

Foot and mouth disease and the illegal importation meat: a quantitative risk assessment

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Summary

This study considers the risk of infection with Foot and Mouth Disease (FMD) posed to Great Britain (GB) livestock from the illegal importation of meat and meat products, and estimates the major contributors to this overall risk. Key findings include that a large majority of illegal meat is smuggled through passenger baggage at airports, and FMDV contaminated bone-in fresh products and de-boned dried products pose the greatest risk to livestock. The findings of this risk assessment have been, and continue to be utilised to inform policy decisions regarding disease prevention and control.

Introduction

FMD is considered by many as the most important animal disease in the world. In 2001 GB was stricken with by an FMD epidemic which resulted in significant losses, both economic and personal. The exact cause of the outbreak will never be known with certainty – but it is widely believed that it was linked to the illegal import of contaminated meat or meat products.

During, and following, the outbreak itself numerous control measures were put in place to tighten controls against illegal imports, to safeguard against recurrence of disease. However, the ability to design the right measures to minimise the risk was hampered by an imperfect understanding of the nature of illegal trade, and inadequate data to help identify and target the risks. To address these issues, in the aftermath of the epidemic a risk assessment was undertaken to provide a better understanding of the current disease risks. In addition, information on possible control points that could be exploited between export of the meat from countries of origin of illegal products and the ultimate exposure of susceptible livestock in GB was also required. This paper outlines the approach and key findings of this work. A full discussion on methods and results is given by Defra (2003).

Objectives

This study has two principal aims:

- To estimate the annual probability, and thus frequency, that the illegal importation of meat will result in infection with the specified hazard, FMD, in GB livestock population.

- To investigate the contribution of a number of factors to the final estimates of risk. Such factors include origin of product, route of entry, and intended usage in GB.

The risk assessment considers importation of meat and meat products that are derived from susceptible animal species from all inhabited territories of the world, into GB. The assessment is conducted up to the point of infection of one susceptible animal; the spread of this initial case is not considered in this assessment. Given exposure, all strains of FMD are assumed to pose an equal risk of infection to GB livestock.

Materials and Methods

For this complex risk assessment, the model has been developed in a modular manner, consisting of three modules describing distinct stages in the processes that lead to the undesired outcome. To estimate the overall risks associated with importation of illegal meat, the modules are: 1) Estimating the flow of illegal meat into GB; 2) Estimating the probability that illegally imported meat is contaminated with FMD virus (FMDV); and 3) Development of exposure pathways and estimation of the probability and frequency with which contaminated, illegally imported meat results in an infection in GB livestock. Together, these modules represent the various transfer pathways of the virus from its country of origin to livestock in GB via the illegal importation of meat. They have been integrated to estimate the overall risk.

Underpinning any risk assessment is data and information; in this work it was a particularly extensive task. The risk assessment team identified, collected and analysed numerous data sets including information on attempted illegal importation, FMD disease prevalence throughout the world, the biological characteristics of FMDV and the processes to which imported meat products may be subject, resulting in exposure of livestock to FMDV. The information gathering process involved extensive discussions with experts in a wide variety of disciplines and required the development and maintenance of links between numerous organisations, for example enforcement agencies, such as Her Majesty's Customs and Excise (HMCE) and many other stakeholder groups affected by the risks associated with FMD and illegal imports.

There are numerous model variables that are associated with a high degree of uncertainty. To reflect this uncertainty the risk model is stochastic in nature. As a result, it was expected that there would be a high degree of uncertainty associated with the estimate of the frequency of infection in GB. Therefore, for each of the key results, the mean value from the associated probability distribution is reported, and in some cases this is accompanied by the 90% uncertainty interval. All results should be considered in the context of their associated uncertainty.

Results and Discussion

From model results, the total amount of illegal meat entering GB each year is estimated to be, on average 7,431 tonnes, with 90% certainty that this is between 2,771 and 17,484 tonnes per year. It is estimated that, on average, 85.2% of the total

weight of illegal meat enters GB via personal baggage at airports; 11.2% is smuggled in sea freight and the remainder via air freight (3.2%) and post and courier (0.3%). Of this total flow, it is estimated that, on average, 55% is actually intended for commercial use (distribution through wholesalers, street markets and other retailers).

The amount of meat entering GB illegally each year which is contaminated with FMDV is estimated to be, on average, 95 kg with 90% certainty that the amount is between 30 kg and 244 kg per year. This corresponds to, on average, 0.001% of the total flow of illegally imported meat. This estimate is influenced by the estimate of prevalence of FMD in each region which is in turn based upon country level estimates of prevalence. For a number of countries considered, there is no source of direct data on their FMD status and assumptions based on their regionality are made. This is a key area of data deficiency.

Overall estimates of risk are obtained through the integration of the estimation of the flow of illegal meat and levels of contamination, with a mathematical description of the routes by which livestock may be exposed to FMDV which enters the country as a contaminant of meat. The estimates give, with 90% certainty, the result that the current annual probability of infection in GB livestock is between 0.0009 and 0.02 with a mean value of 0.008. This translates to a 90% certainty interval ranging from 1 infection in 41 years to 1 in 1,100 years to with a mean of 1 infection in 130 years.

Key insight gained from the risk assessment into the risks posed by smuggled meat include:

- 95% of the estimated risk to susceptible animals from illegal meat is associated with illegal meat arriving in personal baggage. However, there is evidence that meat is arriving in personal baggage in quantities that are destined for commercial use.
- Of the estimated volume of contaminated illegal meat entering per year only 0.013% of the flow is ingested by susceptible livestock
- ~71% of infections attributed to exposure to FMDV contaminated bone-in fresh products and de-boned dried products

The risk assessment breaks new ground in both scope and complexity and the insights gained have proved invaluable to policy makers in the development of safeguards against exotic diseases such as FMD. The tools developed continue to be used to address the probability of infection of GB livestock with Classical Swine Fever, African Swine fever and Swine Vesicular Disease, and provide a dynamic approach to help tackle exotic disease control.

This study was commissioned by the Animal Health and Welfare Directorate General of the Department for Environment, Food, and Rural Affairs (Defra), UK.

References

Defra (2003) Risk assessment for the import of meat and meat products contaminated with Foot and Mouth Disease Virus into Great Britain and the subsequent exposure of GB livestock. Available at http://www.defra.gov.uk/animalh/illegali/risk/risk_assess.htm