Building a National Animal Health Surveillance System

Veterinary Services is charged with protecting and improving the health, quality, and marketability of our nation's animals, animal products and veterinary biologics by preventing, controlling and/or eliminating animal diseases, and monitoring and promoting animal health and productivity. Central to the ability to carry out that charge, and the crux of appropriate application of animal disease control strategies is the timely, efficient and accurate collection of surveillance data. Although definitions of surveillance vary, the Centers for Disease Control and Prevention's current formal definition related to public health surveillance states:

"Public health surveillance is the ongoing systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know. The final link in the surveillance chain is the application of these data to prevention and control a surveillance system includes a functional capacity for data collection, analysis and dissemination linked to public health programs." (Meriwether 1996)

Animal disease surveillance is similar in that it implies an active system, where directed action will be taken if the data indicate that disease prevalence or incidence exceeds a predetermined threshold (Salman 2003). In contrast, disease monitoring describes ongoing efforts at assessing the health status of specific animal populations. The line between disease monitoring and disease surveillance is neither very wide nor straight. Both activities are commonly used in combination with intervention strategies in government administered disease control programs.

Surveillance activities can be divided into two major categories: scanning and targeted surveillance. Scanning surveillance accesses readily available livestock or poultry populations, and thus available biological samples (e.g., blood and other tissues), to estimate the extent of disease in that population or as a case finding mechanism. Serum samples collected at cattle slaughter establishments for bovine brucellosis testing may be considered an example of scanning surveillance.

Targeted surveillance specifically identifies groups or subpopulations of animals with a high projected risk of acquiring or disseminating disease (Bates et al. 2003). These populations are then sampled at a higher rate than populations considered at lower risk of disease. The sampling of pigs from non-commercial or backyard operations in States identified to be at higher risk of Classical Swine Fever (Hog Cholera) infection is an example of targeted surveillance. The balance between scanning and targeted surveillance depends upon the prevalence of the disease under surveillance, the risk of infection, and the availability of resources.

In developing surveillance mechanisms, it is first imperative that the goal of the surveillance through a number of systems, mostly focused on diseased on disease eradication programs and passive reporting of foreign animal diseases. While both of these systems have been effective in meeting their established goals and have served well to advance disease eradication programs, they do not provide for the comprehensive, coordinated, and integrated animal health surveillance system needed today.

Historically, foreign animal disease surveillance in the United States has been primarily dependent on the reporting of suspicious lesions observed in livestock and poultry by private veterinary practitioners or by individual producers. This "passive" system of surveillance relies on the knowledge, understanding and goodwill of those outside of the government's direct influence. With current world conditions, that mechanism should not be relied on as the only mechanism to detect an FAD incursion as potential cases

may not be reported early enough to ensure that appropriate control strategies can be implemented in a timely manner.

Eradication efforts in the United States focusing on diseases such as pseudorabies, brucellosis and tuberculosis have nearly eliminated these diseases from the nation's livestock. Surveillance through testing was focused at primary animal concentration points such as livestock markets and slaughter establishments. Animals testing positive were traced to farms of origin with subsequent herd testing and depopulation where indicated. Targeted surveillance through circle or area testing of livestock operations in areas where disease had been detected with subsequent depopulation of infected herds reduced disease prevalence dramatically. With the current low prevalence of these diseases in most states, surveillance testing is now almost exclusively conducted at slaughter establishments. To successfully complete these eradication programs, it is imperative that surveillance be ongoing and efficient so that the last few cases will be detected before the disease spread occurs.

The risk of introduction of disease to livestock and poultry populations in the United States has always existed. However, with increased international movement of animals and people, the increased threat of intentional introduction, and the continued recognition of new disease or manifestations of disease, the risk has never been greater.

Additionally, the near completion of eradication programs require a transition from a focus on eradication efforts to one of effective surveillance to ensure that any last remaining vestiges of disease will be detected. To address these challenges, approaches to animal disease surveillance must be modified. The transition from the historical model for surveillance to a new National Surveillance System (NSS) is underway. The NSS will be a comprehensive, integrated, flexible and efficient network that will collect, manage, analyze and distribute national animal health information. The NSS thus will be intimately linked to, and frame the responses to, changes in the animal health status of the nation. Responses may include the triggering of eradication efforts in the event of a foreign animal disease incursion or alterations in existing eradication or control strategies for endemic livestock diseases, In addition, the use of surveillance data for risk assessment or to affirm the health of the national livestock is paramount to the facilitation of trade in animals and animal products.

Requirements of the OIE, the world organization for animal health, include that countries ensure transparency in the global animal health situation. This can only be accomplished through monitoring and surveillance for disease that are both endemic and foreign to a country. International trade in animals and animal products is now focusing on the concept of equivalency; that is to be in compliance with international trade agreements, sanitary and phytosanitary measures do not need to be identical between two countries but must be equivalent to satisfy the importing country's appropriate level of protection. Applying equivalency in trade negotiations requires the use of surveillance data in risk assessment and analysis.

Rapidly evolving technological advances in disease diagnostics, animal identification and database management will improve animal disease surveillance system's ability to supply information to decision makers. Molecular techniques that can detect multiple nucleic acid targets in a single polymerase chain reaction assay (PCR) not only reduce the time to diagnosis but also permit testing for different diseases simultaneously (Bates et al. 2003). Key to accurate surveillance is an identification system that accurately links an animal to its farm of origin, to animal concentration points it may have transited (livestock markets) and to slaughter establishments. The use of barcoding, radio frequency identification (RFID) and geospatial information systems are currently used effectively in many countries. The development and subsequent implementation of an animal identification system based primarily ion RFID technology is being rapidly developed in the United States.

Essential to the effective implementation and monitoring of a National Surveillance System is the collaborative interaction with state, federal, university and industry partners. Data gathered by such a system will be critical not only to ensure and affirm the health of the National's livestock, but to provide decision makers with information required for an effective, timely response in the case of an accidental or intentional introduction of a foreign animal disease.