Feeding Acidified Milk to Calves

During a trip to Finland in 2005, OMAFRA’s Dr. Neil Anderson found that feeding acidified milk was a common practice in that country, having several advantages over feeding raw, untreated milk. The acidified milk had a longer ‘shelf-life’ and could be fed free-choice because its slightly acid taste resulted in calves consuming smaller, more frequent meals. In addition, the Finns claimed that feeding acidified milk prevents diarrhea. Since that trip, Dr. Anderson has initiated several trials to examine the effects of feeding acidified milk to calves on Ontario dairy farms. Here are short summaries of some of the results of those trials:

Bacteria in Acidified Milk

In July and August of 2006, samples were collected from 48 containers of acidified milk or milk replacer on 24 Ontario farms. Producers had been advised to follow the acidification protocol described on the next page that calls for a pH in the 4.0-4.5 range. The majority used formic acid but a few used AgriAcid™ which consists of formic plus other organic acids. Two producers acidified their milk to less than pH 4.0 and four producers to pH greater than 4.5; 81% of samples were in the target range. Some producers reported challenges with reading pH paper and testing their milk.

The graph below summarizes the bacterial loads found in the acidified milk samples. *Staphylococci* and *Streptococci* were the most common species found in the samples. Thirty-one of 48 samples had no coliform growth. The majority of samples had no growth or less than 1,000 colony forming units (cfu) per ml of the bacterial species identified. *Staph. aureus* was found in 2 samples of whole milk from two farms. Both had fewer than 500 cfu per ml of milk. One sample had pH=4.4 and 7 hours contact time with acid. The other had pH=4.2 and 1 hour of contact time. Standard textbooks suggest that *Staph. aureus* is inactivated at pH 4.2. The authors of this study recommend 10-12 hours contact time with acid before feeding acidified milk.

**Formic acid kills MAP**

Acidification significantly reduced the colony forming units (cfu) of *Mycobacterium avium* subsp. *paratuberculosis* (MAP)—the bacterium that causes Johne’s Disease—recovered from raw milk. The table above shows the results from a comparison of milk pH and acidifying agents on MAP viability. Raw milk was seeded with 10,000 cfu per ml of MAP. Results are reported as percent cfu recovered after treatment. The rows highlighted in red are the results for pH 4.0-4.5, the recommended range for acidified milk-feeding systems. Formic acid was the most effective acid tested in killing MAP. The researchers observed killing by 8 hours. Greater than 90% of MAP were dead at 48 hours post-treatment at pH below 4.0. All acids achieved significant bactericidal activity after 48 hours at pH 3.5.
How to Prepare Acidified Milk Using 85% Formic Acid

1. Carefully mix 1 part of 85% formic acid into 9 parts of water to produce a dilute (9.8%) acid which is safer to use. **Always add acid to water.** Label the container of dilute acid clearly. **Caution:** 85% Formic Acid is hazardous to skin, eyes and lungs. Wear goggles, face shield, gloves, apron, and respirator when diluting and work in a well-ventilated area.

2. While stirring vigorously, add 30 mL of diluted (9.8%) formic acid per litre of whole milk; 40 to 45 mL per litre of colostrum. Use cool (10-24°C) or cold (≤10°C) milk to avoid coagulation or clot formation.

3. Check pH of milk after adding acid with a pH tester or narrow range (pH 3.0 - 5.5) pH test paper. The target pH is 4.0 - 4.5.

4. Stir acidified milk again within an hour of adding acid and 3 times a day thereafter.

5. Store the acidified milk in a cool location for 10-12 hours before feeding free-choice to calves along with fresh water and calf starter.

Sources:
- 85% formic acid can be purchased from Univar Canada—contacts for locations across Canada are at http://www.univarcanada.com/distribution.htm.
- A rugged, easy to use pH tester is available from Nasco—phone (800)668-0600, order cat. no. B01138NY, $52.65.

Acidified Milk Feeding Does Not Hinder Rumen Development

There is a common notion that feeding acidified milk to calves will not allow their rumens to develop normally. The photographs below demonstrate the fallacy in that belief. Jersey calves were offered unlimited access to acidified milk replacer, water and pelleted supplement mixed with rolled corn. At intervals during the feeding period, calves were euthanized. Examination showed normal rumen linings in all calves. Papillae were in various stages of development and were arranged a linear pattern as seen in a normal rumen.