

# Foot and Mouth Disease (FMD) and FBS

## BACKGROUND INFORMATION

With the globalization of the animal products market and a growing degree of market integration worldwide, Foot and Mouth Disease (FMD) has increased in significance as a major constraint to international trade in live animals and animal products, and it is one of the viruses of concern when importing FBS.

Contrarily to BSE which only loomed in the 1980s, Foot and Mouth Disease has existed since the beginning of bovine breeding. As early as 350 B.C., the philosopher Aristotle mentions a cattle plague causing fever and vesicular lesions on the mouth and hooves of cloven-hooved animals. Since the 16<sup>th</sup> century, FMD has been recognized as one of the most

significant epidemic diseases threatening livestock. Its first clinical description was made in 1546 by Italian physician Hieronymus Fracastorius, and for the following two centuries, the number of FMD outbreaks increased in Europe.

In 1898, German physicians Loeffler and Frosch showed that the disease was caused by a microscopic, filterable, transmissible agent smaller than any known bacteria, thus discovering the first vertebrate virus. It was not until 1920 that a convenient animal model for the study of the FMD virus was established, and with the later in-vitro cell culture systems, the chemical and physical properties of the FMD virus were elucidated, culminating in 1989 with a complete description of the three-dimensional structure of the virion. FMD

virus is classified as a species in the Aphthovirus genus of the family Picornaviridae and measures 27-28 nm in diameter. Seven main serotypes exist throughout the world, as well as numerous subtypes<sup>1</sup>.

The FMD virus can be found in all secretions and excretions from acutely infected animals, including expired air, saliva, milk, urine, feces, and semen.

However, evidence of the FMD virus crossing the placental barrier in bovines has not been demonstrated. In October of 2000, the European Commission's Scientific Committee on Animal Health and Animal Welfare reported that the FMD virus does not cause viremia in bovine fetuses<sup>2</sup>. In 2007, the Institute for International Cooperation in Animal Biologics (IICAB), an OIE Collaborating Center, also reported that the FMD virus does not cross the placental barrier<sup>3</sup>. However, more recently, the IICAB edited their FMD information, stating that an experimental infection of FMD virus in sheep crossed the placental barrier and caused death to the fetus, as reported by Ryan, et al. in 2007<sup>4</sup>.

During the last 100 years, the trade of livestock products has been greatly influenced by the presence or absence of the disease in different regions of the world. Most countries and

regions of the world have had FMD at one time or another, and have gone to great efforts to eliminate the disease and keep it, at great financial cost, from recurring<sup>5</sup>.

During the last few decades, much has been accomplished to eradicate FMD, to establish standards for FMD-free status recognition, and to ensure that animal products being imported and exported are not contaminated with the virus. The World Animal Health Organization (OIE) has led this effort, with the participation of 180 member countries of the OIE. The OIE Terrestrial Code, Chapter 8.7, sets the standards for recognizing countries that have achieved the FMD-free status, either with vaccination or without vaccination<sup>6</sup>. Countries with either FMD-free status (without vaccination and with vaccination) must show scientific evidence and certify that the FMD virus has not been found circulating in their cattle herds.

### VACCINATION

Like many other viruses, the FMD virus ceaselessly evolves and mutates. One of the difficulties in vaccinating against it is the huge variation between, and even within, serotypes. Therefore, FMD vaccines must be highly specific to the strain involved in the epizootic.

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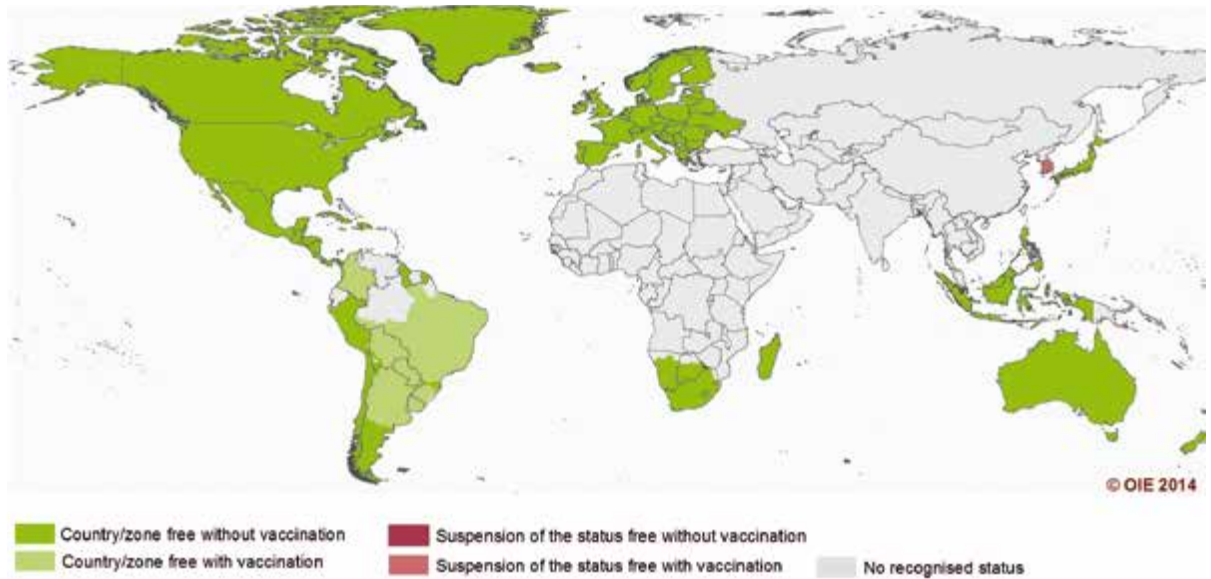
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OIE member countries' official FMD status map  
Last update July 2014



## DISTRIBUTION OF FMD IN THE WORLD

The OIE official FMD Status Map, as well as the lists of FMD-free countries without vaccination and with vaccination<sup>7</sup>, show that North and Central America, Oceania, Europe, Japan, and parts of Southeast Asia are recognized free of FMD without vaccination. Most of South America is recognized as free of FMD with and without vaccination, with the exception of Venezuela, Ecuador, Surinam, and some of the northern Amazon basin of Brazil. Africa and Asia remain as continents where FMD has not been eradicated, except for part of South Africa.

## STANDARDS AND REQUIREMENTS FOR IMPORTING FBS

The International OIE standard (see OIE Terrestrial Code Chapter 8.7 on FMD) for importing FBS from FMD-free countries (with or without vaccination) states that the Veterinary Authorities of the importing country only need to require an international veterinary certificate attesting that the product comes from animals from an FMD-free country, zone, or compartment<sup>8</sup>.

The European Union importation requirement for FBS from FMD-free countries (see Regulation EC No. 294/2013) follows the OIE standard, requiring

that the exporting country certify that no cases of FMD have occurred in their country in the last 12 months. Gamma irradiation at 25 kGy is another option for importing FBS into the EU<sup>9</sup>.

The United States importation requirement relating to FMD does not follow the OIE standards. The USDA takes a more conservative approach, only allowing the importation of FBS from countries free of FMD without vaccination<sup>10</sup>. Gamma irradiation is not currently allowed by USDA as a treatment option for importing FBS into the United States.

## SUMMARY

Despite all efforts, FMD outbreaks still occur throughout much of the world, and while some countries have been free of FMD for some time, its wide host range and rapid spread represent a permanent cause for international concern. The 180 member countries of the OIE have worked together to develop international standards for disease reporting, surveillance and mapping, laboratory diagnosis, vaccine production, disease eradication standards, and trade requirements, which greatly reduce the risk of FMD being spread through the trade of animals and animal products. Only when importing blood products from FMD-infected coun-

tries is there good reason to believe that the FMD virus can be present in the blood of live cattle presented for slaughter. There are no literature reports of the FMD virus ever being found in bovine fetuses, nor are there any reports of FBS ever testing positive for FMD. ■

## ADDITIONAL WEB SOURCES OF INFORMATION ABOUT FMD

- Foreign Animal Diseases, US Animal Health Association, grey book, pages 261-275, <http://www.usaha.org/Portals/6/Publications/FAD.pdf>
- OIE Technical Disease Card, [http://www.oie.int/fileadmin/Home/eng/Animal\\_Health\\_in\\_the\\_World/docs/pdf/Disease\\_cards/FOOT\\_AND\\_MOUTH\\_DISEASE.pdf](http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Disease_cards/FOOT_AND_MOUTH_DISEASE.pdf)
- Institute for International Cooperation in Animal Biologics [http://www.oie.int/fileadmin/Home/eng/Animal\\_Health\\_in\\_the\\_World/docs/pdf/foot\\_and\\_mouth\\_disease.pdf](http://www.oie.int/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/foot_and_mouth_disease.pdf)

## REFERENCES

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8. [http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre\\_fmd.htm](http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_fmd.htm)
9. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:054:0001:0254:EN:PDF>
10. CFR 94.1