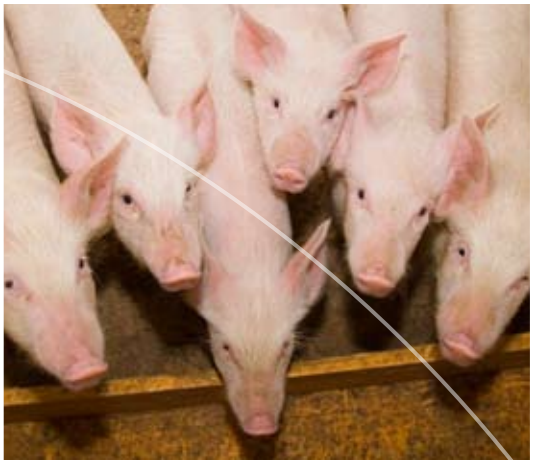
PRACTICAL GUIDELINES

for disinfection with lime



Practical Guidelines on the use of lime for the prevention and control of avian influenza, foot and mouth disease and other infectious diseases

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European Lime Association
Association européenne de la Chaux
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Table of contents

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Any contributions, comments and corrections are welcome and should be sent to info@eula.be.

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1. Introduction

Recent outbreaks of Avian Influenza (Bird Flu) in Europe and worldwide have highlighted the difficulties in controlling this disease[1]. These difficulties can be linked to the easy transmission of the disease, as well as to the resistance of the Avian Influenza viruses.

Other widespread infectious disease outbreaks such as Foot and Mouth disease, Swine Fever and Blue Tongue have also recently reached the news headlines.

According to FAO Animal Production and Health Manual[2], the cleaning and disinfecting of all surfaces regularly (cages, walls, poultry feeding and watering areas) and between each production cycle of the surrounding ground and of the houses, are key actions to prevent Bird Flu.

Lime is listed as an effective disinfectant in many national regulations or guidelines (Germany, France, Austria, Switzerland, UK) and is recommended as an in situ disinfectant on a regular basis and in case of epidemic outbreaks such as Foot and Mouth disease[3], Aujeszky's Disease[4], and African Swine Fever[5].

Scientific research conducted in 2007 by the Institut Pasteur de Lille has demonstrated that the H5N1 virus is effectively and rapidly (within 5 minutes at 4˚C) inactivated by lime[6]. This inactivation is due to the pH increase brought about by lime[7].

Lime has been successfully used in the past to control Avian Influenza, for instance in Japan (2004), in Turkey (2006), and in Germany (2007).

The objective of the present document is to give comprehensive guidelines on the use of lime for Bird Flu and other disease outbreaks and preventions, based on the information available in health protection manuals, scientific literature and field experience.

Current Guidelines can be used when lime is recommended for the protection of animal health.

According to German disinfection guidelines, the following diseases may be treated with lime[8]

- Reovirus – African horse sickness
- Herpesvirus-Aujesky`s Disease/Pseudorabies Reovirus
- Orthomyxovirus-Avian influenza
- Brucellosis (Cattle, pigs, sheep, goats)
- Herpesvirus-Infectious pustular vulvovaginits, infectious bovine rhinotrachetitis
- Mycoplasma mycoides – contagious bovine pleuropneumonie
- Picornavirus-foot and mouth disease
- Newcastle disease
- Alphavirus-equine encephalitis
- Chlamydia psittaci-Psittacosis/Ornithosis
- Clostridium chauvoei-Black leg
- Bunyavirus-Rift Valley fever
- Paramyxovirus - cattleleg
- Pseudomonas mallei-glanders
- Salmonella-Salmonellosis in cattle
- Togavirus-Classical swine fever/hog cholera
- Rhabdovirus-Vesicular stomatitis

Definitions

Lime (airlime): a substance obtained by calcincation of natural calcium carbonate or dolomite
Manure: refers to solid excrement from animals or birds
Litter: refers to solid manure mixed with straw
Quicklime: air lime (CaO) mainly in the oxide form which reacts exothermically on contact with water
Dolime (dolomitic lime): air lime consisting mainly of calcium magnesium oxide
Hydrated lime: air lime mainly in the hydroxide form produced by the controlled slaking of quicklime
Milk of lime: a suspension of hydrated lime in water, commonly called 'whitewash'
Homogenisation: uniform dispersion of lime into the manure by mixing

Lime is currently being registered in the frame of the EU Biocide Regulation for Product Type 2 (Private area and public health area disinfectants and other biocidal products) and Product Type 3 (Veterinary hygiene biocidal products).

2. Use of lime for the prevention and/or treatment of avian influenza (bird flu) and other diseases

Lime is commonly used to disinfect animal houses. This Chapter summarises recommended good practices for the use of lime **to prevent and/or treat** disease outbreaks. For **prevention** purposes, it is common practice to treat the manure, soil, floors and walls in poultry farming, to treat the walls and floors in cattle farming and to treat the walls in pig farming. In the case of an **outbreak**, the treatment of manure, soil, floors and walls is common practice for all animals. Detailed Health and Safety measures for the handling of lime are described in chapter 4.

NB : Always take animals out before treatment

2.1 Soil outside animal houses

At the beginning of a production cycle in poultry farming,[9] it is recommended to sprinkle manually or with a spreader 500 g of granulated quicklime per m^2 of ground and then apply water to the soil. At the end of a production cycle, it is recommended to remove any remaining material from the soil.

2.2 Litter or manure

After every production cycle it is recommended to perform one of the following application methods on the litter or the manure: [NB: In the event of a disease outbreak it is strongly recommended to treat the litter or manure inside the animal house].

A. Application of lime to litter or manure <u>inside</u> animal houses[10]

1. **For Prevention:** Spread approx. 10 kg/m^3 (2 kg of granulated quicklime /m^2 for 20 cm litter) on the litter or manure inside the poultry house
2. **For Treatment:** Spread approx. 100 kg/m^3 (20 kg of granulated quicklime /m^2 of 20 cm litter) on the litter or manure inside the animal house
3. The mixture should be moistened and any self ignition that might occur should be extinguished with water
4. Remove the lime/manure or lime/litter mixture from the animal house
5. Homogenise the lime / manure or litter mixture
6. Stockpile the lime treated manure
7. After at least 24 h, dispose the lime treated manure according to the local legislation

Figure 1:
Example of homogenisation of litter and lime inside using standard mixing equipment (Ain – France)

B. Application of lime to untreated manure or litter removed from animal houses

NB: In the event of an outbreak the manure/litter should be treated before removal from the house[10]

1. Remove the manure or litter from the poultry house
2. **For Prevention:** Add approx. 10 kg of granulated quicklime per m3 of litter or manure
3. **For Treatment:** Add approx. 100 kg of granulated quicklime per m3 of litter or manure
4. The mixture should be moistened and any self ignition that might occur should be extinguished with water
5. Stockpile the lime treated manure
6. After at least 24 h, dispose the lime treated manure according to the local legislation

Figure 2: Homogenisation of manure and lime outside (United Kingdom). The thermal reaction generates steam.

Figure 3: Stockpiling of lime treated chicken manure (United Kingdom)

2.3 Soil inside animal houses

Figure 4: Example of disinfection with quicklime of a chicken farm concrete floor in Turkey.

After every production cycle in the case of poultry and at regular intervals for other animals, it is recommended to perform one of the following application methods after removal of the litter:

A. On concrete floors[11]

1. Wash the installation with running water
2. Sprinkle sufficient granulated quicklime to cover the damp ground (e.g. 1 kg of quicklime/m^2)
3. Spray sufficient water to quench the steaming reaction with the granulated quicklime (e.g. 1,5 litre of water per m^2 of quicklime)
4. Leave to act for at least 2 h
5. Brush and remove the hydrated lime powder which may be recycled as agricultural liming material as described in the European standard EN/TS 15084:2007 (Liming materials – Determination of the lime requirement – Guidelines, principles and parameters)

B. On mud floors[12]

1. Brush the floor
2. Sprinkle approx. 500 g of granulated quicklime per m^2 on the damp ground
3. Spray 0,5 litre of water per m^2 or sufficient water to quench the steaming reaction with the quicklime
4. Leave to act for at least 24 h
5. Brush and remove the hydrated lime powder which may be recycled as agricultural liming material as described in the European standard EN/TS 15084:2007 (Liming materials – Determination of the lime requirement – Guidelines, principles and parameters)

2.4 Walls of animal houses

It is recommended to annually whitewash the walls of animal houses by using the following application method[11] . For poultry, this is done before every production cycle[9].

Application method for 150 to 200 m^2 of wall (depending on the porosity of the wall):

1. Introduce 35 l (25 kg) of hydrated lime into 50 l of water
2. Let the mixture rest for 12 h
3. Eventually add 2 litres of sour milk or curds (about 2%), organic glue or alum (about 1%)
4. Mix the resulting slurry and spray onto the wall

The target is to make the walls of the animal houses completely white (see Figure 5)

Figure 5: Example of whitewashing of a stable with milk of lime. Milk of lime may also be applied by brush or other suitable technique (Belgium).

3. Disinfection of Carcasses in the event of an Outbreak

Lime has been commonly used to disinfect in cases of epidemical outbreaks such as Foot and Mouth disease[3], Aujeszky's Disease[4], African Swine Fever[5] as well as Avian Influenza.

This chapter summarises recommended good practices for the disinfection of carcasses in the event of an **outbreak**.

Detailed Health and Safety measures for the handling of lime are described in chapter 4.

3.1. Intermediate storage before disposal

Cover the potentially contaminated carcasses with an excess of quicklime (see Figure 6). Quicklime layers should completely cover the carcasses.

3.2. Carcass disposal

According to European Regulation (EC) n°1774/2002 (Chapter 2, Article 4.2)[13], contaminated carcasses must be disposed of by some method of thermal treatment or by incineration. Consequently burying / landfilling is not allowed. However, in case of an outbreak, carcass burying is recommended by some manuals and guidelines inside[14] and outside the EU[15, 16, 17]. Application methods may vary but the main purpose is to prevent vector attraction (insects, birds, rats…) and the spreading of disease.

NB : Always take animals out before treatment

Figure 6: Japanese health workers scatter lime on dead chickens to kill the bird flu virus. (Japan 2004 picture available on http://www.duncans.ca/birdflu/, consulted on January 10 2008).

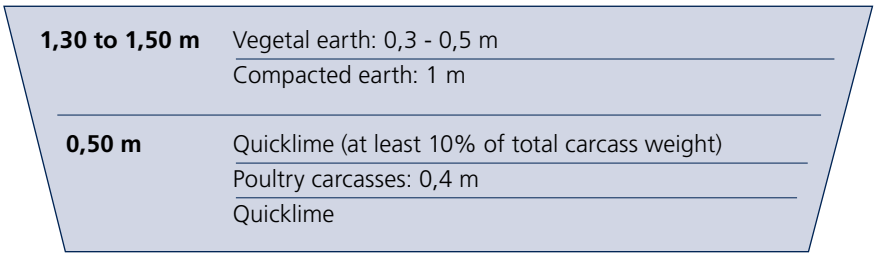

Figure 7: Section of a pit for burying of poultry carcasses, extracted from the French Governmental Avian Influenza Pandemic Plan [14]. Quicklime layers should completely cover the carcasses.

4. Lime Specifications, Health and Safety Information

In the methods described above, it is advised to use quicklime and hydrated lime which complies with the CL90, CL80 (calcium lime) or DL85 (dolomitic lime) grade as described in building lime European Standard EN 459-1:2002. Lime is available in most countries around the world and may be easily sourced via local producers or distributors.

Quicklime, hydrated lime and milk of lime are irritant (Xi) products. Table 1 gives the protection measures to take when using these products. Detailed Safety Data Sheets for quick lime, hydrated lime, and milk of lime are available from the lime producer and can be downloaded at the EuLA Web site: http://www.eula.be.

Liming of manure or litter produces ammonia. In concentrations of greater than or equal to 0.5% and less than 5% (expressed as volume per volume percentage), ammonia is harmful by inhalation, irritating to eyes, skin and the respiratory system.[Xi;R:20-36/37/38]18. Ammonia may be evolved during specific manure/litter liming conditions. During liming of litter or manure, it is strongly recommended to wear protective clothing, gloves and eye/face protection adapted to ammonia exposure (e.g. respiratory masks equipped with cartridges that adsorb ammonia).

Table 1: Protection measures to take when using quicklime, hydrated lime and milk of lime

	Quicklime	Hydrated lime	Milk of lime
Respiratory protection: Use appropriate respiratory protection against particles according to the risk level.	✓	✓	
Hand protection: Use approved nitrile impregnated gloves having CE marks.	✓	✓	✓
Eye protection: Tight fitting goggles with side shields, or wide vision full goggles. Do not wear contact lenses when handling this product. It is also advisable to have individual pocket eyewash.	✓	✓	✓

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