

Algorithm Aids in Monitoring Animal Health Events

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Background

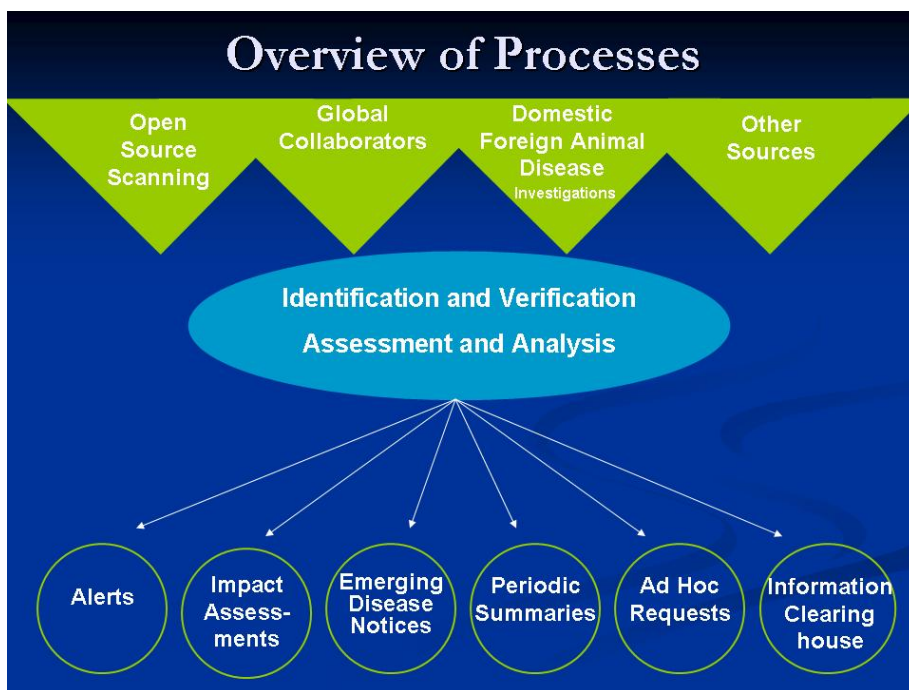
Protecting the animal population of the United States requires constant monitoring of global disease events and conditions that may lead to disease emergence, both domestically and globally.

Since 1999, the Center for Emerging Issues (CEI) at Veterinary Services' (VS) Centers for Epidemiology and Animal Health has actively monitored global information sources to provide early detection, assessments, and increased awareness of emerging disease events and conditions to U.S. Department of Agriculture (USDA) decisionmakers. In recent years, the methods for gathering and processing animal health information have changed. Figure 1 describes the processes CEI uses to gather information from a variety of text-based global sources. These sources are primarily open-source media, but information also originates from a global network of collaborators and domestic foreign animal disease (FAD) investigations as well as other proprietary and confidential sources.

In order to effectively sort through the large volume of information obtained from these sources, CEI analysts assess, verify, and prioritize the emerging animal health events identified from these sources. CEI's response to an event is directed by the priority assigned to the event. For example, a high or medium priority event will immediately result in an alert or advisory to USDA decisionmakers. Further analysis of the high or medium priority event will then determine if an impact assessment or a more in-depth analysis is warranted.

Prioritization Algorithm

In order to more effectively identify and assess events of interest from the large volume of events harvested from various sources, CEI analysts have developed a text-based algorithm that prioritizes events of interest by focusing on animal health issues that are significant, or in some way unusual, regarding morbidity, mortality, clinical signs, location, or other epidemiological characteristics.

Figure 1. Overview of Processes

Using the algorithm, analysts apply the criteria listed for each priority level to an event and characterize it as either a priority 1 (high), 2 (medium), 3 (low), or 4 (other) event. Events are categorized as follows:

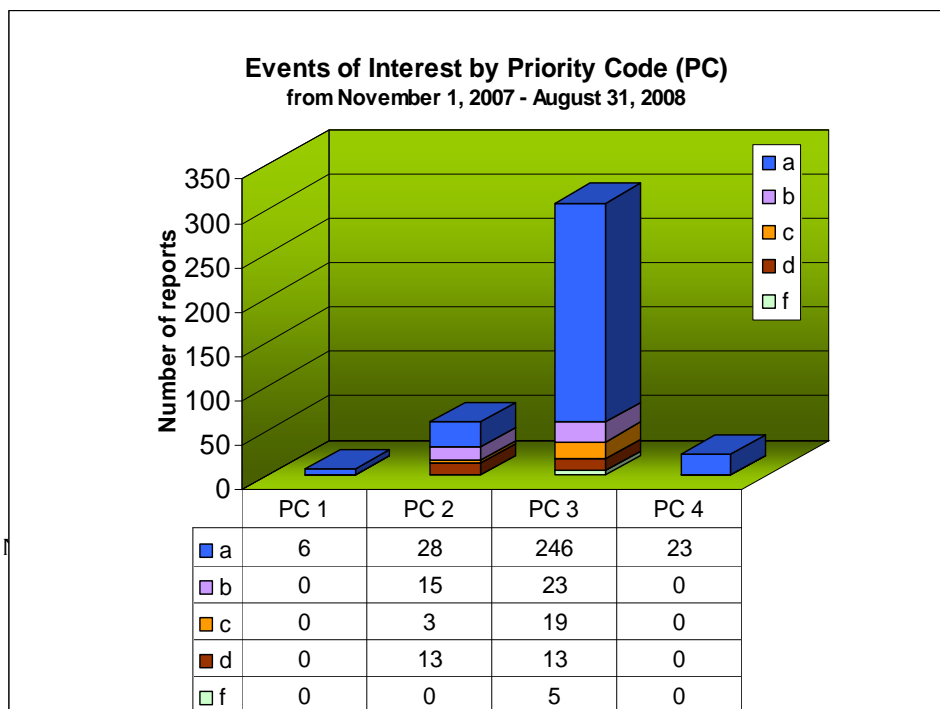
- Priority 1: Major outbreaks of an FAD or a new, unknown, or unconfirmed livestock or zoonotic disease occurring in the United States or in a country that is a U.S. trading partner.
- Priority 2: Occurrences of highly significant or novel diseases in non-U.S. trading partners, non-FAD or undiagnosed livestock mortality clusters of concern in the United States or a major U.S. trading partner, and events with unusual epidemiological characteristics in a known pathogen.
- Priority 3: Primarily animal disease events that do not meet the criteria for higher priority events, but are of interest to analysts for monitoring purposes. In addition, priority 3 events include major outbreaks of known or unknown disease in wild or companion animals with the potential to adversely affect farmed livestock or human health.

- Priority 4: Non-disease events such as smuggling, regulatory changes, and research developments of interest.

Each priority level (1 to 4) contains categories (a, b, etc.) with specific criteria indicating the nature of the event, such as whether the event occurred in a U.S. trading partner or in livestock or wildlife. The prioritization code for an event contains both the priority number and the corresponding category letter.

From November 1, 2007, to August 31, 2008, about 26,000 animal health related records were evaluated and prioritized using this algorithm. A total of 394 events of interest were identified. As illustrated in Figure 2, there were 6 priority 1 events in this period. All of these priority 1 events involved a suspected or confirmed FAD in the United States or in a U.S. trading partner. Fifty-nine events were classified as priority 2. Of these, 28 were first occurrences of a CEI priority disease in a country, 15 were major outbreaks in a non-U.S. trading partner, 3 were undiagnosed or non-FAD livestock mortality clusters of concern in a U.S. trading partner, and 13 were reports of unusual epidemiological characteristics for a known pathogen. There were 306 events categorized as priority 3. Of these, 246 were of interest for monitoring purposes, 23 were major outbreaks of known or unknown diseases in companion animals or wildlife, 19 were minor undiagnosed outbreaks in U.S. trading partners, 13 were reports of undiagnosed or select endemic diseases in the United States, and 5 were reported failures of a livestock vaccine or antimicrobial treatment. There were 23 priority 4 reports dealing with smuggling of live animals or animal products, regulatory changes, or surveillance and research developments that impact animal agriculture.

Figure 2. Events of Interest by Priority Code



Examples of prioritized events

- The detection of piroplasmosis in horses in Florida was given a priority code of 1a because the United States had been considered free of this disease since 1988; therefore, this event represented a confirmed occurrence of a foreign animal disease in the US.
- An outbreak of peste des petits ruminants (PPR) in Morocco was given a priority code of 2a because it was the first report of PPR in Morocco; however, the United States does not import small ruminants from Morocco.
- A report of a large number of moose dying over a period of several months in Newfoundland, Canada, from an unknown disease was given a priority 3b, as this event met the criteria of a major outbreak of an unknown disease in wild animals that should be monitored for further information.

Conclusion

When assessing text-based surveillance data where quantitative data is unavailable, the use of this prioritization algorithm has been an effective tool that allows CEI to quickly identify and prioritize events on which analysts and decisionmakers should focus. CEI monitors high priority events for further developments and reports them to VS management. The prioritization code (number and letter combination) is a descriptive code that can be used to analyze the collected information to describe trends over time. The algorithm also provides consistent evaluation and assessment of these events and minimizes bias introduced by the subjective perspectives of individual analysts. We continue to refine the algorithm in an effort to improve our targeted surveillance and reporting of emerging disease events.