



### What are cross connections?

A cross connection exists when there is a direct physical connection between:

- raw milk and pasteurized milk,
- milk contact equipment and cleaning chemicals,
- a potable water line and any source of contamination including raw and pasteurized milk, or any chemical reservoir,
- product line and a drain.

### Why should you be concerned?

A cross connection between raw milk and pasteurized milk creates the potential for contamination of the pasteurized milk. Consumption of contaminated pasteurized milk could result in a food poisoning illness, and has led to foodborne outbreaks<sup>1</sup>. In fact, a cross connection between raw and pasteurized milk was identified as the most probable cause of the world's largest foodborne outbreak of salmonellosis. In this outbreak, over 16,000 laboratory confirmed cases and two deaths occurred<sup>1</sup>.

Consumption of milk which has been chemically adulterated can also cause a food poisoning illness. Recalls of milk products due to chemical substance contamination have occurred in Canada<sup>2</sup>.

### Where are cross connections found?

Automation and computer control upgrades in dairy plants often lead to the installation of additional pipelines and valves. The installation of these more complex systems has increased the potential for cross connections.

Examples of possible cross connections include:

- A recovery system to transfer unused pasteurized milk to a raw milk storage tank.
- An HTST discharge line connected to a raw milk storage tank.

- A direct connection between a CIP tank and a milk storage tank or pipeline.
- A potable water hose inserted directly into a tank of cleaning solution.

### How can cross connections be identified?

Inspecting every pipeline, particularly in a larger dairy, can be a long and difficult task. A simplified way of identifying cross connections between raw milk and pasteurized milk is to create a graphic representation of the pasteurized equipment and then draw an envelope around it. Only those pipelines which penetrate this envelope have the potential of being cross connections. Each penetrating pipeline is then traced back to its origin. If a pipeline is traced to any termination except the discharge of a pasteurizer, an open balance tank or equivalent, or back inside the envelope to another piece of pasteurized equipment, this represents a cross connection.

### What must be done if cross connections are found?

**Cross connections must be eliminated.** Proper separation of pipelines and establishing effective physical breaks at connection points is required to assure the safety of finished product.

In the production of pasteurized milk products, one way check valves, plug valves, or automatic valves **cannot** be relied upon to isolate pasteurized milk equipment from raw milk equipment. A single drop of contaminated raw milk leaking into pasteurized milk can be enough to cause foodborne illness and lead to a food poisoning outbreak.

In addition to ensuring segregation between raw and pasteurized or sterilized dairy products, during other applications, such as cleaning in place (CIP), supply lines and return line circuits **must** be segregated by the use of separate pipelines and application of effective physical breaks at

connection points to prevent leakage into finished products<sup>3</sup>.

This may be achieved by<sup>3</sup>:

- Physical disconnection of pipelines,
- Air gaps,
- Using double block and bleed valve arrangements,
- Double seat (mix proof) valves, and
- Aseptic barriers.

## References

1. El-Gazzar FE, Marth EH. 1992. Salmonellae, salmonellosis, and dairy foods: a review. *J Dairy Sci* 75:2327-2343.
2. CFIA. 2012. Health Hazard Alert. <http://www.inspection.gc.ca/about-the-cfia/newsroom/food-recall-warnings/complete-listing/2012-01-26/eng/1357586661377/1357586661408> Accessed July 24, 2015.
3. CFIA. 2014. Dairy establishment inspection manual – Chapter 19 Appendices. Appendix 10- Preventing cross connections in dairy plants. <http://www.inspection.gc.ca/food/dairy-products/manuals-inspection-procedures/dairy-establishment-inspection-manual/chapter-19/eng/1355950915810/1355952333841?chap=10>. Accessed July 24, 2015.

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