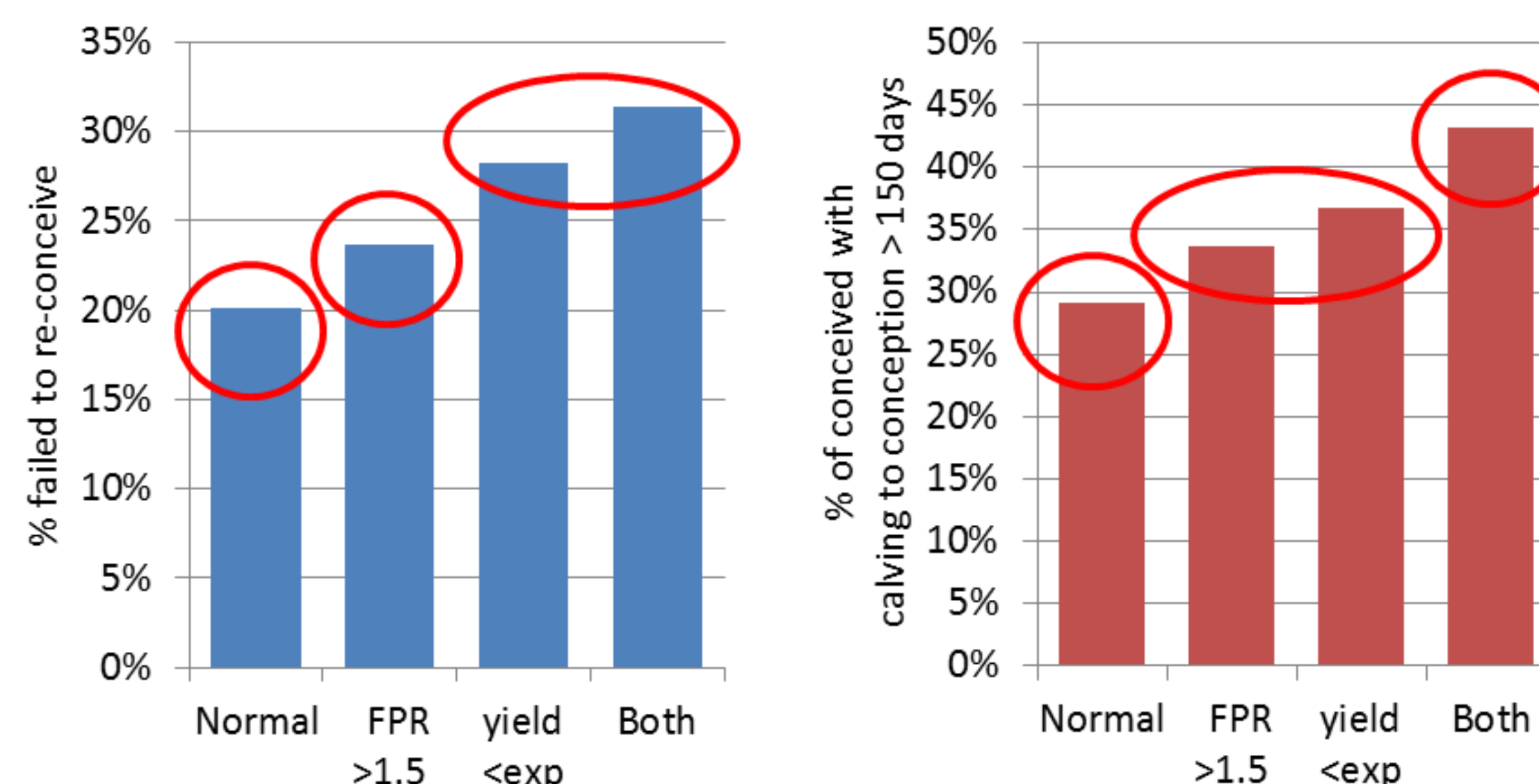
[‡]Key to First Milk Record (FMR) categories:

Normal	NEITHER FPR>1.5 or milk yield 15+%below expected
FPR>1.5	Fat:protein ratio > 1.5 ONLY
yield <exp	Milk yield 15+%below expected ONLY
Both	BOTH FPR>1.5 and milk yield 15+%below expected

Findings

- Cows with a Fat:Protein Ratio (FPR) greater than 1.5 had a higher risk of culling or, if retained, had longer calving to conception intervals (Table 1 and Figure 1).
- Higher than individually adjusted “expected” fat yield at FMR was strongly associated with cows yielding less milk than the average in their herds (adjusted for herd, parity and month of calving). Lower than individually adjusted “expected” protein yield was strongly associated with cows yielding more milk than the average in their herds. Herd managers try to keep high yielding cows at the expense of lower yielders. The influence of yield-related management decisions confounds cause-effect associations between higher than expected fat yield or lower than expected protein yield at FMR (perhaps indicating metabolic stress) and a cow’s subsequent fertility performance:
 - cows with higher than expected fat at FMR (~ ‘low yielders’) were more likely to be culled, but, if retained, had shorter calving to conception intervals;
 - cows with lower than expected protein at FMR (~ ‘high yielders’) had extended calving to conception intervals but were eventually more likely to re-calve.
- However, negative deviation from a cow’s “expected” kg milk yield (15%+ below expected milk yield), was **not** associated with the cows lactation yield level relative to herd-mates but **was associated** with poorer fertility performance, possibly indicative of metabolic stress:
 - regardless of yield level, cows with 15%+ below expected milk yield at FMR had a higher rate of culling or, if retained, had longer calving to conception intervals (Table 1 and Figure 1).
- If both FPR and yield deviation are considered together, cows with **both** negative yield deviation and high FPR had significantly worse fertility outcomes (Table 1 and Figure 1).
- Furthermore, parameters at the FMR in the **PREVIOUS** lactation were also similarly associated with culling rate and calving to conception at the **NEXT** lactation (Table 2).

Figure 1: Fertility performance according to [fat:protein ratio] and [kg yield compared with expected] at FMR in the SAME lactation



Red ovals enclose groups that ARE NOT significantly different

Table 2: Fertility performance in NEXT lactation according to [fat:protein ratio] and [kg yield compared with expected] at FMR in PREVIOUS lactation

FMR Category [‡]	n cows	%that did not re-conceive	Of conceived: %with Ca:Co> 150d	Of all cows calved: %exits within 50 days post-partum
Normal	13,208	26.8%	30.1%	3.5%
FPR>1.5	2,493	28.3%	32.5%	4.0%
yield <exp	1,891	29.7%	36.6%	3.3%
Both	535	34.2%	38.4%	5.6%
Overall	18,127	27.5%	31.3%	3.6%
Chi-square p-value		<0.0001	<0.0001	0.034

Summary

- Negative deviation from a cow’s “expected” milk yield at FMR (InterHerd+) is an indicator of metabolic stress that is not confounded by the cow’s yield level.
- Cows with **both** a lower than expected yield **and** high fat:protein ratio at FMR were at greater risk of culling or delayed conception in the current lactation.
- FMR parameters in the **PREVIOUS** lactation could also be used to target cows at greater risk of metabolic stress in the **NEXT** lactation. This has potential for improving management of transition cows.

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