Assessment of paper interstate certificates of veterinary inspection used to support disease tracing in cattle

Katie Portacci, DVM, MPH, DACVPM; Ryan S. Miller, MS; Philip D. Riggs, PhD; Michael G. Buhnerkempe, PhD; Lauren M. Abrahamsen, MEng, DVM

**Objective**—To evaluate the differences among each state’s Interstate Certificate of Veterinary Inspection (ICVI) form and the legibility of data on paper ICVIs used to support disease tracing in cattle.

**Design**—Descriptive retrospective cross-sectional study.

**Sample**—Examples of ICVIs from 50 states and 7,630 randomly sampled completed paper ICVIs for cattle from 48 states.

**Procedures**—Differences among paper ICVI forms from all 50 states were determined. Sixteen data elements were selected for further evaluation of their value in tracing cattle. Completed paper ICVIs for interstate cattle exports in 2009 were collected from 48 states. Each of the 16 data elements was recorded as legible, absent, or illegible on forms completed by accredited veterinarians, and results were summarized by state. Mean values for legibility at the state level were used to estimate legibility of data at the national level.

**Results**—ICVIs were inconsistent among states in regard to data elements requested and availability of legible records. A mean ± SD of 70.0 ± 22.1% of ICVIs in each state had legible origin address information. Legible destination address information was less common, with 55.0 ± 21.4% of records complete. Incomplete address information was most often a result of the field having been left blank. Official animal identification was present on 33.1% of ICVIs.

**Conclusions and Clinical Relevance**—The inconsistency among state ICVI forms and quality of information provided on paper ICVIs could lead to delays and the need for additional resources to trace cattle, which could result in continued spread of disease. Standardized ICVIs among states and more thorough recording of information by accredited veterinarians or expanded usage of electronic ICVIs could enhance traceability of cattle during an outbreak. (J Am Vet Med Assoc 2013;243:555–560)

The ability to trace animals is a critical component in livestock disease control and eradication efforts. The availability of records documenting individual animals as they move through the system can help identify the source of infection. Rapidly tracing the source herd and exposed animals during an outbreak situation maximizes the effectiveness of emergency response actions and minimizes the social, economic, and environmental costs. Animal health authorities in the United States have proposed new animal disease traceability program requirements for the interstate movement of farm-raised livestock and poultry to ensure infected and exposed animals can be quickly traced during an outbreak. According to the current traceability plan, cattle are a priority in this effort because of the gaps in individual animal identification and movement documentation, compared with other livestock industries. Tracing animal movements begins with the detection of an infected animal or herd and has the goal of identifying all animals that may have been exposed prior to (trace-in) and after (trace-out) the infected animal enters a herd. The ability to trace individual animals through the movement system could significantly improve the speed and effectiveness of emergency disease response actions and help contain the spread of a disease. The present infrastructure is not designed to trace individual animals throughout the course of their life, and trace investigation periods for endemic diseases can exceed 150 days. 

From USDA APHIS Veterinary Services (Portacci, Miller, Riggs, Abrahamsen), Fort Collins, CO 80526, and Department of Biology, College of Natural Sciences, Colorado State University, Fort Collins, CO 80526 (Buhnerkempe). Supported by USDA cooperative agreements 11-9208-0269-CA and 09-9208-0235-CA. The authors thank Dr. Colleen Webb for technical assistance. Address correspondence to Dr. Portacci (katie.portacci@aphis.usda.gov).

**ABBREVIATION**

ICVI  Interstate Certificate of Veterinary Inspection
animals relies on individual identification, the ability to track movements, proper identification of premises, and recording of this information. The ICVI is an important tool to assist with tracing the movement of animals among states. An ICVI is an official document that may be signed by an accredited veterinarian or an official state or federal veterinarian. The ICVIs are often referred to as health certificates; however, this is misleading because an ICVI only requires a veterinarian to certify that an animal or group of animals is apparently healthy with no visible signs of communicable diseases at the time of inspection. It does not certify that the animal is free of all infectious diseases. In general, ICVIs are required for interstate cattle movement with the exception of animals going directly to slaughter. The ICVIs are also used for intrastate movement when required for exhibition or other purposes. Although ICVIs do not confirm that interstate movements of livestock occurred (ie, an ICVI can be issued but the shipment may not occur), in many instances, it provides the only source of information to help establish where animals moved to and from across state lines. If the previous location of an infected animal is identified, other exposed animals at the same location could be tested.

The present traceability system relies on accredited veterinarians to provide accurate information on an ICVI to trace animal movement and identify exposed animals. The process for use of ICVIs requires the accredited veterinarian to inspect the animals being shipped, fill out the ICVI required by the state of origin, and provide a copy to the originating state, destination state, and owner. With the exception of exhibit animals in some states, cattle must be moved within 30 days after certification, after which time the ICVI expires (60 days in 1 state). Accredited veterinarians have 2 options when filling out an ICVI: use of paper or electronic forms. Multiple electronic repositories exist for submitting ICVIs, but for cattle shipments, these are used by only a small percentage of accredited veterinarians. Most accredited veterinarians use paper ICVIs for cattle that are shipped across state lines.

The objective of the study reported here was to evaluate differences in data elements requested on paper ICVI forms by state and the legibility of the data provided by accredited veterinarians to support animal disease tracing in cattle. This assessment was intended to provide an understanding of the data presently available and the value of paper ICVIs for tracing cattle movements. A more thorough understanding of the available data will provide a foundation for further enhancement of the use of paper ICVIs in existing animal tracing systems or promote expanded usage of electronic systems.

Materials and Methods

ICVI form review—To describe the differences in paper ICVIs among the 50 states, each state provided an example of their paper ICVI form. Data elements listed on each state’s ICVI were recorded in an electronic database for comparison of the similarities and differences. This initial comparison identified 16 data elements that were similar among states and have the potential to contrib-

Data analysis—The 16 data elements important for accurate tracing of individual animals were classified as legible, illegible, or blank (no data) by examination of the information provided by the accredited veterinarian who filled out the form. Each of the 16 data elements was summarized by the percentage of forms with legible data, by state. Data elements that were blank or illegible were deemed unusable for tracing. This state-level information was used to summarize the availability of legible data at the national level. States that did not request a particular data element were excluded from the national estimates for that element. Mean ±
Presence of legible ICVI data—All 50 states were also asked to provide a random sample of their completed interstate export records for cattle in 2009. Forty-nine of 50 (98%) states agreed to participate in this part of the study. Of the participating states, Alaska did not have any interstate export records that met the study criteria, resulting in 7,630 ICVIs available for evaluation from 48 states. Each state was ranked according to the proportion of ICVIs with legible data present in each of 3 elements considered key for tracing purposes: origin address, destination address, and official animal identification. The states that performed the best for origin address were Maine, Connecticut, and Delaware (100%); the state that performed the best for destination address was Idaho (91.7%), and the state that performed the best for official identification was New York (84.9%).

Location information (origin and destination) was frequently recorded on ICVIs. A mean ± SD of 70.0 ± 22.1 ICVIs in each state had legible origin address (street level) information. The percentage of forms with legible origin address information was variable, ranging from 21.1% to 100.0% across the 48 states that requested it (Table 1). Of the records with unusable origin address information, 65% were left blank, 2% were illegible, and 33% used a post office box address rather than a street address. Legible destination address information was less common, with a mean ± SD of 55.0 ± 21.4% of ICVIs with legible records (range, 10.0% to 91.7%). The most common finding for unusable destination address information was a blank field (85.6% of unusable records). City information was commonly recorded for origin (99.1 ± 0.0%) and destination (97.3 ± 9.3%) of the shipment.

Information related to dates on an ICVI (issue, shipment, and examination) was highly variable. When specifically requested, issue date and shipping date were the most commonly recorded dates (98.0 ± 7.1% and 91.2 ± 17.8% of ICVIs, respectively). Examination date was the least commonly recorded date (39.9 ± 25.9% of ICVIs).

The most frequently recorded information was related to sex (97.4 ± 4.4% of ICVIs), cattle breed (86.5 ± 8.6% of ICVIs), and state of shipment (99.0 ± 2.1% of ICVIs). Results of testing for the causative organisms of bovine tuberculosis (47 states) and brucellosis (46 states) most commonly requested.

### Table 1—Percentages of ICVI forms in each state for which information recorded for 16 data elements was legible.

<table>
<thead>
<tr>
<th>Data element</th>
<th>No. of states</th>
<th>Mean ± SD (%)</th>
<th>Median (range [%])</th>
</tr>
</thead>
<tbody>
<tr>
<td>Origin</td>
<td>18</td>
<td>8.0 ± 14.2</td>
<td>2.0 (0.0–60.0)</td>
</tr>
<tr>
<td>Premises identification No.</td>
<td>48</td>
<td>70.0 ± 22.1</td>
<td>71.4 (21.2–100.0)</td>
</tr>
<tr>
<td>Address</td>
<td>48</td>
<td>98.1 ± 2.0</td>
<td>100.0 (90.0–100.0)</td>
</tr>
<tr>
<td>City</td>
<td>48</td>
<td>99.0 ± 2.1</td>
<td>100.0 (90.0–100.0)</td>
</tr>
<tr>
<td>State</td>
<td>48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Destination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premises identification No.</td>
<td>16</td>
<td>0.2 ± 0.4</td>
<td>0.0 (0.0–1.3)</td>
</tr>
<tr>
<td>Address</td>
<td>48</td>
<td>55.0 ± 21.4</td>
<td>53.2 (10.0–91.7)</td>
</tr>
<tr>
<td>City</td>
<td>48</td>
<td>97.3 ± 9.3</td>
<td>100.0 (40.0–100.0)</td>
</tr>
<tr>
<td>State</td>
<td>48</td>
<td>96.8 ± 4.0</td>
<td>100.0 (100.0–100.0)</td>
</tr>
<tr>
<td>Date</td>
<td>30</td>
<td>98.0 ± 7.1</td>
<td>100.0 (60.8–100.0)</td>
</tr>
<tr>
<td>Issue</td>
<td>15</td>
<td>91.2 ± 17.8</td>
<td>99.1 (57.5–100.0)</td>
</tr>
<tr>
<td>Shipping</td>
<td>30</td>
<td>39.9 ± 25.9</td>
<td>33.0 (5.1–100.0)</td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Official identification No.</td>
<td>48</td>
<td>33.1 ± 25.1</td>
<td>25.4 (0.0–84.9)</td>
</tr>
<tr>
<td>Unofficial identification No.</td>
<td>48</td>
<td>54.0 ± 23.1</td>
<td>54.1 (7.4–100.0)</td>
</tr>
<tr>
<td>Breed</td>
<td>48</td>
<td>86.5 ± 18.7</td>
<td>94.7 (33.3–100.0)</td>
</tr>
<tr>
<td>Age</td>
<td>48</td>
<td>82.8 ± 16.3</td>
<td>89.2 (46.6–100.0)</td>
</tr>
<tr>
<td>Sex</td>
<td>48</td>
<td>97.4 ± 4.4</td>
<td>99.3 (62.7–100.0)</td>
</tr>
</tbody>
</table>

*The number of states that requested each data element.
± 18.7%). The most frequent reason for unusable data related to sex, cattle breed, and age was leaving the field blank (97.2%, 96.9%, and 77.5%, respectively, of the unusable records). Official animal identification was present on only 33.1 ± 25.1% of ICVIs and ranged from 0.0% to 84.9% in the 48 states that requested identification on an ICVI. When official animal identification information was unusable, the space provided was left blank (99.5%). Unofficial animal identification was more common, with a mean of 34.0 ± 23.1% of ICVIs in each state recording some form of unofficial individual animal identification (range, 7.4% to 100.0%).

Discussion

Incursion of a contagious or World Organisation for Animal Health–listed disease can be costly to livestock industries because of the loss of animals, trade restrictions, and loss of consumer confidence.10–12 Outbreaks of highly infectious diseases have resulted in large-scale social and economic devastation.13,14 The United States has been successful in avoiding large-scale outbreaks of highly infectious diseases in cattle but continues to manage sporadic occurrences of bovine brucellosis, tuberculosis, and other endemic diseases. Presently, the period required for completion of trace investigations for bovine tuberculosis may exceed 150 days, with additional time spent testing unexposed cattle because of lack of available individual animal identification.8 The 2003 bovine spongiform encephalopathy case exemplified the importance of tracing an individual animal throughout its life to US livestock markets.5 Rapidly detecting and tracing infected animals in a highly infectious disease outbreak are critical to minimizing the impact of the outbreak by reducing the number of animals euthanized and other costs.15–18 By enhancing the ability to trace individual animals, the cost of managing diseases endemic to the United States could also be reduced and improve the marketability of US products in countries where traceability yields a price premium.18

An effective animal traceability system requires common standards for collecting information, presence of legible information, and the ability to rapidly recall this information when necessary.19 Efforts have been underway in the United States to develop a traceability system that is cost-effective for producers yet provides animal health officials the information necessary to respond to disease situations. Concerns over confidentiality, liability, and cost create challenges for implementing mandatory animal identification and the use of electronic systems. The USDA's new traceability program encourages the use of low-cost technology and allows states the opportunity to develop a system that works for them.4 With the limited use of electronic systems for cattle, the paper ICVI remains an important component of a state's traceability program and provides information that all states have access to for tracing animals during an outbreak.

Limitations of the usefulness of paper ICVIs as they presently exist must be understood as states continue developing their own traceability systems. Each state has its own unique ICVI (or multiple ICVIs, in some states) designed to satisfy state and federal requirements. Because each state's form contains different information in different locations, tracing shipments of animals that entered a state or verifying that all import requirements have been met may take additional time for importing states. Accredited veterinarians certify a single shipment through an ICVI, but that record could have far-reaching implications in the event of an outbreak. The incompleteness of information often provided by accredited veterinarians creates an added barrier to the effective use of paper ICVIs to trace cattle. Although all 50 states request certain elements on an ICVI, results of this study indicated that many elements do not have definitions or are missing useful information when completed by accredited veterinarians. Because the critical elements are not always complete and legible, all of the elements indicated (Table 1) should be included on a uniform ICVI, with the exception of a standardized date field. Although address information is requested by all 50 states, failure to differentiate between physical locations of the owner or animal, mailing addresses, and markets will delay completion and affect the accuracy of animal tracing. The address of the owner may be helpful, but it does not identify the location of the animals, which is necessary to help identify exposed animals. Seventy percent of origin address information provided by accredited veterinarians (to the street level) was legible, but only 55% of the destination addresses were legible. The unusable data were most commonly caused by leaving the field blank. However, a post office box address was also used on some ICVIs but does not represent an animal’s location. Thus, ICVIs cannot always be relied on for rapid tracing of either individual animals or shipments of animals to a physical location where other animals may be exposed. When other elements (eg, identification, age, breed, and purpose) are available to help identify an animal, tracing only to the city or state scale will hinder an investigation. Age, breed, and sex information are standard elements on all ICVIs, but the purpose of shipment differs among all states. Standardizing the purposes of shipment among states would make the information more helpful for prioritizing traces, such as tracing breeding animals before tracing animals directed to slaughter channels, when appropriate.

Differences in the manner in which dates are requested may also hinder an investigation by leading to confusion regarding when the animals were actually shipped versus when they were examined by the accredited veterinarians. Only 15 states requested a shipment date, but it was provided on 91.2% of ICVIs, indicating veterinarians often have an idea of when a shipment is intended to occur. Although a shipping date may not always be exact, it may provide a narrower window when searching for exposed animals. With only an issue date or examination date, the animal may be moved at any time within 30 days (60 days in 1 state) after the ICVI is written. The lack of a specific date could complicate searching for animals exposed to an infectious disease at locations such as markets. For example, when all animals passing through markets for a period of 30 days need to be tested because the exact date an infected ani-
Unidentified animals increases. In the United States, it is estimated that at least 70% of the animals in a specific species sector (e.g., beef cattle) must be identified and traceable to effectively respond to an outbreak situation. According to the National Animal Health Monitoring System 2007–2008 beef study, approximately two-thirds of beef-cow-calf producers used at least 1 form of individual identification for cows and almost half of all operations used individual identification for heifers. Nearly 65% of the cows and calves had some form of individual identification, and approximately 75% of feedlot and stocker cattle were unofficially identified. According to the National Animal Health Monitoring System 2007 dairy study, 93% of operations and 97.4% of cows had some form of individual animal identification. In the present study, 49% of the ICVIs and electronic ICVIs (Veterinary Services Process Streamlining) maintained by the USDA evaluated how well electronic ICVIs represented cattle movement in the United States and found that, in 2009, they represented an estimated 1.4% of cattle shipments and were highly biased toward shipments originating in or destined for Texas and Wisconsin. Thus, presently, electronic ICVIs represent a small, unrepresentative sample of cattle movements, which limits their general use in traceability and studies of disease spread. However, the quality of these electronic records appears to be superior to paper ICVIs.

The value of the paper ICVI for tracing individual animals may be limited, but it remains the only document all states can use to track the interstate movements of cattle. In the absence of electronic ICVIs, a uniform paper ICVI used by all states (or at least consistency in standard fields with appropriate definitions) and enforcement of legibility would improve the use of paper ICVIs and ensure that the most critical elements (origin address, destination address, and individual animal identification) are always provided.


