Comparison of on-line measurements with conventional single-day herd tests

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Previous theoretical studies have shown that frequent tests by on-line milk analysers (OMA) can provide better cow assessments than infrequent laboratory-based tests. This is because the higher test error associated with OMA averages to zero with multiple tests and the true means of traits with high day-to-day variation are better captured using tests taken over several days than with a single-day herd test (1DHT). This theory, however, assumes tests are not affected by cow specific bias (CSB). CSB is a systematic error that causes cows to be consistently under- or over-evaluated relative to the herd, which reduces the accuracy of between-cow comparisons. We compared the precision of data from OMA and 1DHT for milk volume, fat, protein, lactose and SCC, using the 10d average herd test as ground truth. The precision of OMA was better at a cow average level than at an individual test level, but this was dependent on the degree of CSB. CSB was negligible for protein, lactose and somatic cell count (SCC) ≥200 kcells/mL and not negligible for volume, fat and SCC <200 kcells/mL. The precision of the 1DHT estimate of the cow average was numerically similar to the within-cow day-to-day variation of each trait. For traits with high day-to-day variation (milk volume, fat, SCC ≥200 kcells/mL), OMA provided a statistically equal or better estimate of the cow average than 1DHT. For traits with low day-to-day variation (protein, lactose, SCC <200 kcells/ mL), 1DHT provided a significantly better estimate of the cow average than OMA, despite OMA protein and lactose exhibiting negligible CSB. For all milk production traits and for SCC in the range most useful for herd management purposes (≥200 kcells/mL) OMA estimated the cow average with precision and ranking accuracy suitable for herd management.