

Quality Milk Management Services

Bacteriology and Antimicrobial Sensitivity Testing

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Welcome to QMMS

About Us

'where quality counts'

We are a small family company, focused on the dairy industry, offering laboratory and consultancy services to a range of clients from dairy farmers to multinational companies. We benefit from over 100 years combined experience in the dairy sector and are also involved at the 'cutting edge' of mastitis research and the application of the latest findings on farm. We have an uncompromising approach to quality, adopted from a firm research base.

QMMS has a dedicated team of personnel, which includes specialist veterinary surgeons, bacteriologists, skilled laboratory staff as well as research assistants. Familiarity with farming and the industry as well as speaking to the same person ensures any query can be dealt with rapidly and to your satisfaction.

Our Philosophy

'more than just numbers'

Our philosophy is to deliver a cost effective service centred on 'adding value' to the milk recording and bacteriology data we produce. We are firmly committed to providing appropriate unbiased advice and are acutely aware of the key management decisions that need to be made on the basis of our analyses.

About Our Clients

'big enough to cope - small enough to care!'

Our clients are many and varied including conventional and organic farmers, veterinary surgeons, cooperatives, processors, universities and large multi-national pharmaceutical companies. All of our customers are valued from the smallest to the largest and we pride ourselves on fulfilling our clients' needs, irrespective of whether they are a small family business or a pharmaceutical giant.

Our farm clients range from smaller herds of less than 50, to very large herds of over 1,000 cows on a mixture of systems from pasture-based, seasonal calving herds to intensive, high yielding herds.

Our vet and advisor clients include specialist farm practices and consultant groups, as well as individual vets and advisors who require assistance with on farm investigation and monitoring of milk quality.



Our Services

Clinical Bacteriology

We offer a full range of bacteriological analyses from individual cow samples to bulk tank analyses, as well as water analysis. We aim to tailor bacteriology to the individual farm, ensuring that we make cost effective use of your investment – we won't sell you tests you don't need. Our individual cow bacteriology exceeds the recommendations of the National Mastitis Council (NMC) and is designed to maximise the opportunity of isolating and identifying the problem pathogens on your farm.

Our individual cow bacteriology uses a full range of laboratory tests and a standard 72 hour incubation period to identify causal bacteria; we do not make 'presumptive' diagnoses. Interim reports at 24 hours are available on request. As with all our services, results are backed by RCVS Recognised Specialist veterinary advice.

Key facts about our bacteriology services are listed below:

- Individual cow bacteriology and antibiotic sensitivity testing
- Bulk tank screens and analysis
- Bedding analysis
- Udder cloth assessment
- High Bactoscan investigation including differential counts
- Water analysis (bacteriology only)
- Techniques exceed the recommendations of the National Mastitis Council
- Speciation using the latest techniques including MALDI-TOF Mass Spectrometry
- *Mycoplasma* spp testing available (by culture and including speciation)
- Results include interpretation and comments by RCVS Recognised Specialist veterinary surgeons
- Full sampling kits including detailed instructions available on request



Dairy Foods Testing

As well as routine clinical bacteriology aimed at producers, we also offer a full range of food testing services designed to meet the needs of small producer processors. We tailor tests to the needs of individual clients; examples of some of the tests offered are outlined below:

- Bacterial counts
 - Total counts as well as specific counts (*e.g.* coliforms, *S. aureus*)
- *Listeria* spp and *Salmonella* spp detection
- Milk and cream constituent analysis
- Freezing point depression
- Testing for inhibitory substances (Delvotest SP)
- Phosphatase testing

Our routine testing is backed up with support to identify and isolate the causes of any problems highlighted.



QMMS Bacteriology

Routine Bacteriology

Individual cow bacteriology at QMMS exceeds international standards with the aim of maximizing the detection of causal pathogens. All samples are plated onto blood, Edwards and MacConkey Agar, with an increased volume being inoculated onto the latter to maximize the chances of isolating Gram-negative organisms such as *E. coli* as well as *S. aureus*. All samples are incubated for at least 72 hours as many pathogens will not grow within a shorter time frame.

Our service also differs from that of other mastitis diagnostic labs in that, where possible, we identify all organisms isolated to the species level. It is possible for us to achieve this in a cost effective manner as we use MALDI-TOF mass spectrometry to identify organisms (with a very high level of accuracy) by their protein 'fingerprint'. This approach also speeds up results as an identification can be reached in minutes rather than within hours or even days.

We can provide kits for sample collection which, as long as used correctly, meet the legal requirements for posting diagnostic specimens. As well as the necessary sample pots these contain instructions on how to collect an 'aseptic' sample, as good sampling technique is essential to achieve optimum results. It's also important that samples arrive at the lab as cool as possible; for that reason we use insulated boxes. Frozen samples can act as their own 'cool packs' otherwise our kits contain 'ice blocks'.



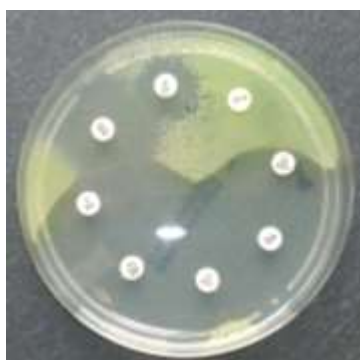
An excellent sampling technique is necessary to achieve optimum results



Sampling kits are available on request

Sensitivity Testing

In addition to routine bacteriology we offer a full antibiotic sensitivity testing service. Our routine 'panels' cover all of the commonly used intramammary and systemic mastitis treatments, but other options are available on request. Our routine sensitivity testing is undertaken using the Kirby-Bauer Disk Diffusion Assay as illustrated below. However, we can undertake more detailed testing and determination of MICs (mean inhibitory concentrations) using the Vitek 2[®] (bioMérieux) if required.



The Kirby-Bauer Disk Diffusion Test



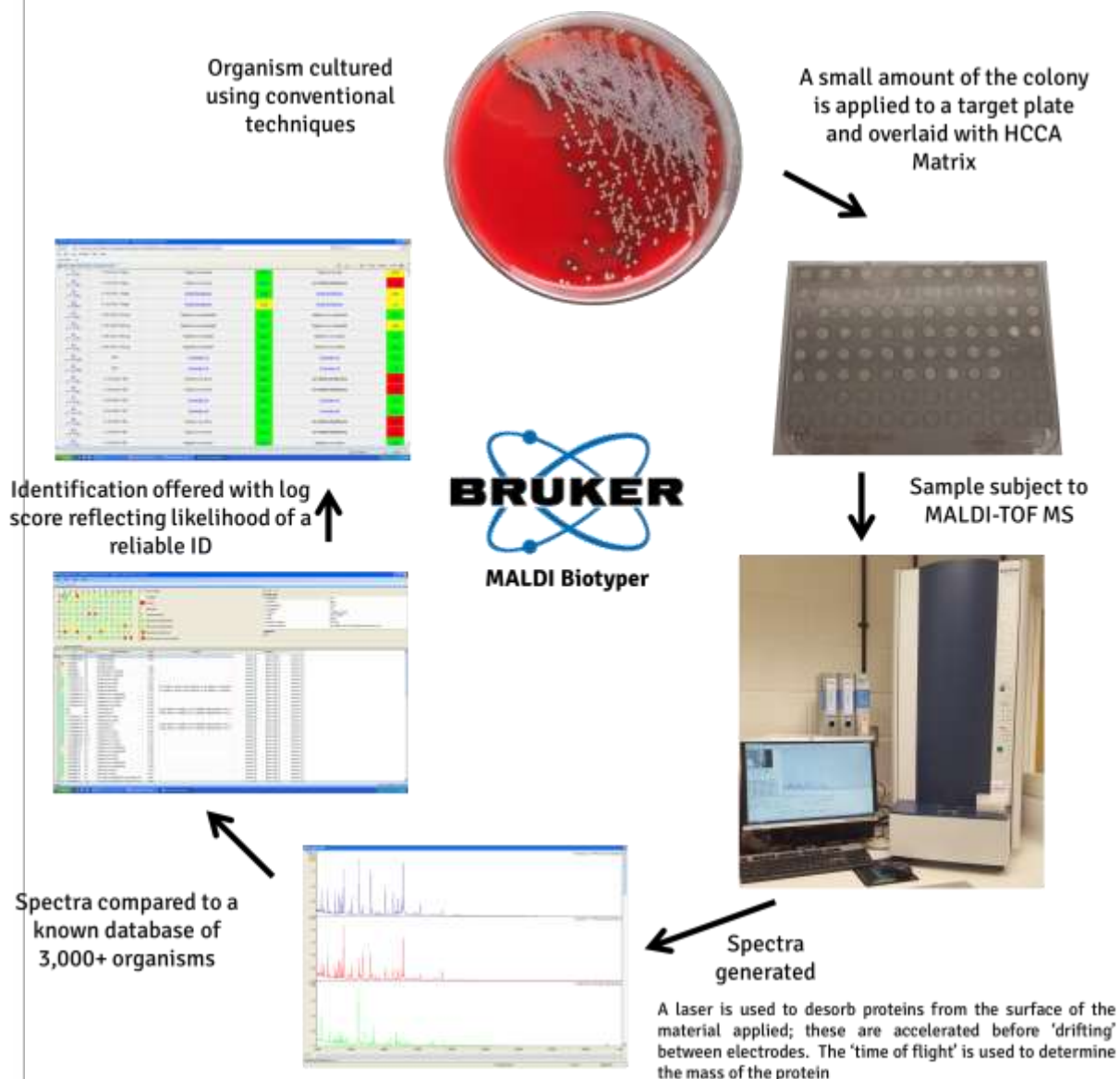
The Vitek 2[®], used to determine MICs

MALDI-TOF Mass Spectrometry

Introduction

Bovine mastitis is a complex disease, with over 150 different causal organisms identified. Historically, the industry standard for identification of organisms has been bacteriology supplemented with biochemical tests; these methods are slow, labour intensive and prone to error in interpretation. PCR techniques offer more rapid screening, though only for a small number of different organisms. MALDI-TOF MS offers a more rapid and robust alternative to conventional techniques for the identification of bovine mastitis organisms.

How MALDI-TOF Works....



In addition to allowing identification of bacterial species, research at QMMS has demonstrated that we can use this technology to differentiate different strains of the same organism (see overleaf). More specifically we are already able to differentiate between 'contagious' and 'environmental' strains of *Streptococcus uberis*.

Strain Typing

Using MALDI-TOF MS we are able to differentiate between different strains of the same species of bacteria and thereby investigate some of the more complex outbreaks of mastitis seen on farm. Whilst the use of this technology is still in development, we can already differentiate (with a high level of confidence) 'contagious' and 'environmental' strains of *Streptococcus uberis*, which has potentially important implications for the control of this difficult pathogen. Using this technique we have been able to demonstrate the 'spread' of this organism within a herd and can potentially identify farms at increased risk of disease.



A CCI (Cluster Correlation Index) demonstrating spread of a 'contagious' strain of *Streptococcus uberis* through a dairy herd.

Bulk Tank and Water Testing

In addition to routine mastitis bacteriology we offer a range of tests to investigate bactoscan issues and on farm water quality. These tests include a full breakdown of the organisms present in bulk milk as well as a 'direct plating' to identify the key pathogens present. This service is backed up with specialist veterinary advice and where necessary 'on-farm' investigation to identify gaps in the current process.

Our bulk tank bacterial 'breakdowns' include the following:

- **Total Bacterial Count:** An overall count of the bacteria present which broadly correlates with the 'bactoscan' allowing an insight into the 'bacterial load' in the milk. (Note: this does not grow all the organisms present and needs to be supplemented with other counts).
- **Thermotolerant Count:** A count reflecting the numbers of organisms that are tolerant of higher temperatures and used as a marker of plant cleaning.
- **Coliform Count:** A count of coliform organisms. This is often elevated when teat preparation is poor, but can also rise in other circumstances.
- **Psychrotrophic Count:** A count of organisms that will grow at refrigeration temperatures. This can help identify teat preparation issues, but also issues with milk storage. We undertake a **true** psychrotrophic count which involves incubation at 6°C for 6 days. Whilst this is slower than the techniques offered at some laboratories it ensures that potential problem organisms are not overlooked.
- **Direct Plating:** This involves culture of the sample on 'broad spectrum' and selective agars to identify the key pathogens present

Interpretation of the results of is undertaken by RCVS Specialists as the above analyses are often not straight forward. Interpretation is further aided by the use of MALDI-TOF as we can usually accurately identify organisms, allowing a more rapid resolution of issues present.



QMMS Bacteriology - FAQs

Why should I submit samples for bacteriology?

Sampling cases of clinical mastitis and periodically submitting these for bacteriology testing will give valuable information about the type of bacteria causing infections. This information can be used alongside cell count and mastitis case data to provide insight into appropriate changes required to improve udder health.

Do I have to freeze samples for bacteriology?

No. However, if you are collecting samples from clinical cases or high cell count cows, freezing allows the sample to 'keep' for longer. Frozen samples will remain suitable for culture for up to 6 months, allowing batches of samples to be submitted.

If you are submitting bulk tank samples or water samples for differential counts, these must **NOT** be frozen.

It seems excessive... Do I really have to bother to clean the cow's teats?

A good sampling technique is essential if meaningful results are going to be generated from the samples you collect. The reason for this is that many of the pathogens that cause mastitis are also in the environment and if samples aren't collected appropriately it is impossible to differentiate causal organism from contaminants. Also, the teat canal and teat skin are often colonized by minor pathogens and without thorough cleaning and stripping of fore-milk these might predominate in your sample.

Do you test all isolates for sensitivity to antibiotics?

No, we only test isolates from samples as requested. However, we routinely test all *Staphylococcus aureus* isolates for penicillin sensitivity as this can be a useful indicator of likely response to treatment.

What about testing for Mycoplasma species?

QMMS offers Mycoplasma culture although turnaround times are slower as these organisms take some time to grow. Whilst samples are incubated for Mycoplasma culture, standard bacteriology testing is also undertaken to rule out involvement of other pathogens.

Can I freeze samples that are to be submitted for Mycoplasma spp culture?

No, samples for *Mycoplasma* spp culture must be collected, chilled and submitted for culture as quickly as possible as they can lose viability quite quickly.

Is it worth culturing my bulk tank to try to identify mastitis pathogens?

This is a difficult question and the answer is not straight forward. In reality it depends on what pathogens you are looking for. For contagious pathogens that are 'specific' to the udder, such as *Streptococcus agalactiae* and to a lesser extent *Staphylococcus aureus* this can be a useful screening exercise (though the former is now very rare in the UK). It can also be a useful way to screen a herd for the presence of *Mycoplasma* spp. However, for most bacterial species (particularly environmental organisms) it is not useful as the organism is unlikely to have originated from an infected cow. That said, on occasions the presence of large numbers of *Streptococcus uberis* in a bulk milk sample can reflect the presence of an infected cow in the herd.

We're starting 'selective dry cow therapy' – should we do some bacteriology? If so what's appropriate?

We recommend strategic sampling of some high SCC cows in late lactation to better understand the pathogens you need to cure at drying off and of clinical mastitis cases in early lactation to get an insight into the main pathogens causing new intramammary infection in the dry period. A bulk tank sample is **NOT** an appropriate way to approach or justify blanket antibiotic use at drying off.



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Don't follow the herd ...

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