Integration of multiple sensor data streams to assist in the detection of mastitis

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Incidence of mastitis within the dairy industry is estimated to cost the UK dairy industry around £200Million GBP annually in terms of lost production. This paper examines the combination of two independent sensor technologies for early detection of mastitis. Behavioural monitoring collars that measure feeding and ruminating times were combined with milk component analysis and quarter conductivity from an automated milking robot. Combining information from both sensors reduces the prevalence of false positives and increases the specificity of health alerts. Accurately detecting illnesses can enable early treatment which can significantly benefit both farm profitability and animal welfare, increasing short- and long-term milk production, reducing milk refusals, and reducing use of medication in treatment of animals. 200 Holstein-Freisian cows of varying parity and stage of lactation were milked over 4 Fullwood Merlin2 robots providing per-quarter conductivity and yield measurements per milking, and bulk fat, protein, and lactose milk content. Farm operatives were challenged to monitor and identify animals with mastitis. The collar alerts (both rumination and feeding behavior) showed strongest predictive ability, followed by milk conductivity and time between milkings. In 74% of the cases the feeding/rumination signatures alerted at least one day before the condition was noted by the farmer. More than 90% of cases were detected at least as early as the farm observations. Given that this was a trial where the farm operatives were specifically tasked with maintaining a close watch on the herd for welfare related indicators, this performance is impressive. Conductivity changes were typically observed after either rumination or eating alerts from the collar. Conductivity alerted in 25% of cases at least 1 day in advance of the farmer, was equal to or in advance of the farmer in 50% of cases. Changes in the fat to protein ratio were not observed to be a strong indicator for mastitis; only 13% of cases had a drop in fat:protein ratio in advance of the farmer.