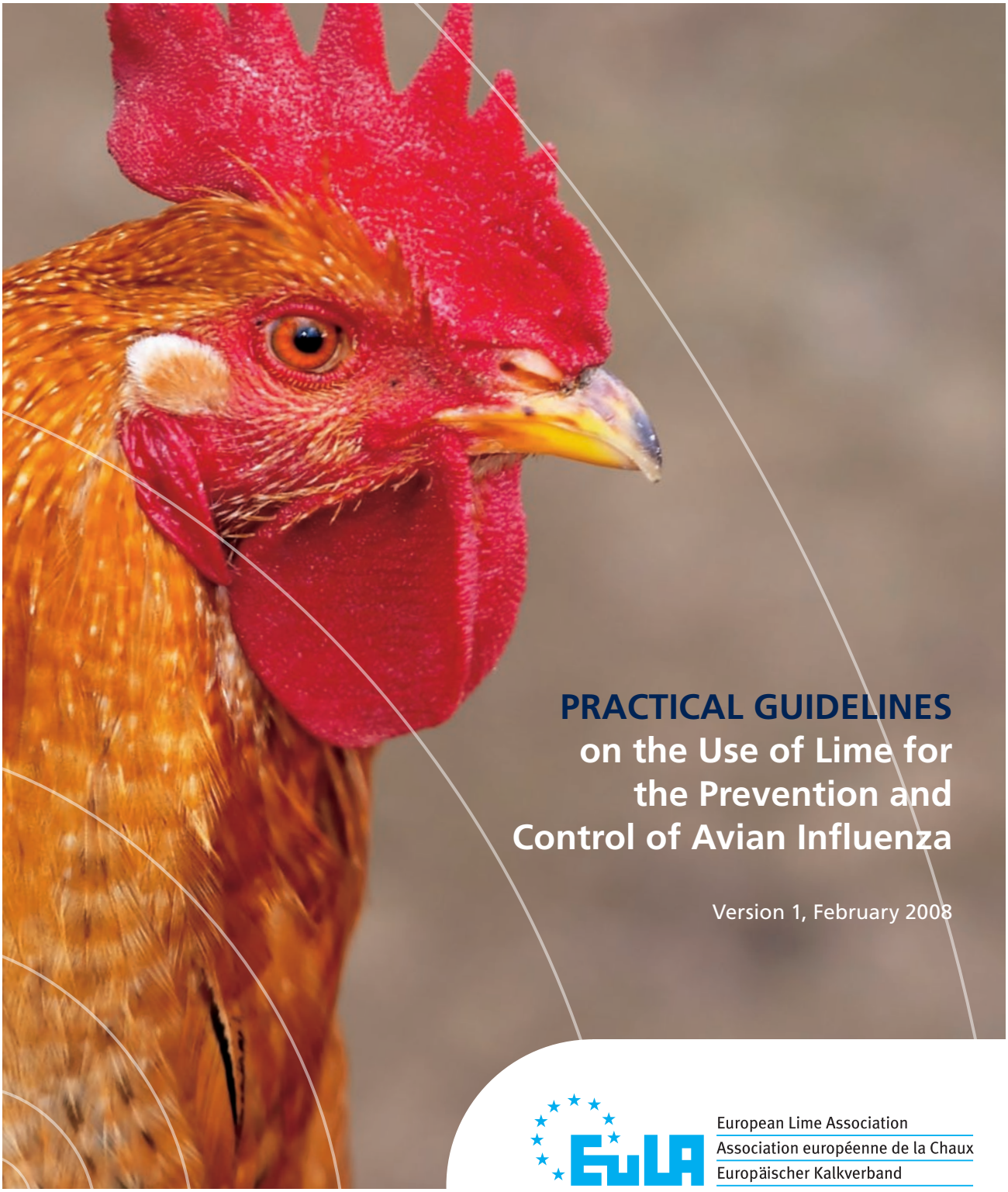

PRACTICAL GUIDELINES on the Use of Lime for the Prevention and Control of Avian Influenza

Version 1, February 2008

European Lime Association
Association européenne de la Chaux
Europäischer Kalkverband

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

EuLA aisbl (European Lime Association) - Rue des Deux Eglises 26 - B-1000 Brussels
Tel. +32 2 210 44 10 - Fax +32 2 210 44 29 - E-mail : info@eula.be - Website : www.eula.be

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.

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

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

Scientific research conducted in 2007 by 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, due to the pH increase brought by the lime, is significantly quicker than the inactivation of African Swine Fever Virus by liming in similar conditions [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 outbreak and prevention, based on the information available in health protection manuals, scientific literature and field experience.

The document is a summary of the practices and literature identified by EuLA. Any contribution to improve the present document can be sent to info@eula.be.

The current Guidelines are not limited to poultry health protection and may also be used, when lime is prescribed, for the health protection of pigs and cattle.

Lime is a substance obtained by calcination of natural calcium carbonate or dolime 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).

It is important to emphasize that lime is used in many other environmental applications such as drinking water treatment (softening and remineralisation), waste water treatment (neutralisation, flocculation), sludge treatment (hygienisation), flue gas treatment (acid gas removal), as well as in agricultural applications as liming material for soil improvement.

Definitions

Manure: refers to excrement from animals or birds
Litter: refers to solid manure mixed to straw
Quicklime: air lime (CaO) mainly in the oxide form which reacts exothermically on contact with water
Dolime (dolomotic lime): air lime consisting mainly of calcium magnesium oxide and/or calcium magnesium hydroxide without any hydraulic or pozzolanic addition
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

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

Lime is commonly used to disinfect animal houses and more specifically poultry houses.
According to the FAO Animal Production and Health Manual, the regular cleaning and disinfecting of all surfaces (cages, walls, poultry eating and watering areas) of the surrounding ground and of the houses, and between each production cycle, are key actions to prevent Bird Flu. This Chapter summarises recommended good practices for the use of lime **to prevent and/or treat** an Avian Influenza outbreak. Quicklime, hydrated lime and milk of lime are irritant products and must be handled with care. Detailed Health and Safety measures for the handling of lime are described in chapter 5.

2.1 Soil outside poultry houses [8]

At the beginning of a production cycle, it is recommended to sprinkle manually or with a spreader 500 g quick lime per m^2 of ground and then apply water to the soil. At the end of a production cycle, it is recommended to remove 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 an outbreak of avian influenza it is advised to treat the litter or manure inside the poultry house.

A. Application of lime to litter or manure <u>inside</u> poultry houses [9]

1. **For Prevention:** Spread approx. 10 kg/m^3 (2 kg of 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 quicklime/m^2 of 20 cm litter) on the litter or manure inside the poultry house
3. Extinguish with water any self ignition that could occur
4. Remove the lime/manure or lime/litter mixture from the animal house
5. Homogenize 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 poultry houses

NB: In the event of an outbreak the manure/litter should be treated before removal from the house [9].

1. Remove the manure or litter from the poultry house
2. Add approx. 10 kg of quicklime per m^3 of litter or manure
3. Homogenise the lime/manure or litter mixture
4. Stockpile the lime treated manure
5. 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)

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

2.3 Soil inside poultry houses

After every production cycle it is recommended to perform one of the following application methods after removal of the litter:

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

A. On concrete floors [10]

1. Wash the installation with running water
2. Sprinkle approx. 1kg of quicklime/m^2 on the damp ground
3. Spray 1,5 litre of water per m^2 or sufficient water to quench the steaming reaction with the quicklime
4. Leave to act for at least 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 [11]

1. Brush the floor
2. Sprinkle approx. 500 g of 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 poultry houses [10]

It is recommended to annually whitewash the walls of the poultry houses by using the following application method.

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 so-obtained slurry and spray on the wall

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

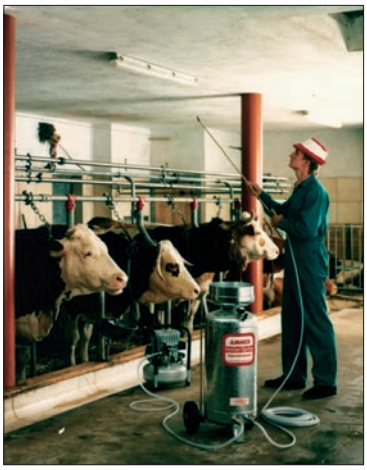

Figure 5: Example of whitewashing of a stable with milk of lime. Milk of lime may also be applied by brush or other suitable technique (Austria).

3. Disinfection of Carcasses in the event of an Outbreak

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

This chapter summarises recommended good practices for disinfection of carcasses in case of Avian Influenza **outbreak**.

Quicklime, hydrated lime and milk of lime are irritant products and must be handled with care, respecting protective measures such as described in chapter 5.

3.1 Carcasses

A. Intermediate storage before disposal

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

B. Carcasses disposal

According to European Regulation (EC) n°1774/2002 (Chapter 2, Article 4.2) [12], 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, carcasses burying is recommended by some manuals and guidelines inside [13] and outside the EU [14,15,16]. Application methods may vary but the main purpose is to prevent vector attraction (insects, birds, rats…) and disease spreading.

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).

1,30 to 1,50 m	Mineral earth: 0,5 m Vegetal earth
0,50 m	Quicklime Poultry carcasses sprinkled with caustic soda Quicklime

Figure 7: Section of a pit for poultry carcasses burying, extracted from the French Governmental Avian Influenza Pandemy Plan [13]. 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 CL 90 (calcium lime) or DL85 (dolomitic lime) grade as described in building lime European standard EN 459-1:2002. Lime is available in almost all 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 respectively given by the lime producer and can be downloaded at the EuLA Web site: http://www.eula.be.

Liming of manure or litter produces ammonia. If ammonia concentration is greater than or equal to 0.5% and less than 5% (expressed as volume per volume percentage), which could happen in very particular manure/litter liming conditions, then ammonia is harmful by inhalation, irritating to eyes, respiratory system and skin [Xn;R:20-36/37/38] [17]. 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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