The Use of Bleach in Dairy Farms Cleaning Routine – Basic Information and Precautions

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In our farm visits, we frequently observe the use of **Bleach** (hypochlorites) to disinfect hands or utensils, such as teat cup plugs or reproductive chains/ straps for calf extraction. Not uncommon as well is the use of **Bleach** solutions as a cost-affordable alternative to a teat dip in milking procedures. The cleaning practice of using **Bleach** for disinfecting purposes requires attention regarding caution when handling a product and the proper label indication to achieve efficiency and effectiveness.

Deciding on the suitable disinfectant for a specific situation is not an easy task as we should consider factors such as the type of microorganism to target, the surface to be applied, and how easy and secure it is to use.

Before learning about **Bleach**, it will be important to understand what a disinfectant refers to.

A **disinfectant or *germicide*** is a chemical agent that destroys microorganisms, especially viruses, bacteria, fungi, and mold, on either living or inanimate objects (e.g., instruments, milking machine parts, towels, floors, walls). There is a wide range of products used as **disinfectants,** such as alcohols, hypochlorites (such as **Bleach**) and other chlorine-containing compounds, formaldehyde, glutaraldehyde, hydrogen peroxide, iodophors, phenolics, and quaternary ammonium compounds.

- ***IMPORTANT ASPECTS WHEN USING A DISINFECTANT***

Contact time is defined as the time a contaminated object or surface is exposed to a disinfectant. The diluted **Bleach** solution should usually follow the recommended contact time before wiping it off for better effectiveness. Most EPA disinfectants (U.S. Environmental Protection Agency) have a *10-minute contact time* label claim.

Bioburden refers to the level of contamination with organic matter of objects to be disinfected, and it is of particular importance in the disinfection of surfaces contaminated with blood, milk, or fecal material that harbors infectious pathogens.

Cleaning is the physical removal of foreign material, which includes organic material[a]. It is the most important step in a disinfection process as it removes organic material that can inactivate or diminish the potency of the disinfectant used. It is important to understand that even a rigorous disinfection procedure may not inactivate contaminating bacteria or viruses if they are protected by organic material, such as blood, milk, manure, and uterine secretions (Figure 1).

Decontamination is the removal of pathogenic microorganisms from objects so they are safe to handle. The Effectiveness of Bleach as a Disinfectant of Injection Drug Equipment - Preventing HIV Transmission - NCBI Bookshelf (nih.gov).

Cleaning and disinfection, along with other contamination control measures like proper milking procedures such as the use of gloves, cleanliness of bedding where cows are housed, alleys, and identification of infected animals at milking, are important ways to help control intramammary infections. A recent Irish study comparing 95 different products mentioned some products would promote a higher reduction in bacterial levels depending on the type of bacteria present on teat skin. Thus, highlighting the importance of the environment where cows are housed. The effect of disinfectant ingredients on teat skin bacteria associated with mastitis in Irish dairy herds | Irish Veterinary Journal | Full Text (biomedcentral.com) https://doi.org/10.1186/s13620-020-00179-7

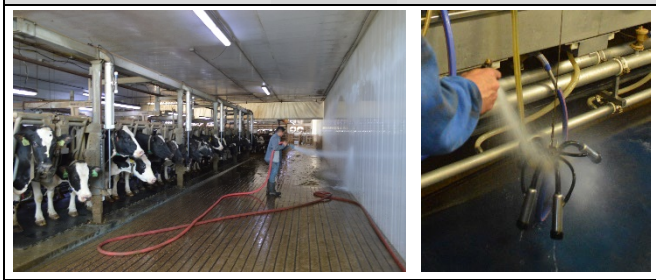
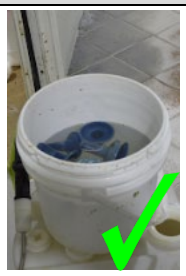
CLEANING	DISINFECTING
  	    
Aids in removing dirt, soil, sand, or manure from a surface using water only or soapy water (e.g., Dawn)	**Kills pathogens such as bacteria, fungi, and viruses after cleaning. Attention: the solution must cover the items to be disinfected**

Figure 1. What you should know when cleaning and disinfecting.

- ***A CLEAN ENVIRONMENT IS A SAFE PLACE. THE USE OF BLEACH***

Bleach usually consists of a sodium hypochlorite solution (NaOCl), a chemical compound containing chlorine (a powerful oxidizer). The **Bleach** solution disinfectant potential decreases over time due to the relative instability of the active chlorine component. **Bleach** solutions can lose potency at a fast rate when exposed to sunlight, oxygen, or heat. Disinfection can also fail if the material (e.g., milking equipment) or water with **Bleach** presents organic material such as blood, milk, or manure. (The Effectiveness of **Bleach** as a Disinfectant of Injection Drug Equipment - Preventing HIV Transmission - NCBI Bookshelf (nih.gov) An ATP testing is widely used in various industries (food processing, healthcare, and water treatment) to verify the effectiveness of cleaning procedures, to reduce the risk of cross-contamination and microbial growth (Figure 2).

ATP TEST EQUIPMENT	CLEANING AND DISINFECTING	
		
Reading the Results: • **ATP test = 0** ► 0% Probability of Pathogenic Biofilm • **ATP test = 100** ► 50% Probability of Pathogenic Biofilm • **ATP test = 200** ► 99% Probability of Pathogenic Biofilm		

Figure 2. The ATP test (Charm reading equipment / & swab for testing) is used to verify the cleaning and disinfection of food contact surfaces, equipment, and tools. It provides a quantitative and objective measure of cleanliness and helps establish and maintain cleaning standards and protocols.

Mixing products could be dangerous and should be avoided. Follow proper guidelines with caution to ensure safety and effectiveness. Below are some examples and important points to be considered:

a) **Bleach and Acidic Products**

Mixing **Bleach** with acidic cleaners (e.g., acetic acid or vinegar, some glass and toilet bowl cleaners, drain cleaners, citric acids such as lemon juice, rust removals, and descaler products used for removing limescale) can be extremely dangerous as it can produce chlorine gas, a toxic and potentially deadly substance.

Chlorine gas can cause severe respiratory and eye irritation and, in high concentrations, can be fatal. In small levels and for short periods of time, it can cause ear, nose, and throat irritation, coughing/breathing issues, burning, watery eyes, and runny nose. After long periods of exposure, these symptoms may result in chest pain, severe breathing problems, vomiting, pneumonia, and fluid in the lungs.

b) **Bleach and Alcohol**

Mixing **Bleach** and alcohol, such as rubbing alcohol (isopropyl alcohol) and acetone, is also **not** recommended due to the potential for formation of chloroform and other toxic compounds, which pose serious health risks (dizziness, nausea, headache, and more severe health effects in high concentrations).

Also, remember that some alcohols are flammable, and mixing them with **Bleach** increases the risk of fire or combustion.

c) **Bleach and Other Cleaners**

Mixing **Bleach** with cleaners like hydrogen peroxide, oven cleaners, and pesticides can produce toxic fumes like chlorine gas or chloramine gases.

d) **Bleach and Water**

Diluting **Bleach** with water is a regular practice and is **usually safe when done properly**. It is a standard method for using **Bleach** in various domestic applications such as disinfecting surfaces, doing laundry, and in farm operations (e.g., disinfecting milking parlor equipment, surgical material, floors, and walls).

Here are some key points to consider when diluting **Bleach** with water:

- **Dilution**: the recommended dilution ratios will be found on the **Bleach** container label instructions. Common ratios for general disinfection are around 1:10[b] (1 part **Bleach** to 10 parts water).
- **Effectiveness**: **Bleach** is neutralized by dirt and other organic material, so it isn't very effective when used on a surface that hasn't been cleaned.
  - ➢ CDC and WHO recommend cleaning with detergent and water before applying **Bleach** or other disinfectants. This removes any organic matter that may interfere with the germicidal activity and ensures effective disinfection.
- **Monitor Solution Clarity**: If the solution becomes visibly dirty during use, consider changing it more frequently to maintain effectiveness. Rinse the bucket with clean water to remove any residue and dirt from the previous solution. This helps prevent cross-contamination and ensures the effectiveness of the new cleaning solution. **Use your common sense to decide when it is time to change the solution** (Figure 3)**.**

Solution is clean and bucket dirt	**Solution is not suitable for desinfecting**	**Clean bucket for the disinfectant solution**

Figure 3. Some examples of when the use of common sense dictates the efficacy of a product.

e) **Bleach and Manure**

The **Bleach** solution, if mixed with manure (e.g., when this solution has been used many times, as in Figure 3B), could decrease its efficiency, as the reaction with organic matter can neutralize the active components of the **Bleach**, reducing its ability to kill bacteria and pathogens.

How much organic matter is necessary to inactivate **Bleach** will vary depending on the initial concentration of the **Bleach** solution, the duration of exposure, and the type of microorganism present. Here are some recommended contact times: chemical-disinfectants_fact-sheet_2-26-21.pdf (utah.edu):

Bleach solutions, %	Contact time, minutes
10.0	10
5.0	20
2.5	30

Suppose you need to disinfect an area that has been in contact with manure or other organic materials. In that case, cleaning the area thoroughly with water or a mild detergent is generally recommended. After cleaning, you can use a disinfectant according to its recommended label instructions, ensuring it is compatible with the surfaces and materials.

TAKE HOME MESSAGE

- Always follow the product's label instructions and safety guidelines to avoid accidental mixing and potential harm.
- To prevent chemical reactions, if you need to use different cleaning agents in close succession, ensure that surfaces are thoroughly rinsed and cleaned between applications.
- **Bleach** concentrations may vary, so reading and following the specific product's guidelines is essential.
- Always store disinfectant products in original containers, away from direct sunlight and heat. Additionally, be aware of each product's specific safety guidelines and recommendations.
- Wear gloves when using **Bleach** to avoid contact with skin.
- If **Bleach** dilution is not done properly, you may burn teat skin and also your hands.
- Remember that regularly changing the water and **Bleach** solution ensures that your cleaning efforts remain effective and that you're not spreading dirt and contaminants around.
- Use common sense when using **Bleach** solutions for disinfecting. If you have specific concerns or questions about using **Bleach** or disinfectants in conjunction with manure, it's advisable to consult with your managers for guidance tailored to your situation.

► Important concepts to remember:

[a]**Organic Material**: In the context of chemistry and biology, "organic" doesn't necessarily mean the material is derived from living organisms; rather, it refers to compounds containing carbon-hydrogen (C-H) bonds. Some examples of organic materials: **living organisms** (plants and animals including leaves, fruits, wood, bones, and tissues), **waste and decomposed matter** (compost or humus formed by the decomposition of plant

and animal matter), **synthetic organic materials** (e.g. plastics composed of long chains of organic molecules), fossil fuels (e.g., coal, oil, and natural gas), and **carbon-containing compounds** such as *carbohydrates* (e.g., sugars, starches, and cellulose), *proteins* (e.g., amino acids), *lipids* (fats and oils).

[b]**Bleach solution**: to create a solution with a 1:10 ratio of **Bleach** to water, you can use the following example:

Ingredients:	**Instructions:**
1 cup of **Bleach** 10 cups of water (1 cup = 250 mL. 10 cups = 2,5 liters)	In a bucket, measure out 1 cup of **Bleach** Add 10 cups of water to the container Mix the **Bleach** and water thoroughly

Let us know if you need a specific protocol or guidance for sharing with your employees and colleagues. We will be glad to help. You may contact us at:

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