Concepts in Foreign Animal Disease Surveillance

In two recently published papers by Bates et. al[1] and Thurmond[2], the authors expressed ideas regarding the need to revolutionize foreign animal disease (FAD) surveillance in order to improve accuracy, efficiency and rapidity of detection. Veterinary Services has incorporated several of the concepts discussed in these articles into development of surveillance plans for foreign animal diseases.

The fundamental concept being adopted is that of probability based surveillance in which a hierarchy of probabilities for the introduction of FAD, ranging from a baseline to high probability level, is employed. The key point in the process of establishing and maintaining this hierarchy is the application of risk analysis, pathway analysis, threat analysis and modeling to define the probability of introduction of foreign animal diseases as accurately as possible. In addition, the continuous use of passive surveillance systems will better inform where and when incursions are most likely to occur. Information generated from these systems would be used to direct the specific application of active surveillance during times of increased probabilities of introduction.

Currently, the majority of FAD surveillance is conducted via *passive* surveillance systems, relying primarily on producers and practitioners to report suspect cases. Additional passive surveillance currently in use or proposed for future integration include: development of a case definition library and education materials for national distribution to producers and practitioners; syndromic surveillance in veterinary clinics, livestock markets, feedlots, slaughter plants, on farm, in wildlife centers and zoos, sentinel feedlot monitoring, and use of Food Safety Inspection Service (FSIS) condemnation data; the Department of Homeland Security's National Biosurveillance Integration System (NBIS); Pathfinder and other Web scanning tools; Emerging Veterinary Events Database (eVe); Offshore Pests Information System (OPIS); Adverse Events Database; and the National Animal Health Laboratory Network (NAHLN). Risk, pathway and threat analyses and modeling, Pathfinder, eVe, NBIS, OPIS and others would be used to establish the baseline level in this probability based surveillance design. These systems would also serve as initial indicators for an increase in the probability of the introduction of FAD to some level above baseline.

In this hierarchical scheme, the nature of the threat, as detected by the passive surveillance systems, would dictate the extent of activation of *active* surveillance systems such as mass screening, biosensors and strategic targeting of high risk animals and locations. Mass screening systems might use bulk tank milk screening or serum samples in a multi-plex diagnostic approach (simultaneously testing for multiple pathogens, currently under development at Lawrence Livermore National Laboratories, Kansas State University, and at other institutions). Biosensors, devices that sample the air quality for

---

[1] Bates TW, Thurmond MC, Hietala SK, et al. Surveillance for detection of foot-and-mouth disease. *J Am Vet Med Assoc* 2003;223:609-614.
[2] Thurmond MC. Conceptual foundations for infectious disease surveillance. *J Vet Diagn Invest* 2003;15:501-514.

contaminants (also in developmental phase at Lawrence Livermore National Laboratories and Research Triangle Institute), have potential use in areas of animal concentration. Target sampling of high risk populations by geographic location or commodity may by indicated at livestock markets, feedlots, waste feeders or heifer raisers, for example. Active surveillance would be initiated only at a time of increased probability of the introduction of FAD. Continuous use of these systems is not practical, nor feasible, due to the resources required to implement such operations.

Utilizing probability based surveillance as the foundation for a surveillance plan is intended to improve the accuracy and rapidity (by using proportional risk and targeted sampling) and maximize efficiency (by implementing a hierarchical scheme and multiplexed assays) of FAD detection, as suggested by Thurmond. As a result, directed and organized actions can be taken in a timely manner to address the response to a foreign animal disease incursion.