The FUIDI Herd Management Schema

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ABSTRACT
The FUIDI Herd Management Schema is an integrated set of tests and recommendations based upon Infectious Diseases Incorporated’s (IDI) conceptualization of the natural history of infection due to *Mycobacterium avium* subspecies *paratuberculosis* and related pathogenic bacteria. The intent of the sequential use of a series of tests and resultant recommendations is designed to enhance retention of productive animals in the herd while reducing the introduction of pathogenic mycobacterium into the human food chain.

INTRODUCTION
The FUIDI Herd Management Schema is based upon an expanded understanding of the natural history of infection due to *Mycobacterium avium* subspecies *paratuberculosis* (Map). The pathogenic mycobacteria in the *M. avium* spectrum of mycobacterium appear to be deeply embedded in the natural food chain of herbivores, accounting for their prevalence in herbivore and rodent populations on a global level (Harris and Barletta, 2001; Turenne et al., 2007). The concentration of animals into herd groups makes animals that cannot attain immune governance over the pathogenic strains prime disseminators of infection, but they are not the ultimate reservoirs of infection. The congregation of animals makes it likely that over time every animal in a large herd will be infected by Map or a polymorphic variant of Map. When a herd is studied from, not the presence or absence of Map specific antibodies, but rather from the point of whether or not active Map replication is occurring, over 70% of animals will attain immune governance and cease to have evidence of continued Map replication (Monif et al., 2009). By so doing, these animals have achieved the prolonged cell-mediated immunity against the prevailing Map strain at the portal for infection. In these animals, relative immunity (auto-vaccination) to reasonable environmental re-expose at the portal of infection (the gastrointestinal tract) is theoretically in place. The probability of persistence and/or progression of infection to clinical Johne’s disease are a partial function exposure dose and the strain’s relative virulence is not effectively counterbalanced by the animal’s cell-mediated immune system.

Animals exhibiting continued Map replication constitute a subgroup for which the risk of organism shedding into milk is heightened. Once substantial infection is established, the probability of subsequent immune capture of Map replication is usually remote. Animals identified as having had prior significant Map antigen processing, using the FUIDI #1 Map ELISA test, but no evidence of active infection, constitute a subgroup of animals that are potentially at risk of Map re-activation of replication at calving, particularly if environmentally and/or nutritionally stressed.

METHODOLOGY
The FUIDI Herd Management Schema is composed of two divergent types of Map ELISA tests: a direct milk Map PCR test and a nested Map PCR test or fecal culture and sets of directives that emanate from the resultant data.

The two FUIDI Map ELISA tests are used to dissect out subgroups at varying risk within the herd. The antigenic composition of the FUIDI #1 test identifies animals that have had significant antigenic exposure to Map at some time. The FUIDI #2 test assesses the probability of active mycobacterium replication.
RESULTS

![Diagram of FUIDI Map Test results]

DISCUSSION
The majority of animals with low-level organism replication and subsequent documented immune capture constitute a subgroup for long-term retention in the herd. Theoretically, such naturally auto-vaccinated animals have now in place permanently enhanced cell-mediated immunity and are better able to handle continued environmental Map challenges. Potentially more important, the progeny from such animals in time will result in heifers better able to handle continued environmental Map challenges.

The animals with ongoing evidence of active antigen processing over time identify animals at augmented risk for intra-herd Map dissemination, shedding into the milk, and
progression to clinical disease. Sequential use of the FUIDI tests in conjunction with selective use of Map PCR testing of milk and with resultant guidelines may allow retention of productive animals in the herd while reducing the introduction of pathogenic mycobacterium into the human food chain.

**CONCLUSION**

The FUIDI Herd Management Schema

1. gives milk producers on-going assessment of their herd’s condition,
2. lessens the probability of having bulk milk rejected because of Map detection,
3. over time, allows producers to develop herds with greater inherent immunity to environmental Map challenge, and
4. reduces the introduction of Map into the nation’s food supply and in so doing diminishes liability.

By being proactive, dairy producers, more likely than not, can partially shield themselves from the legal liability that will occur when, in a court of law, a jury finds cause for a relationship between Map in commercial milk and Crohn’s disease.

**REFERENCES**


Monif GRG, Williams J E, 2009. The natural history of *Mycobacterium avium* subspecies *paratuberculosis* as interpreted from the FUIDI # 2 Test. 10th ICP, Minneapolis, MN August 9-14, 2009. p.111.