Disinfection of trucks and trailers

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Summary: The author provides an outline of the basic procedure for cleaning and disinfecting road transport vehicles, with special attention to the types of cleaning agents which may be used.

KEYWORDS: Disease prevention - Disinfection - Road transport - Transport of animals.

INTRODUCTION

Changes in the world economy in recent years have led to an opening up of international markets, resulting in an increase in the volume of transport involving animals and animal products. Regular transit of animals and animal products between countries has compelled national health authorities to strengthen preventive measures to combat diseases of animals. Cleaning and disinfection constitute one of the most important elements in such measures.

The mode of transport most frequently used to transport animals is road transport, and – although some animals are sent by air, train and ship – trucks and trailers are always required to collect animals from their herds of origin and deliver them to their destination. For this reason, the cleaning and disinfection of trucks and trailers is a highly important factor in the prevention, control and eradication of diseases of animals.

GENERAL RECOMMENDATIONS

Trucks and trailers

All trucks, trailers and other vehicles used for transporting animals, animal products, by-products, feed, offal and contaminated equipment are a potential risk in the spread of a disease.

Drivers should not enter farms or other animal production premises without good reason. Vehicles should be disinfected between farms. All feed, equipment and other goods should be unloaded outside the farm (1, 3).

The procedure for cleaning and disinfecting vehicles is essentially the same as that used for premises housing livestock. It is important to consider the following points:

– Each country must regulate the use of cleaning agents and disinfectants and the procedures for cleaning and disinfection, taking into account the prevalent pathogens and types of installations, vehicles and objects (2).

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Cleaning and disinfection should not rely on a single application of a physical agent or chemical compound.

Chemical agents are effective only when they come into direct contact with the pathogen, and are ineffective when the latter is protected by soilage or body tissues (1, 2, 3).

Viruses vary considerably in their degree of resistance to inactivating agents (4).

**MATERIALS AND MANAGEMENT**

The materials required for cleaning and disinfection consist of brushes, sponges, containers, buckets, overalls, goggles, face masks, scrapers and receptacles for measuring and mixing disinfectants. High-pressure sprayers are also very important tools for cleaning and disinfecting trucks and any heavy equipment which leaves the premises (1, 3).

The spraying equipment must operate at high pressure (at least 200 p.s.i. \[14 \times 10^5 \text{ Pa}\]) (1).

When chemical compounds are used, the following safety precautions must be observed:

- The compounds must be stored and transported in such a way as to prevent spillage. Containers must be suitably labelled to prevent confusion with other compounds (4).

- Personnel must be familiar with the concentrations required, and must be capable of measuring and diluting the compounds satisfactorily. They must know how to operate the equipment, and must be aware of special instructions, restrictions and risks to humans and animals (1, 4).

- Cleaning agents must be used only where they are needed. It is very important for personnel to receive instruction on how to dispose safely of used and unused materials and containers at the end of operations.

**CLEANING PROCEDURE**

The primary objective of cleaning is to remove all large particles of earth and other soilage, thus ensuring contact between the disinfectant and pathogens. Despite the inability of most chemical agents to kill all pathogens, adequate cleaning may remove up to 99% of the bacteria and viruses present on a surface (1, 3, 4).

Water is the preferred solvent and cleaning medium, and its efficacy may be increased by two additives, namely: energy (in the form of temperature, time and force) and cleaning agents (1, 3, 4).

Increase in temperature weakens the bond between soilage and the surface to which it adheres. Of course, optimum temperature ranges exist, and these will be mentioned later (3, 4).

It is highly important that sufficient time is allowed for cleaning, and visual inspection must be used to judge whether operations are of adequate duration. Efficiency declines if such inspection is not performed.
Turbulence or swirling of the water determines the angle at which the water strikes the debris to be removed, and the pressure (usually expressed as pounds per square inch, or p.s.i.) indicates the force which the water will exert on the debris.

The use of chemical compounds should proceed as follows (4):

1. Preliminary rinsing greatly reduces soilage. Depending on the type of soiling and the surface to be cleaned, this stage may remove up to 90% of soilage. The ideal water temperature for this operation is usually 38-46°C.

2. The cleaning agent must come into contact with the soilage, and the water temperature for this purpose is usually 49-77°C (as some detergents are unstable at higher temperatures). The compound used at this stage must have the capacity to enhance water penetration.

3. At the next stage, soilage is eliminated from the surface, with fats becoming saponified, proteins peptonised and mineral matter dissolved.

4. The soilage becomes dispersed in the solvent. At this stage, the important properties of the agent are dispersion, deflocculation and emulsification.

5. A final rinse prevents the soilage from being deposited again on cleaned surfaces. In order to be effective, the agent should have satisfactory rinsing properties. To prevent foaming, it may be necessary to use cold water at 7-13°C. The timing of the final rinse is also important, as the agents require some time in which to act, but they may be difficult to remove if left for too long (1, 4).

6. All organic matter and rubbish from vehicles must be burnt or buried (1, 3, 4).

In addition, a cleaning agent must have the following properties (1):

- capable of softening water
- neither corrosive nor toxic
- economical and stable
- no tendency to solidify or deposit powder during use and storage.

The functions of cleaning agents include reduction of the surface tension of water, emulsification, dissolving solids, and peptonising and dispersing proteins. The choice of cleaning agent must take into account the following factors (1, 3):

a) type and amount of soiling
b) composition of the surface to be treated
c) presentation of the cleaning agent (liquid or solid)
d) cleaning method used.

These factors are as important as the availability of the agents and their cost (1).

Another factor to be considered is water hardness – either temporary (bicarbonates of calcium or magnesium) or permanent (sulphates, nitrates or chlorides of calcium or magnesium) – as this may cause precipitation of soaps (4).

Different types of cleaning agents exist, which may be used alone or in combination. The most commonly-used agents are briefly described below.

**Soaps**

Soaps are formed by the combination of sodium hydroxide and fats. They produce emulsions in contact with organic matter. Soaps have the advantage of being highly biodegradable, although they are less versatile and less effective than most of the new synthetic compounds (4).
Alkalis

Basic alkalis provoke emulsification, saponification and peptonisation. These substances are very corrosive. However, alkalis are effective against spores, and are easily rinsed off. One of the most commonly-used alkalis is sodium hydroxide, which has good germicidal properties and readily dissolves proteins, but is inefficient at deflocculation and emulsification; it has a corrosive action on certain materials (3, 4).

Amphoteric compounds

Amphoteric compounds are alkaline amino-acids which enhance water penetration, are good emulsifiers and are compatible with anionic, non-ionic and cationic surfactants (3, 4).

Acids

Cleaning acids are highly effective for softening water and removing mineral deposits at a pH of 2.5 or less. Most are organic acids, and are mild, stable and less corrosive than alkaline cleaners. Acids can be combined with other agents to enhance water penetration and are easily rinsed off (3, 4).

Complex phosphates

Complex phosphates are excellent water softeners and good emulsifiers, dispersants and peptonisers, and they inhibit re-depositing of minerals. Some of these compounds are cheap to produce (e.g. pyrophosphates), but they can contaminate the environment (4).

Proteolytic enzymes

Proteolytic enzymes are typical cleaning agents which are seldom used in combination with other compounds. They are only efficient if the surface to be cleaned has been previously soaked (4).

Surfactants

Surface-active compounds diminish the surface tension of water, facilitating the penetration of water between the soilage and the surface. They reduce the attraction between lipid molecules and surfaces, and act as penetrating and dispersing agents, preventing re-depositing during rinsing.

Surfactants are soluble in cold water and are unaffected by water hardness, therefore improving the efficiency of rinsing with hard water. The three types of surfactants are anionic, non-ionic and cationic (3, 4).

Anionic surfactants are the most commonly used, acting effectively in hard water. Being essentially pH-neutral, anionic surfactants can be used at acid and alkaline pH, although they function best under alkaline conditions.

Non-ionic surfactants are complex organic compounds which do not become ionised, and are therefore compatible with other cleaning agents. They are usually acidified to enhance their germicidal action.

The best known cationic surfactants are the quaternary compounds. In view of their poor penetration, these compounds are generally used as germicides and deodorants, working best in acidic conditions.

Chelating compounds

Chelating compounds hold metal ions in solution, function as water softeners, and control mineral deposition. They are salts of organic acids, and as each compound is specific for certain metals, they have specialised uses (4).
DISINFECTION

Disinfection is a process which aims to destroy infectious agents. The disinfection process is defined as a chemical reaction between the infectious agent and the disinfectant. Most pathogens are protected by soil, dust, dung, feed or some other material which prevents the disinfectant from gaining access to the pathogen. For this reason, the cleaning process must precede disinfection (1, 3, 4).

Various factors have to be considered when choosing an effective disinfectant:
- nature of the pathogens to be disinfected
- bactericidal properties of the disinfectant
- influence of the environment
- temperature of the disinfectant solution
- concentration of the disinfectant in solution
- contact time
- method of applying the solution.

DISINFECTION PROCEDURE

To disinfect trucks and other transport vehicles, the following procedure must be applied once the outside of the vehicles (including the platform) and the interior have been thoroughly cleaned (1, 3):

1. Spray all the coachwork with an adequate disinfectant, making sure that the entire surface is covered.
2. Remove dung, adhering rubbish or organic matter with a scraper and brush, paying special attention to edges and corners.
3. Repeat the spraying of all the coachwork with disinfectant.
4. Carefully clean and disinfect the wheels of the vehicle. This procedure may be difficult to accomplish, and in view of the importance of these requirements (particularly under emergency conditions) it may be convenient to use an existing vehicle-cleaning facility provided with high-pressure equipment, and to draw up a contract with such an establishment for this purpose.
5. The interior of the vehicle cabin must be washed with clean water, and all surfaces washed with a sponge previously soaked in an approved disinfectant.

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REFERENCES
