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Define "cleaning" and "sanitizing" and the differences between the two procedures.

I. CLEANING

Cleaning is the process of removing food and other types of soil from a surface, such as a dish, glass, or cutting board. Cleaning is accomplished using a cleaning agent that removes food, soil, rust stains, minerals, or other deposits. The right cleaning agent must be selected because not all can be used on food-contact surfaces. (A food-contact surface is defined as a surface of equipment or utensil with which food normally comes into contact or a surface of equipment or a utensil from which food may drain, drip, or splash into a food or onto a surface normally in contact with food.)

Definitions for Cleaning Terms

- **Acidity** -- the degree or measure of the amount of acid in a solution or substance; measurement can be expressed in parts per million, percentage, or pounds or grains per gallon.
- **Acids** -- they are chemicals that form hydrogen ions in solution giving a pH less than 7.
- **Acids, strong** -- they are substances that release high concentrations of hydrogen ions in a solution giving a very low pH. Examples include muriatic and sulfuric acids.
- **Acids, weak** -- they release moderate to low concentrations of hydrogen ions in a solution, giving a moderately low pH. Examples include organic acids, such as lactic and acetic acids.
- **Alkalinity** -- the degree or measure of the amount of alkali in a solution or substance.
- **Alkalies** -- they are chemicals that release an excess of hydroxyl ions in a solution giving a pH of greater than 7.
- **Alkalies, strong** -- they are substances that release high concentrations of hydroxyl ions in solution giving a very high pH. Examples include caustic soda and caustic potash.
- **Alkalies, weak** -- they release moderate to low concentrations of hydroxyl ions giving moderately high pH values. An example is sodium bicarbonate.
- **Buffer** -- any material that moderates the intensity of an acid or alkali in solution without reducing the quantity of acidity or alkalinity.
- **Corrosion-resistant materials** -- materials that are capable of maintaining their original surface characteristics under prolonged use, including the expected food contact and the normal use of cleaning compounds and sanitizing solutions.
- **Dispersion or deflocculation** -- the action of breaking up of mass into fine particles, which are then suspended and flushed off the surface and/or equipment.
- **Dissolving** -- refers to the mixing of a liquid and a solid to produce a homogeneous soloution.
- **Easily cleanable** -- surfaces must be readily accessible and made of such materials and finish and so constructed that chemical residues may be effectively removed by the cleaning process.
- **Emulsification** -- the action of breaking up fats and oils into very small particles which are uniformly mixed in a water solution, preventing the clumping or clustering of the particles; in a stable emulsion the oil particles are suspended for a long period of time.
- **Peptizing** -- the physical formation of colloidal solutions from soils which may be only partially soluble; this action is similar to dispersion but is particularly applicable to protein soils.

- **Rinsing** -- condition of a solution or suspension which enables it to be flushed from a surface easily and completely; action occurs by reducing the surface tension of the water being used.
- **Saponification** -- a chemical reaction of esters into acids or alcohols by the action of alkalis or acids; use of alkalis with animal or vegetable fats results in soap.
- **Sequestration** -- the chemical action resulting in the binding of a metal ion in solution with the formation of a soluble and stable complex; when the activity is performed to control water hardness with formation of a typical organic ring structure, the action is termed "chelation."
- **Surfactant** -- a chemical product whose molecules are able to modify the properties of an interface, e.g. liquid/liquid, liquid/air by lowering (reducing) the surface tension, allowing water to contact all surfaces. The four major types of surfactants used in detergents are: anionic, cationic, nonionic, and amphoteric.
- **Suspension** -- the action which keeps insoluble particles uniformly distributed in a solution, preventing them from settling and forming deposits and making it easier to flush them from equipment.
- **Water hardness** -- relates to water containing mineral constituents which form insoluble products, resulting in poor lathering of soap; principally caused by salts of calcium, magnesium, and iron.
- **Water softening** -- the process of removing the calcium and magnesium salts, preventing the precipitation of insoluble carbonates and hydroxides.

Types of Cleaning Agents

Not all cleaning agents can be safely used on food-contact surfaces. Examples of those that should not be used include: glass cleaners, some metal cleaners, tub and tile cleaners. The label should indicate if the product can be used on a food-contact surface.

Secondly, the ideal cleaning agent must be selected to make cleaning easy. Cleaning agents are divided into four categories:

- **Detergents** -- All detergents contain surfactants that reduce surface tensions between the soil and the surface, so the detergent can penetrate quickly and soften the soil. Examples include Dawn and Joy dishwashing detergent and automatic dishwasher detergents.
- **Solvent cleaners** -- Often called degreasers, solvent cleaners are alkaline detergents that contain a grease-dissolving agent. These cleaners work well in areas where grease has been burned on. Examples include Fantastik.
- **Acid cleaners** -- Use on mineral deposits and other soils alkaline cleaners cannot remove, these cleaners are often used to remove scale in warewashing machines and steam tables. Examples include CLR.
- **Abrasive cleaners** -- Use these cleaners to remove heavy accumulations of soil often found in small areas. The abrasive action is provided by small mineral or metal particles, fine steel wool, copper, or nylon particles. Some abrasive cleaners also disinfect. Examples include Ajax and Comet.

II. SANITIZING

Sanitizing is the process of reducing the number of microorganisms that are on a properly cleaned surface to a safe level. A safe level is defined as a 99.999% reduction of the number of disease microorganisms that are of public health importance. Sanitizing is accomplished by using either heat, radiation, or chemicals. Unless the item to be sanitized is effectively cleaned, it is impossible to obtain close contact between the sanitizer and the surface to the sanitized. Also, some chemical sanitizers, such as chlorine and iodine, react with organic matter and so will be less effective when the surface is not properly cleaned.

Definitions for Sanitizing Terms

- **Antiseptic** -- an agent used against sepsis or putrefaction in connection with human beings or animals.
- **Disinfectant** -- an agent that is applied to inaminate objects; it does not necessarily kill all organisms.
- **Sanitizer** -- an agent that reduces the microbiological contamination to levels conforming to local health regulations.
- **Germicide** -- an agent that destroys microorganisms.
- **Bactericide** -- an agent that causes the death of a specific group of microorganisms.
- **Bacteriostat** -- an agent that prevents the growth of a specific group of microorganisms but does not necessarily kill them.
- **Sanitization** -- the process of reducing microbiological contamination to a level that is acceptable to local health regulations.
- **Sterilization** -- the process of destroying all microorganisms.

Sanitizing Methods

- **Heat.** There are three methods of using heat to sanitize surfaces. The first is exposing the surface to steam using one of the following time temperature schedules -- 170 degrees F for 15 minutes or 200 degrees F for 5 minutes. A second method is hot water, which is the most common method used in food establishments. The higher the temperature, the less time that is needed to kill microorganisms. If hot water is used in the third compartment of a three-compartment sink, it must be at least 171 degrees F (77 degrees C). If high-temperature warewashing machine is used to sanitize cleaned dishes, the final sanitizing rinse must be at least 180 degrees F. Cleaned items must be exposed to these temperatures for at least 30 seconds. The final method of using heat is hot air that is applied at 180 degrees F for 20 minutes.
- **Radiation.** Ultraviolet radiation can be used to sanitize but is not used in most foodservice establishments. Its major application is in the packaging areas of food processing facilities. The contact time should be at least 2 minutes. It only destroys those microorganisms that are in direct contact with the rays of light.
- **Chemicals.** The chemicals that have been proven to be effective at the proper concentration include chlorine, iodine, and quaternary ammonium.

Factors that affect the efficacy of the sanitizing agent

Different factors influence the effectiveness of chemical sanitizers. The three factors that must be considered are:

- **Concentration** -- The presence of an insufficent amount of a sanitizing agent will result in an inadequate reduction of microorganisms. Too much can be toxic.
- **Temperature** -- Generally chemical sanitizers work best a temperatures between 55 degrees F (13 degrees C) and 120 degrees F (49 degrees C).
- **Contact time** -- In order for the sanitizer to kill microorganisms, the cleaned item must be in contact with the sanitizer (either heat or approved chemical) for the recommended length of time.

Relative Merit of Chemical Sanitizing Agents

Chlorine -- 50 ppm in water between 75-100 degrees F (7 seconds)

- Advantages -- effective on a wide variety of bacteria; highly effective; not affected by hard water salts; generally inexpensive.
- Disadvantages -- corrosive, irritating to the skin, effectiveness decreases with increasing pH of solution; deteriorates during storage and when exposed to light; dissipates rapidly; loses activity in the presence of organic matter.

Iodine -- 12.5-25 ppm in water at least 75 degrees F (30 seconds)

- Advantages -- forms brown color that is indicative of the germicidal strength; not affected by hard water salts; less irritating to the skin than is chlorine; active against a wide variety of non-spore forming bacteria; and activity not lost as rapidly as chlorine in the presence of organic matter.
- Disadvantages -- bactericidal effectiveness decreases greatly with an increase in pH (most active at pH 3.0 and very low acting at pH 7.0); less effective against bacterial spores and bacteriophage than is chlorine, should not be used at temperatures greater than 120 degrees F; and may discolor equipment and surfaces.

Quaternary Ammonium Compounds -- up to 200 ppm in water at least 75 degrees F (30 seconds)

- Advantages -- nontoxic, odorless, colorless, noncorrosive, nonirritating; stable to heat and relatively stable in the presence of organic matter; active over a wide pH range; and quite active against thermoduric organisms.
- Disadvantages -- slow destruction of coliform and psychrophilic organisms; non-compatible with anionic detergents and hard water salts; and not effective against bacteriophage