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Cleaning and Sanitation: Introduction to Soil Types and Residues

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1

Objectives

 This module defines the soil types that occur in milking equipment



- ❶ Fats
- ❷ Proteins
- ❸ Sugars
- ❹ Minerals
- ❺ Biofilms

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2

Soils in milking equipment


-  Milk can leave residues consisting primarily of minerals, lipids (fats), carbohydrates (sugars) and proteins
-  Other potential contaminants include
 - ❶ Sediments drawn in from the environment
 - ❷ Bacteria that grow on surfaces
 - ❸ Cleaning and sanitizing compounds not removed from the system.

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3

Soil types

 Soils that might remain on milking equipment surface after milking can be categorized as:

- ❶ Organic (from milk, water)
 - ✓ Fats, proteins, sugars
- ❷ Mineral (from milk, water)
 - ✓ Calcium, magnesium
- ❸ Microorganisms (from milk, water)
- ❹ Chemicals (from water, cleaning solutions)

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What is the problem of having soils inside milking equipment?

- 🔧 If organic and mineral soils are not removed, they may serve as a nutrients and breeding ground for **microorganisms**.

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5

If soils are not removed...

- 🔧 If **microorganisms** or chemicals are not removed, they may cause:
 - ❶ Milk contamination
 - ❷ Human health hazards
 - ❸ Milk quality problems during processing

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How are soils removed?

- 🔧 Soils are removed from the inner surface of milking equipment by a combination of:
 - ❶ Thermal - Temperature
 - ❷ Chemical - Detergent/Acid/Sanitize
 - ❸ Physical - Turbulence

🔧 Processes

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Composite soils are difficult to remove

- 🔧 Composite soils resulting from:
 - ❶ Combination of organic and minerals
 - ❷ Layers of organic/mineral or mineral/organic (milkstone)
 - ❸ Precipitation due to chemical or temperature related actions
 - ❹ Combination of an organic deposit in which bacteria have incubated and formed attachment matrices to surfaces (biofilms)

= are more difficult to remove.

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Sugars

- ☞ Sugars that have been deposited at low temperature are water soluble and generally easy to remove in the rinsing and cleaning cycles.
 - ☞ Caramelization of sugars at high temperature greatly increases their adherence to surfaces and difficulty of removal.

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9

Proteins

- ☞ Proteins are:
 - ☞ Insoluble in water
 - ☞ Slightly soluble in acidic solutions
 - ☞ Highly soluble in alkali solutions
 - ☞ One of the more difficult deposits to remove
 - ✓ Especially if they have been denatured by high temperatures or acidity

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Fats

- ☞ Lipid (fat) deposits are water insoluble and must be removed by a combination of thermal and chemical means.
 - ☞ They are removed from the inner of milking equipment by hot alkaline solutions.

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11

Minerals

- ☞ Calcium phosphates in milk may adhere to surfaces forming 'milkstone.'
 - ☞ Protein is denatured and deposited on heated surfaces.
 - ☞ Milkstone is usually a porous deposit, which can provide an attachment site for bacteria.

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12

Minerals

- ☞ Hard water contains minerals,
 - Sodium carbonates
 - Calcium and magnesium salts
 - That can be deposited as “waterstone”
- ☞ Waterstone is a relatively inert deposit.
- ☞ Minerals deposits are removed with acid compounds.

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Biofilms

- ☞ Biofilms are soil/bacteria matrices that can protect bacteria from the sanitizing process.
- ☞ Materials that are porous or rough are more favorable for surface attachment.

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14

Biofilms

- ☞ Biofilm formation begins with the deposition of a substratum which facilitates bacterial attachment.
- ☞ Deposition continues as bacteria adhere to the surface. Cells bound in this structure are very resistant to anti-microbials.
- ☞ The main strategy against biofilms is to prevent their formation through proper cleaning.

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15