Interpreting Culture Results from Quarter Milk Samples

The Laboratory for Udder Health recently began using a new technology (MALDI TOF Mass Spectrometry) to identify bacteria in milk samples. In some cases, this technology allows us to be more specific in naming the bacteria isolated and so clients of the Laboratory for Udder Health may see some unfamiliar bacteria listed on their culture reports.

The following is a list of bacterial species that may be isolated from milk samples submitted to the Lab for Udder Health. These bacteria have been grouped under their common classification for mastitis management purposes. Clients should reference this list if they find a bacterial species that is unfamiliar on their culture report. For more information about a particular mastitis pathogen, see the Mastitis Pathogen Factsheets at http://www.cvm.umn.edu/vdl/ourservices/udderhealth.

Environmental Mastitis Pathogens

These pathogens are considered “environmental” because the source of bacteria is the cow’s environment. Intramammary infection occurs when bacteria from dirt or manure at the teat end overcome the defense mechanisms of the udder. The primary way to prevent these infections is by decreasing exposure of the teat to bacteria – by maintaining a clean environment and using an effective pre-milking teat disinfectant.

Environmental Streptococci (Gram-positive):

- *Aerococcus sp.*
- *Aerococcus viridans*
- *Enterococcus casseliflavus*
- *Enterococcus faecalis*
- *Enterococcus hirae*
- *Enterococcus saccarolyticus*
- *Enterococcus casseliflavus*
- *Enterococcus faecalis*
- *Enterococcus hirae*
- *Lactococcus gravieae*
- *Lactococcus lactis*
- *Lactococcus lactic*
- *Lactococcus saccarolyticus*
- *Lactobacillus gravieae*
- *Lactobacillus lactis*
- *Lactobacillus lactic*
- *Lactobacillus saccarolyticus*
- *Micrococcus sp.*
- *Streptococcus sp.*
- *Streptococcus bovis*
- *Streptococcus dysgalactiae*
- *Streptococcus equi*
- *Streptococcus uberis* *
- *Streptococcus vestibularis*
- *Streptococcus uberis*

*Although Streptococcus uberis is grouped with the Environmental Streptococci, it sometimes acts as a contagious pathogen. For more information about Streptococcus uberis, see the pathogen factsheets available on the Lab for Udder Health website.*

Coagulase-negative or Environmental Staphylococci (Gram-positive):

- *Staphylococcus sp.*
- *Staphylococcus chromogenes*
- *Staphylococcus simulans*
- *Staphylococcus xylosus/saprophyticus*

Other Gram-positives:

- *Trueperella pyogenes* (formerly *Arcanobacterium pyogenes*)
- *Corynebacterium sp.*
- *Listeria monocytogenes*
- *Bacillus sp.*

Coliform Gram-negatives:

- *Citrobacter sp.*
- *Enterobacter sp.*
- *Enterobacter amnigenus.*
- *Escherichia coli*
- *Hafnia sp.*
- *Klebsiella sp.*
- *Klebsiella oxytoca*
- *Klebsiella pneumonia*
- *Pantoea sp.*
**Other Gram-negatives:**
- Acinetobacter sp.
- Acinetobacter baumannii
- Pasteurella sp.
- Proteus sp.
- Salmonella sp.
- Serratia sp.
- Serratia marcescens
- Yersinia sp.

Considered as or similar to Pseudomonas:
- Aeromonas sp.
- Flavimonas sp.
- Plesiomonas shigelloides
- Pseudomonas fulva
- Plesiomonas sp.
- Stenotrophomonas sp.

**Other Non-bacteria:**
- Yeast
- Nocardia sp.
- Prototheca sp.*

*Although Prototheca originates in the environment, it may behave as a contagious pathogen.

### Contagious Mastitis Pathogens

These pathogens are considered “contagious” because the source of bacteria is milk from infected cows. Intramammary infection occurs during milking when milk from an infected cow contacts the teat end of another cow. The primary way to prevent these infections is through good milking hygiene, use of an effective post-milking teat disinfectant, and prompt identification and management of clinical mastitis.

- Mycoplasma sp.
- Prototheca sp.
- Streptococcus agalactiae
- Staphylococcus aureus

### Contaminated Samples

Milk samples are considered contaminated if 3 or more bacterial species are isolated. It is unlikely that a true mastitis infection would be caused by more than one, or possibly two, bacterial species. Culture results from quarter milk samples that are contaminated should be viewed as suspect and the affected quarter should be re-sampled. For more information on how to collect a clean milk sample, see the sample collection guide on the Lab for Udder Health website.

### Interpreting Composite Samples

Composite samples are samples where milk from all four quarters is combined into one sample vial. Composite samples are more difficult to interpret than individual quarter samples for several reasons. First, it is not uncommon for composite samples to contain several bacterial species – either because the sample is contaminated with bacteria from the udder skin or environment, or because there may be different bacterial species present in the milk from multiple quarters. It is difficult to distinguish between contaminants and bacteria causing infection. This is especially true when the bacteria present are environmental bacteria. Second, it is difficult to know which quarter or quarters may be infected. For these reasons, we recommend using composite samples only to screen for contagious pathogens, such as Staphylococcus aureus or Prototheca. If the culture is positive for a contagious pathogen, it is very likely that the bacteria originated in an infected quarter. The California Mastitis Test (CMT) can be used to identify which quarters have an increased somatic cell count and are therefore likely to be infected, or individual quarter samples can be submitted to definitively determine which quarter(s) is infected.

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