

Feasibility of Identification of Pathogenic Coliform Bacteria in Dairy Products at the ISDA Dairy Laboratory

Coliforms are types of bacteria that fit into the category based on their form and function. Coliforms are defined as aerobic and facultatively anaerobic, gram negative, non-spore-forming rod bacteria that ferment lactose with the production of acid and gas within 48 hours at 35-37°C.

While most coliforms are not necessarily pathogenic, coliform presence in processed dairy is an overall indication of cleanliness (or lack thereof) and an indicator that there is high likelihood of post-processing contamination and unsanitary conditions.

Most coliforms are from 4 genera of the Enterobacteriaceae family (however not all strains of these genera are coliforms and some coliforms are not a part of these genera, e.g. *Aeromonas* spp.)

Enterobacteriaceae family genera of most coliforms are *Citrobacter*, *Enterobacter*, *Escherichia*, and *Klebsiella* and have been found to constitute about 35%, 30%, 11%, and 24% of coliforms found in raw milk respectively. Some of the more common pathogenic dairy coliforms are:

Citrobacter freundii – can cause foodborne illness.

Enterobacter spp (e.g. *sakazakii* and *Enterobacter aerogenes*) – can cause foodborne illness.

Escherichia coli (over 700 serotypes have been identified) – some serotypes can cause foodborne illness, many do not. Dangerous shiga toxin producing types include **O157:H7** (most common for severe illness), **O6:NM**, **O104:H21**, **O111:NM** and can cause gastroenteritis and hemolytic uremic syndrome.

Klebsiella pneumoniae- potentially dangerous, associate with mastitis.

Aeromonas spp. – some species can cause gastroenteritis and necrotizing fasciitis.

Currently the Dairy Laboratory utilizes a commercially prepared dehydrated media to culture all aerobic bacteria and coliforms. This media allows for us to test large numbers of samples in an efficient and economical manner. There are no similar commercial culture media platforms that would allow for identification of most coliforms on the species level. There is the ability for us to easily determine the presence and CFU counts for *Escherichia coli* in addition to the overall coliform count in fluid milk. Testing for *E. coli* would cost \$0.75 more per sample. As *E. coli* is ubiquitous in most environments and many forms are not pathenogenic, this may not be any more informative that total coliform testing. There is also the option to test/quantify total Enterobacteriaceae at a cost of about \$0.10 more per sample, but this would provide more generalized information and include more types of organisms that just coliforms.

There are molecular based test kits for the identification of *E. coli* O157 which would require the purchase of a Molecular Detection Instrument (approximately \$10,000-12,000), block heater,

and chill block in addition to the test kit which can test 96 samples for \$520.79. The testing protocol and sample preparation appears to be involved and we do not currently have the laboratory personnel and equipment to accommodate this additional testing for the current volume of raw samples we receive.

All species-specific identification would be molecular based testing involving PCR and/or DNA sequencing which would be cost prohibitive and would require more staffing to support.