A Research Note

Evaluation of the Bacteriological Health Risk of 60-Day Aged Raw Milk Cheddar Cheese

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ABSTRACT

One hundred twenty-seven 60-d aged Cheddar cheese samples produced by 21 provincially inspected cheese plants were analyzed by 8 regional laboratories of the Ontario Ministry of Health. Coliforms were detected in 37 (31.2%) and fecal coliforms confirmed in 22 (18.3%) samples, with geometric mean counts per g of 92.5 and 79.3, respectively. Staphylococcus aureus was found in only two products at a level of >1000 per g. Salmonella spp. and Campylobacter jejuni were not isolated from any of the samples tested. Yersinia enterocolitica was isolated from one product; however, the isolate was bile esculin-and salcin-positive, and considered a non-pathogenic biotype. The pH of these aged Cheddars ranged between 4.98 and 5.50, with a mean of 5.26. Alkaline phosphatase activity was detected in 94 (79.7%) of the 118 samples tested. These results suggest that 60-d aged raw milk Cheddar cheese produced in Ontario does not pose a significant bacteriological health risk.

Government of Canada regulations require that all cheese made from unpasteurized or raw milk must be stored (aged) for at least 60 d before sale or consumption to eliminate pathogenic organisms. Recent studies (11, 18) suggest that 60-d aging may be insufficient to eliminate bacterial pathogens and that 90 or 120 d may be required to ensure a safe product.

In addition to Salmonella spp., Yersinia enterocolitica and Campylobacter jejuni have been isolated from both raw milk and raw milk products (1, 9, 10, 14, 17). These organisms have been implicated in foodborne disease outbreaks associated with the consumption of raw milk and related products, but rarely isolated from epidemiologically incriminated samples (3). Studies have shown that certain virulent strains of Y. enterocolitica could be recovered from artificially contaminated cheeses after 8 wk of storage at 3 ± 1°C, depending upon the initial inoculum level, temperature, pH and other environmental conditions (11). C. jejuni has been reported to be even more susceptible to environmental storage conditions, being activated within 3 to 5 wk of storage at 4°C and within 4 d at 25°C depending on pH (4, 8).

Despite the suggested susceptibility of these pathogenic organisms to adverse environmental conditions, there have been very few studies to evaluate the actual incidence of Y. enterocolitica and C. jejuni in aged raw milk cheese. Such studies are needed to provide additional assurance that experimental results are upheld under natural production and storage conditions, as well as to evaluate possible geographic variation in susceptibility and incidence of pathogenic organisms. This survey was undertaken to evaluate the bacteriological status and potential health risk of 60-d aged raw milk Cheddar cheese produced in provincially inspected plants in the Province of Ontario.

MATERIALS AND METHODS

This survey was organized by the Disease Control and Epidemiology Service of the Ontario Ministry of Health and carried out in 1982-83. Analytical services were provided by 8 Ontario Ministry of Health regional laboratories located in Hamilton, Kingston, London, Palmerston, Peterborough, Ottawa, Timmins and Toronto. Two samples, from separate lots of 60-d aged raw milk Cheddar cheese, were collected from 21 plants, twice monthly, by health inspectors from the local health units and transported under refrigeration to the respective laboratory, usually within 24 h of collection. Each sample consisted of a 50-g portion of cheese cut or bored from three different blocks of cheese bearing the same product lot number and composited into one sterile Whirl-Pak bag. Samples were analyzed for total coliforms, fecal coliforms, Staphylococcus aureus and Salmonella spp. using methods prescribed by the Ontario Ministry of Health which conform to the Association of Official Analytical Chemists Official Methods of Analysis (1). The two-step enrichment method of Schiemann (15) and the confirmation procedure described by Devenish and Schiemann (7, 16) were used to isolate and confirm Y. enterocolitica. Analysis for C. jejuni was done using the enrichment isolation method of Doyle and Roman (8), but with static incubation conditions. Phosphatase analyses were performed using the AutoAnalyzer technique (12, 13) following extraction with n-butyl alcohol (2). pH measurements were determined directly with a combination flat surface electrode (No. 13-639-83, Fisher Scientific) attached to a Corning (model 12) pH meter.
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RESULTS

One hundred twenty-seven samples of 60-d raw Cheddar cheese from 21 plants were tested. Bacteriological results are shown in Table 1. Coliforms were not detected (<30/g) in 83 of the 120 samples tested (68.8%). Thirty-five (29.2%) samples from 14 plants had coliform counts between 30 and 500 per g. Two (1.8%) samples from one plant had coliform counts greater than 500 per g and one of these exceeded 1500 per g.

Fecal coliforms were not detected (<30/g) in 98 of the 120 samples tested (81.7%). Twenty-one (17.5%) samples from 11 plants had fecal coliform counts between 30 and 500 per g and only one sample (0.8%) had a fecal coliform count between 500 and 1500 per g. No samples had fecal coliform counts in excess to 1500 per g.

Staphylococcus aureus above the screening level of 1000 per g was found in only two (1.7%) of the 118 samples tested, at levels of 4x10^5 and 7x10^5 per g.

Salmonella spp. and C. jejuni were not detected in any of 118 and 110 samples tested, respectively. One Y. enterocolitica isolate, bile esculin, salicin-positive biotype, was isolated from one of 112 samples tested.

Alkaline phosphatase activity was detected (>4 μg/ml) in 94 (79.7%) of 118 samples tested. The pH of the 127 aged Cheddars ranged between 4.98 and 5.50, with an average of 5.26.

The incidence of total and fecal coliforms in 60-d aged raw Cheddar cheese produced in Ontario was similar to the incidence we reported previously (5) for freshly prepared Cheddar cheese made from raw or heat-treated milk. The levels of microorganisms were somewhat lower in the aged cheeses, and more than 98% of the samples complied with proposed bacteriological standards (6).

The incidence of S. aureus (1.7%) was also low in aged Cheddar cheese; however, two products did have S. aureus counts above 1000 per g.

The absence of Salmonella spp. and C. jejuni, as well as the absence of any recognized pathogenic biotype of Y. enterocolitica (16), indicates that 60-d aged raw milk Cheddar cheese produced in the Province of Ontario does not pose a significant health risk.

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REFERENCES


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