Identification of milk samples and linking to the recorded cow

Tony Craven

National Milk Recording, Laches Close, Calibre Business Park, Four Ashes, Wolverhampton, Wv10 7DZ, England

Over recent years the numbers of individual cow milk samples destined for additional testing following the traditional butterfat, protein and somatic cell count testing has increased year on year. Currently approximately 12% of the samples submitted for herd recording require additional testing and the soon to be introduced milk test for pregnancy is expected to increase the numbers dramatically.

NMRs current practice was to write the cow line numbers on the sample vial lids and use these to identify samples for individual cows at every milking attended, adding a sample from each cow at each milking proportionate to the time interval between milkings by the use of calibrated dippers. The on farm recording system allows for entry of milk weights and events for individual animals and samples are placed in the box of 60 in numeric order, with new animals after the last sample. There is a checking procedure when the samples arrive in the laboratory to check that the samples are in the correct order within the box of 60 (made up of 6 racks of 10 samples) because when the samples are presented to the Combifoss instrument, sample vials lids are removed, thus the identification of the cow to which the sample relates and the allocation of the analysis to the correct cow is dependent on the sample being in the correct position within the rack.

The concern to NMR is that as sample numbers being sent for additional testing are increasing, as well as being racked out into differing racks that are then used to hold the samples whilst the Tecans take samples from the vials for Eliza plate testing, the potential for error is high. NMR is therefore going through a process to increase the robustness of sample identification with an objective of improving the accuracy of disease and PD result allocation to individual cows.

Slide 1	IN NMR we want to ensure the right sample analysis is allocated to the correct cow and with more samples heading for subsequent testing, this is becoming a bigger worry.
Slide 2	Background information on the size of the business- herd numbers, herd size, how our transport system works, laboratory working hours and payment testing
Slide 3	Refrigerated compartment within our vans to handle the payment samples. Herd recording samples preserved with Bronapol so these are transported in ambient temperatures.
Slide 4	Our vans go out in all weathers 365 days a year.
Slide 5	Locations of milk testing labs and transport depots and hubs.
Slide 6	Laboratory in Wolverhampton which was built from an old garage in 2012. As a result we could merge the payment and herd improvement labs and test both in the same lab as opposed to the situation beforehand where the payment samples were delivered to Wolverhampton then the herd recording samples were taken 3 hours drive to the NMR laboratory in Harrogate in Northern England.
Slide 7	Inside the lab we have 8 combifoss instruments, 4 Bactoscans plus disease and micro/ pcr laboratories.
Slide 8	We have a number of IT systems that have developed over the years and which we have had to work on to get them to talk to each other: THOR – Total Herd On-line Recording

	Sample Manager Lab system Hamsta- Health and Microcheck Sample Testing Application Whilst it would be lovely to set up a new all encompassing system that incorporated all our sample handling and testing needs automatically using RFID or bar codes, the money to do so is just not available.
Slide 9	Sample pots are prepared prior to milking with the line numbers of the cows expected to be milking. At the end of the recording, the recording day data is downloaded over the web to the NMR database and the samples are transported to one of our testing labs. Once the samples reach the lab, generally the same evening, the sample positions are checked before testing. After testing, samples destined for additional disease or PD testing will be registered into HAMSTA, racked out into white racks and placed on the Tecan for sampling into the ELIZA wells. Following disease testing, reporting is done through the HAMSTA system.
Slide 10	Our concerns are that more and more samples are destined for additional testing and once the pot lid is removed, the only reference to the sample relating to a cow is from the position of the pot and the order of racks of samples. We need to be more robust, effective and more efficient.
Slide 11	List of diseases offered to farmers from the milk samples: Johnes disease - Herd wise- whole herd quarterly testing - Herd Tracker- 30 cows identified by computer based on highest cell counts over a 6 month period for cows between lactations 3 and 6. BVD Leptosirosis IBR Pregnancy diagnosis to be launched
Slide 12	Before the milking takes place, the milk recorder enters the events into THOR system on farm such as calvings and cows dried off and this provides a picture of the NMR box with line numbers of the cows expected to be recorded. The milk recorder then numbers the pots with cow line numbers ready for recording. There are no bar codes or RFID tags- the samples must match the cows in milk in the THOR system.
Slide 13	Cow line numbers are written onto the pot lids prior to milking. Weights of milk from each recording will also be written on the pot lid and then entered into THOR at the end of the milking.
Slide 14	At the end of milking the sample box should contain samples for every cow in the herd, in line number order with no gaps between samples, starting from the bottom left of the box. This will mean the analysis will be allocated to the correct cow as the system looks to sample position.
Slide 15	In the lab, the picture of the NMR box is presented to the lab technician which can be printed so that sample position can be checked.
Slide 16	The technician checks sample position against a printout of the box of samples and marks the printout to indicate the sample positions have been checked.
Slide 17	Samples that are due to go for additional testing after the traditional butterfat, protein and somatic cell counts are marked on the side of the pot with the cow line number.
Slide 18	Once warmed in the waterbaths, the lids are removed so the sample identities on individual pots is then lost.
Slide 19	Samples tested in batches and sample analysis is allocated to cows based on rack position, hence the need to endure positions are correct before analysis.
Slide 20	Why don't we use a hinged lid? Cant clean the lids therefore would need to dispose

	of the vials after each use- more expensive and less environmentally friendly
Slide 21	We dispose of the lids with writing on and wash the sample pots, racks and boxes after the lab testing has been done.
Slide 22	After washing and drying, liquid preservative is dosed into the empty pots and a new lid is applied before the serviced box is sent out to our fieldstaff for use again on farm. If time allows I would like to show you a 1 minute video of the capper machine in action.
Slide 23	After combi testing the samples for disease or PD testing are registered manually into the HAMSTA system. With the introduction of this new system, there is a link from Sample Manager system to Hamsta which means the cows identified for additional testing are automatically sent to the Hamsta system and this is populated with the herd and cow details of the animals needing subsequent testing.
Slide 24	Samples for disease testing are racked out into racks that fit on the ECAN sampling robots.
Slide 25	Once racked out into white racks and registered into Hamsta, the samples for disease testing are placed on the TECAN for sampling into the Eliza plates
Slide 26	When the disease testing has been completed, the results are reported to the customer using Hamsta by whatever medium he chooses- paper, e mail, fax etc.
Slide 27	We identified that there was an opportunity to improve the way we handled the samples to : Improve the sample identification Increase confidence that we were allocating the correct analysis to the correct cow. Introduce automatic population of disease handling systems to reduce the keying errors and improve staff utilisation
Slide 28	With the new system, the samples identified for additional testing which are identified by the label attached to the pots, the Hamsta system is automatically populated by the Sample Manager system link to Hamsta. This saves all the manual keying of cow line numbers into the Hamsta system. In addition, the presence of a label on a sample pot is a good reminder to the combi operator not to throw the sample away after the combi test.
Slide 29	Sample labels have been designed to produce bar codes as part of the print so that in the future we can look to automate the handling of the samples.
Slide 30	Also set up for QR codes
Slide 31	Application of labels with herd and cow numbers on each pot destined for additional testing will improve the reliability of identification of the correct animal, removes the need to write on every sample vial and helps the combi operator identify samples that should not be disposed of.
Slide 32	Automatically populating the disease system from the NMR system reduces keying errors by removing the requirement to key in animal identities.
Slide 33	Placing the NMR boxes directly onto the sampling robots means staff do not need to rack out from one rack system to another and retains the samples in the same order in the racks in which they were tested for fat, protein and cell counts.
Slide 34	Concluding summary of why we are making the changes which should result in improved accuracy of sample identification and savings of staff tasks plus we are set up with the ability to produce bar codes to further improve efficiencies and automation in the future.
Video	1 minute video of the capper machine