Detecting and Correcting Off-flavors in Milk

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A pleasantly sweet, refreshing milk flavor is the key to consumer acceptance. **Flavor quality starts at the farm.** Check the flavor of your milk regularly because milk flavor can change suddenly if production conditions are altered. For the most effective flavor evaluation, milk samples should be warmed in the range of 55 to 70 degrees Fahrenheit. Temperatures below 50 F tend to mask potential off-flavors.

<table>
<thead>
<tr>
<th>Off-flavors</th>
<th>Causes</th>
<th>Prevention</th>
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<tbody>
<tr>
<td>Feed</td>
<td>Cows eating or inhaling odors of strong feeds one to three hours prior to milking (corn or grass silage, hay or haylage, wild onions or other weeds)</td>
<td>Withhold objectionable feed or remove cows from pasture one to three hours prior to milking; feed aromatic roughages after milking.</td>
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<td>Sudden changes in roughage</td>
<td>Make feed changes gradually.</td>
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<td>Poor ventilation in building</td>
<td>Provide good barn ventilation.</td>
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<td>Oxidized</td>
<td>Exposure to “white metal”** or rusty surfaces on milk-handling equipment (this includes copper tubing from hot water heater, “white metal” elbows or fittings in milk lines or cleaning lines and/or rust in the wash-up sink)</td>
<td>Use only high-quality stainless steel, glass, plastic or rubber for all milk contact surfaces.</td>
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<td>Copper, iron or manganese in water supply</td>
<td>Water treatment/softening may be necessary.</td>
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<td>Excessive use of chlorine sanitizers</td>
<td>Use iodophor sanitizers preferably.</td>
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<td>Exposure of milk to sunlight or fluorescent lighting</td>
<td>Protect milk from exposure to sunlight or fluorescent lighting; cover glass pipelines.</td>
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<td>Spoiled or Unclean</td>
<td>Psychrotrophic (spoilage) bacteria</td>
<td>Clean all milk-handling equipment properly. Sanitize just prior to use.</td>
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<td>Dirty milk-handling equipment (bulk tank, milk pipelines and/or milking machines)</td>
<td>Clean facilities and cows.</td>
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<td>Dirty cows due to poorly maintained loafing or feeding areas</td>
<td>Handle milking equipment properly.</td>
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<td>Improper preparation (washing) of cows for milk</td>
<td>Wash and dry udders prior to milking.</td>
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<td>Failure to dry teats before milking</td>
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<td>Rancid</td>
<td>Excess agitation or foaming of raw milk (air leaks)</td>
<td>Keep fittings tight and air admission to a minimum. Avoid risers and overhead lines. Don’t run milk pumps in starved condition.</td>
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<td>Admission of excessive air at the claw or fittings</td>
<td>Restrict air admission, prevent equipment leaks.</td>
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<td>High blend temperature of milk</td>
<td>Cool milk to at least 40 F and maintain there.</td>
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<td>Late lactation (more than 305 days) or low production cows.</td>
<td>Discard milk from low-producing or late-lactation cows.</td>
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<td>Low protein content of cow rations</td>
<td>Use balanced cow rations.</td>
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<td>Malty and/or High Acid</td>
<td>Soiled, unclean milk handling equipment</td>
<td>Rinse and clean milk-handling equipment after each use and properly sanitize.</td>
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<td>Slow or insufficient cooling of milk</td>
<td>Promptly cool milk to 40 F and maintain there.</td>
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<td>Foreign Flavors</td>
<td>Medications, chemicals and/or insecticides improperly used or stored</td>
<td>Use approved medications and insecticides with caution and according to directions. Avoid strong-smelling sanitizers and disinfectants; use recommended concentrations.</td>
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<td>Excessive concentration, improper use and/or inadequate drainage of sanitizing agents</td>
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*“White metal” is the term applied to a low-quality stainless steel that has substantial copper content. Metallic flavor in milk results from electrolytic processes between stainless steel and copper, rust or manganese.*

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A Schematic on the Composition of Milk

**Major constituents**
- Lipids (milkfat) (3.3 - 5.9%)
- Proteins (2.9 - 3.8%)
- Carbohydrates (4.4 - 5.0%)
- Inorganic and organic ions and salts (0.67 - .77%)
- Total solids (12%)*
- Gases
- Lipids other than milkfat (includes fat-soluble vitamins other other precursors)
- Enzymes
- Water-soluble vitamins
- Non-protein non-vitamin nitrogenous substances
- Trace minerals (usually present)

**Minor constituents**
- Water (88%)*
- Casein – alpha, beta and gamma
- Serum (whey) proteins
- Alpha lactalbumin
- “Blood” serum albumin
- Immunoglobulins – euglobulin, pseudoglobulin
- Other proteins
- Lactose (milk sugar)
- Glucose (trace)
- Phosphates
- Calcium
- Potassium
- Chlorine
- Sodium
- Oxygen
- Nitrogen
- Carbon dioxide
- Phospholipids (includes fat-soluble vitamins other other precursors)
- Cerebrosides
- Sterols
- Carotenoids
- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin K (trace)
- Catalase
- Peroxidase
- Xanthine oxidase
- Phosphatases (acid and alkaline)
- Amylase
- Lipases and other esterases
- Porteases
- Adolase
- Carbonic anhydrase
- Thiamine
- Riboflavin
- Niacin
- Pyridoxine
- Pantothenic
- Riboflavin
- Niacin
- Pyridoxine
- Pantothenic
- Thiamine
- Riboflavin
- Niacin
- Pyridoxine
- Pantothenic
- Biotin
- Folic acid
- Choline
- Vitamin B₁₂
- Ascorbic acid
- Inositol
- Ammonia
- Urea
- Creatine and Creatinine
- Zinc
- Iron
- Copper
- Manganese
- Iodine
- Cobalt
- Aluminum
- Barium
- Strontium
- Boron
- Rubidium
- Lithium

* Ranges in milk components dependent on breed.


For further information, contact your dairy fieldman, state dairy director or county office of the NDSU Extension Service

For more information on this and other topics, see www.ag.ndsu.edu

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