The use of computer imaging technology to facilitate the capture of feedlot necropsy information

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Abstract — The collection of necropsy information is an integral component of veterinary feedlot consulting. Computer imaging technology can be employed to facilitate the capture of feedlot necropsy data. A digital camera is used to capture necropsy images. Subsequently, the images are electronically transferred to a central site for veterinary interpretation and diagnosis.

Résumé — Utilisation de l'imagerie numérique pour faciliter la prise des résultats de nécropsie dans les parcs d'engraissement. La collecte des résultats de nécropsie fait partie intégrante de la tâche du vétérinaire-conseil dans les parcs d'engraissements et la technologie de l'imagerie par l'ordinateur peut faciliter cette collecte. Une caméra numérique est utilisée pour saisir les images de nécropsie et celles-ci sont ensuite transférées électroniquement à un centre d'interprétation et de diagnostic vétérinaires.

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Necropsy information is an integral component for monitoring feedlot disease and designing rational preventive and therapeutic feedlot animal health strategies. Feedlot Health Management Services strongly advocates that the necropsy of all dead animals, using a standardized approach, is imperative to establish a valid database for rational decision-making. The objective of this communication is to document a new approach to the collection of necropsy information from feedlots.

A cost-effective solution to ensure that necropsy information is obtained from all dead animals posed a considerable challenge for clients located a significant distance from our office. Initially, still photos were utilized to collect necropsy data. However, this approach entailed a significant lag time to necropsy diagnosis associated with transport and development of the pictures. In addition, the cataloging and storage of the pictures was a major issue. Next, we utilized a videotape recorder camera to avoid the film processing issue; unfortunately, image quality, physical transfer of the videotape, and time consumption to view videotapes were sizable obstacles.

New developments in digital imaging technology allow for excellent images using equipment that is not prohibitively expensive. An initial investigation on the use of digital imaging technology to collect feedlot necropsy information was conducted in conjunction with the Animal Health Laboratories Branch, Airdrie Section, Alberta Agriculture Food and Rural Development, Airdrie, Alberta, starting in the fall of 1995 and continuing into the spring of 1996. During the course of this investigation, several practical issues were identified. First, image detail and resolution were limiting factors for diagnosis with first generation digital cameras. Second, artificial lighting was detrimental to image quality. Third, when frozen carcasses were thawed at the laboratory, image quality was substantially diminished. Thus, it was crucial to use fresh specimens to obtain diagnostic images. Fourth, a standardized flow-chart, in conjunction with the treatment history of the dead animal, was necessary to determine which necropsy images to capture. Finally, it became apparent that the specific postmortem techniques used by the prosector could significantly influence the diagnostic quality of the images.

The experience and information derived from the initial investigation provided the impetus to develop our current system for the collection, transfer, interpretation, and storage of necropsy information from feedlots located a significant distance from our office.

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To collect the images, we are currently using a zoom digital camera (Kodak DC 260, Kodak, Rochester, New York, USA). The images provided by this camera are 1280 × 960 pixels and are saved in Joint Photographic Experts Group (JPEG) compressed format. Images of this pixel density provide very good detail and are considered to be the minimum required at the present time. These files are 300 to 450 Kb each in size, and take 2 to 3 min per file to transmit by modem. Other file types consume much more disk space due to inefficiencies in data compression. The cost of the camera and complete software system required for transferring the images to a computer and subsequent viewing is approximately $900 CDN. Additional information regarding the specifications of this camera can be found at www.kodak.com. Note that most existing office computers that run Windows 95 or Windows NT 4.0 Workstation are capable of running the camera software.

It is necessary to train feedlot technicians to apply a standard prosection technique (1) for each carcass. A detailed and comprehensive written protocol, in combination with intensive wet lab training sessions, is used to capture appropriate necropsy images at various stages of prosection. In the beef feedlot scenario, a series of standard views are used on all carcasses (the unopened carcass, the opened chest cavity, a cross section of the lung, and a cross section of the heart). Additional views may be required, based on the treatment history of each animal. For example, a view of the opened larynx is necessary for an animal with a history of treatment for diphtheria. Based on the treatment history (or lack thereof) for each case, between 4 and 8 views are usually adequate for establishing a diagnosis. The protocol for the prosection and image capture has been carefully designed in flow-chart fashion to minimize the need for decision-making by the feedlot technicians.

Subsequent to image capture, the images are downloaded from the camera to a local computer, from which they are electronically transferred to our office via e-mail or a direct-dial bulletin board system. When the images arrive in our office, they are viewed by using a commercially available software (ThumbsPlus 3.0, Cerious Software, Charlotte, North Carolina, USA). A veterinarian establishes the cause of death based on the necropsy images and the treatment history of the animal. A necropsy report is generated by the veterinarian and transferred to the originating feedlot, in order to update the computerized animal health record-keeping system. The images are temporarily stored on an office server and are periodically archived to CD-ROM for permanent storage.

An evaluation was carried out on 71 postmortem examinations from a commercial feedlot in Nebraska. In this evaluation, a trained technician followed a written protocol for prosection of each carcass, capturing necropsy images as appropriate. Subsequent to the prosection, a veterinarian at the feedlot performed a postmortem. The veterinarian established a necropsy diagnosis, based on the gross postmortem findings, that was considered the gold standard diagnosis. The images collected by the technician were transferred to 2 veterinarians in our Okotoks office who were blinded as to the diagnosis established by the on-site veterinarian. These veterinarians independently viewed the digital images and made a gross postmortem diagnosis. The diagnoses obtained from the digital necropsy images agreed with the gold standard diagnosis on average 95% of the time (92% agreement for the one veterinarian and 98% agreement for the other veterinarian). When disagreement occurred between the off-site and on-site diagnoses, it was related to image quality rather than interpretation of the gross findings.

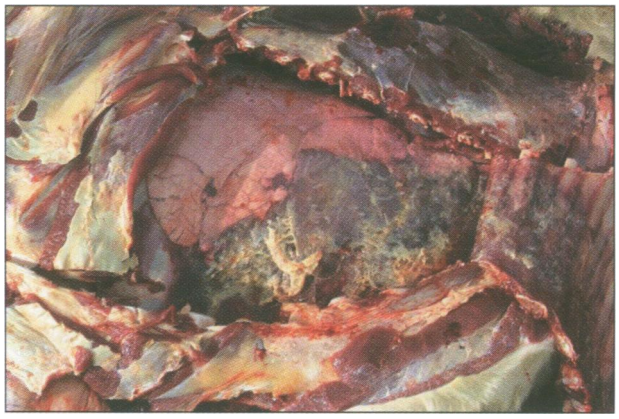

Figure 1. Opened chest cavity image obtained from an animal with fibrinous pneumonia.

The quality of images obtained with digital cameras continues to improve as technology advances. An example of an image obtained with the current camera is presented in Figure 1.

The application of digital imaging technology is a very cost-effective method of obtaining necropsy information from all feedlot mortalities, compared with the more common method of charging for necropsy fees and mileage. As a result, the consulting veterinarian is provided with the information necessary to develop science-based herd health programs. In our opinion, a veterinary/feedlot client relationship that is reliant on sporadic necropsy data will fail, because inappropriate assumptions regarding the cause of death in animals that are not necropsied will eventually result in erroneous management decisions. Other advantages of using the digital camera include a permanent digital record of all necropsies performed and the creation of a 'digital library' of lesions for teaching and client education.

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Reference

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