

RISK ASSESSMENT MODEL OF CLASSICAL SWINE FEVER INTRODUCTION INTO SPAIN

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1. Introduction and Objectives

Spain has increased the production of swine and swine products in the last 15 years, and nowadays is the second swine-producing country in the UE-25. Our trade balance has changed, with an increase of exports and a descent of imports, but there is yet much dependence on the imports of swine and swine products from other countries. That is why the introduction of diseases such as Classical Swine Fever (CSF) is possible and probable and the result of a CSF incursion will involve significant losses to the Spanish's economy as it happened in the outbreaks of 1997-98 and 2001-02. For this reason an assessment study to determine the circumstances surrounding the probability of reintroduction of the CSF virus and the main ways of entrance in Spain has been performed. This assessment not only will provide the more risky places as well as the main ways of CSF entrance, but also it will be useful to quantify the effectiveness of the different controls applied to minimize the risk of entrance.

2. Material and methods

Data to create the model has been taken from a range of sources including available literature and official databases of imports (5), swine census (4), human population (5), etc. Each parameter included into this model has been carefully chosen, taking into account the particular characteristics of Spain, trying to obtain the best approach to the real risk situation into the Country.

The first aspect studied to develop the model was the CSF routes of the introduction into Spain: legal and illegal imports of swine and swine products, vehicles and other fomites, etc. Secondly we describe the sequence of events (scenarios) that determine the introduction of the disease, that is, the way they occur in time and the interactions among them. Finally, considering these scenarios, we have developed a stochastic model that allows to calculate the probability of CSF introduction into Spain.

The legal introduction of risky products into the EU and in Spain is very well regulated (2), but if a Country has not detected or has not notified an outbreak the introduction of contaminated animals or material will be possible. Our model has considered the amount and origin of those risky materials legally imported as one of the most important ways of CSF entrance into Spain. Also, we have analysed the risk associated with illegal imports, vehicles movement, and the introduction of other contaminated fomites as potential ways of the CSF entrance. The model not only reflects the probability of introduction of contaminated animals or materials, but also the probability of exposure (probability that a susceptible pig contacts with these contaminated materials).

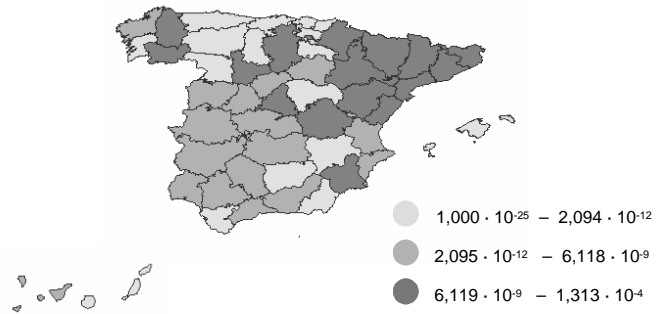
3. Results

The results of the model show that the probability of introduction of CSF into Spain is in general low (the average probability is $4,843 \cdot 10^{-6}$). The most probable Provinces to introduce CSF would be Lleida (average probability of $1,313 \cdot 10^{-4}$), Girona ($5,083 \cdot 10^{-5}$), Huesca ($2,897 \cdot 10^{-5}$) and Zaragoza ($2,591 \cdot 10^{-5}$) and the less probable would be Albacete ($1,000 \cdot 10^{-25}$), Palencia ($1,346 \cdot 10^{-22}$) and Guadalajara ($2,381 \cdot 10^{-22}$). We can visualize the result of the model using the Spatial Analyst extension of ArcGIS 9.1. Software (Figure 1).

We have observed that 99% of the risk of introduction is directly related with the introduction of live animals in 30 provinces (this corresponds with the provinces where introduction of CSF is more likely), while in the other 20 provinces the risk is related with other factors, mainly introduction of meat and meat products. We observe a positive correlation between pig density and probability of introduction (correlation coefficient $r=0,59$), which is logical if we consider that the

most productive places (with more density rates) are usually the most active importers of animals, but it is important to consider the devastating consequences that CSF introduction would produce in such high density places.

Figure 1. Probability of CSF entrance in Spain by Provinces (Map generated using ArcGIS 9.1)



4. Discussion and Conclusions

According to our model the main way of CSF entrance in Spain will be live pigs, in contrast with countries like Germany, where most primary outbreaks of CSF were caused by illegal feeding of swill to domestic pigs (21%) and by direct or indirect contact with CSF-infected wild boar (Fritzmeier *et al.*, 2000). The second way of introduction will be swine products being necessary more studies to determine its potential contact with susceptible animals, because in Spain the feeding of swill to pigs is not practised. Other important way of entrance are the contaminated vehicles, as has been reported by Elbers *et al.* 1999, being the most risky areas of introduce the CSF by this way Valencia, Malaga, Lugo and Segovia. No good quality data are available of illegal imports and movement of people to quantify exactly the risk of CSF entrance by these ways although we are conscious of their importance. For that reason further studies should be made to estimate the real importance of those ways of CSF entrance and the level of control that we can exert over them.

5. Acknowledgements

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6. References

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