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A literature review of Foot-and-Mouth Disease emergency vaccination strategies and their implementation in contingency planning

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There is no single FMD eradication strategy that is perfect or even appropriate for all circumstances. The emphasis given to various control measures in devising FMD control and eradication strategies will depend on epidemiological factors, livestock husbandry systems, community acceptance and the likely costs. The strategy chosen is likely to be a combination of some appropriate approaches and will likely have to be adapted to the development of the epidemic over time.

These conditions make it difficult to choose an optimal strategy early on in the epidemic, and therefore contingency plans can by the nature of the situation not be very specific about this issue. In addition different countries have different political and social experiences, traditions and needs, which can be challenged during an epidemic by political, economic or public opinions. Nevertheless, there has been a considerable international movement during the past decade towards preparing for the use of emergency vaccination in the case of an FMD epidemic.

Various types of decision tools have been developed to assist in making timely and difficult decisions on how to manage FMD outbreaks. Considering the multi-factorial management decisions taking into account all relevant conditions, it is not surprising, that there has been limited practical experience with these tools as documented in the literature.

Even simulation models are limited in their capacity to embrace all factors that might influence decisions on the best strategy. It is important to realize that scenarios used for FMD simulation models focusing on alternative control strategies require not only that the control strategy can be specified and modified over time according to the progress achieved, but also that an appropriate type of epidemic is unfolding, since simulations with identical seed value may develop quite differently, according to which herds initially become infected, the animal species, the regional herd density, etc. Depending on the time of detection, speed of spread, human resources available, etc. the epidemic will vary and the choice of an optimal strategy will differ.

Taken across all the literature covered by this report there are however a few key points that seem to prevail as far as the potential use of emergency vaccination (EV) for FMD:

- Although it is recommended or even required that national contingency plans contain detailed preparations for applying EV, this is not always the situation. The problem is likely due to the many different situations that may develop during an epidemic, which makes it difficult to prescribe certain strategies in advance. Regular simulation exercises with different scenarios can make up for some of these problems.
- According to some experts, predictive models should not be used during an epidemic, unless the model has been verified, validated and exercised in advance, and provided up-

to-date epidemiological information of sufficient quality and detail is available to feed into the model. Models that mimic the biological behaviour of the epidemic seem to be more useful than purely mathematical models.

- Timing is important – most epidemic situations would be tackled initially by stamping-out of affected and in-contact herds, which in some situations may be sufficient to stop the spread; if not, EV should be considered, but if the spread has already been considerable due to late detection, wind-borne spread, long-distance spread by trade, etc., it may be too late to benefit from EV.
- Suppressive and protective EV strategies are not in general as cost-efficient as stamping-out strategies, but EV may be considered as a means of protecting against a catastrophic development of the epidemic. EV is resource-demanding, especially when combined with stamping-out (suppressive EV), but protective EV may even be more costly overall, due to long-term trade implications.
- EV in ring-zones can be as effective as stamping-out strategies in preventing further spread, if the time needed for immunity to develop is not critical, e.g. if the infection was detected and contained rapidly and if wide-spread infection has been prevented due to effective and rapid stand-still, no risk of wind-borne spread, etc.

Reference: The full 110-page report: 'A Literature Review of Emergency Vaccination Strategies for Foot-and-Mouth Disease' is available, including a reference list with around 100 original references to published and unpublished literature that have been reviewed. The report can be obtained by request to the author.