



ELSEVIER



<http://www.elsevier.com/locate/jiph>

REVIEW

# Investigation of disinfectants for foot-and-mouth disease in the Republic of Korea

Hyun-Mi Kim\*, Il-Seob Shim, Yong-Wook Baek, Hye-Jin Han, Pil-Je Kim, Kyunghee Choi

*Environmental Health Research, Republic of Korea*

Received 29 August 2012; received in revised form 26 February 2013; accepted 5 April 2013

## KEYWORDS

Foot-and-mouth disease;  
Disinfectant;  
Aquatic toxicity;  
Acute toxicity

**Summary** Disinfectants for foot-and-mouth disease were sprayed on livestock barns and roads from early February to May 2011. Although 90% of the disinfectant was concentrated on the roads, 10% was sprayed on cattle sheds and other sites where foot-and-mouth disease occurred. Since the outbreak of foot-and-mouth disease in November 2010, there has been a steady increase in disinfectant use. Consequently, its adverse environmental effects have prompted government officials to take preventive measures. The major chemical components of the disinfectants are citric acid, potassium sulfate base complex, quaternary ammonium compound, malic acid, and glutaraldehyde, ranging in amounts from tons to hundreds of tons. The exact amount of each component of the disinfectants could not be identified because the types of components used in the different commercial formulations overlapped. In this review, we obtained information on disinfectants that are widely used nationwide, including the types of major chemical components and their respective toxicities (both human and ecological).

© 2013 King Saud Bin Abdulaziz University for Health Sciences. Published by Elsevier Ltd. All rights reserved.

## Contents

Introduction .....	332
Types of disinfectants for foot-and-mouth disease .....	332
Hazards of the components in the disinfectants for foot-and-mouth disease .....	333
Concluding remarks .....	337
Acknowledgement .....	337
References .....	337

\* Corresponding author at: Risk Assessment Division, Department of Environmental Health Research, National Institute of Environmental Research, Kyungseo-Dong Seo-Ku, Incheon 404-708, Republic of Korea. Tel.: +82 32 560 7169; fax: +82 32 568 2037. E-mail address: [hmikim@korea.kr](mailto:hmikim@korea.kr) (H.-M. Kim).

## Introduction

Foot-and-mouth disease is a highly communicable disease that affects cattle, swine, sheep, goats, deer, and other animals. It is characterized by fever and blister-like lesions and erosions [1]. Foot-and-mouth disease is an OIE list a disease (OIE Animal Health Code, OIE bulletin), meaning that it is a transmissible disease that is considered to be of socio-economic importance within some countries and has a significant impact on international trade [2]. Between November 2010 and the summer of 2011, in the Republic of Korea, 203 cases of foot-and-mouth disease have occurred, and more than 3,500,000 cattle were buried at 4500 burial sites (82 districts in 12 cities and provinces). The Korean government tried to contain the expansion of foot-and-mouth disease shortly after the outbreak at the end of 2010, but the cold weather (below 0°C) froze the diluents used for the disinfectants. Therefore, the diluted disinfectant could not be sprayed until the end of January 2011. A survey of the disinfectants was performed by the local self-governing body and

the Korea Animal Pest Control Association from September 2010 to May 2011. The employed disinfectants weighed more than 5000 tons. The largest amount of disinfectant was sprayed around Gyeongbuk Province (1228 tons), followed by Gyeonggi Province (1150 tons), Chungbuk Province (984 tons), Cheonam Province (895 tons), Chungnam Province (388 tons), Gyeongnam Province (176 tons), Gangwon Province (94 tons), Incheon City (84 tons), Ulsan City (47 tons), Cheonbuk Province (40 tons), Seoul City (12 tons), Busan City (7 tons), and Daegu City (6 tons) (Fig. 1). Foot-and-mouth disease is caused by a single-stranded RNA virus of the genus aphthovirus (family *Picornaviridae*) that affects cloven-footed animals [3]. Foot-and-mouth disease virus (FMDV) is highly contagious and causes severe morbidity and mortality in livestock [4]. Disinfection during an outbreak can prevent the virus from spreading [5]. FMDV does not have an outer membrane and therefore is destroyed rapidly in conditions below pH 5.0 and above pH 11.0. If the virus is exposed to an environment of 60% or less of relative humidity or is contained for 30 min at 56 °C, its viability is drastically decreased. There are seven types of FMDV: A, O, C, SAT1, 2, 3, and Asia 1 [6]. The development of molecular techniques has enabled the characterization of individual virus strains [7].



**Figure 1** Map showing the foot-and-mouth disinfectant-sprayed areas in the Republic of Korea (South Korea).

## Types of disinfectants for foot-and-mouth disease

Disinfectants are typically diluted several hundred to 1000-fold when they are dispersed in the environment. In this procedure, the usual diluted disinfectants may be neutralized and the pH effects of the disinfectants may be minimized. However, the temperature is highly critical for the time period during which the diluted disinfectants are effective. Usually, the effectiveness of the disinfectants is decreased below 15 °C or above 20 °C. Furthermore, the temperatures in December, January, and February were below 0 °C in Korea, and the water-diluted disinfectants could not be sprayed properly because they were frozen. Thus, the initial attempt to halt the spread of foot-and-mouth disease failed. However, beginning in mid- February, the disinfectants were sufficiently sprayed on livestock barns and roads. Since then, foot-and-mouth disease was gradually eradicated in the spring (March, April, and May) and disappeared. A total of 176 commercially available disinfectants were approved by the Korea National Animal Plant and Fisheries Quarantine and Inspection Agency

Download English Version:

<https://daneshyari.com/en/article/6132644>

Download Persian Version:

<https://daneshyari.com/article/6132644>

[Daneshyari.com](https://daneshyari.com)