Western Beef Resource Committee *Fourth Edition*

Cattle Producer's Handbook

Management Section 711

Technologies in Cattle Identification and Tracking

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Cattle identification is important to cattle producers for a variety of reasons. Livestock need permanent identification to aid in record keeping and to establish ownership. Traditional forms of cattle identification include: hot iron brands, freeze brands, tattoos, ear marks, waddles, neck chains or straps, and ear tags (see fact sheet 710). Although the majority of these methods are still used today, emerging technologies in cattle identification have developed in recent years. Consumer demands have made source and age verification, as well as disease prevention and traceability, key factors in implementing these new identification technologies that can establish ownership for the producer.

Farm and ranch operations are complex in the fact that they deal with a variety of management tasks to improve their herd. Cattle producers look at genetic enhancement, animal health, nutrition, data gathering, and account and pasture management with sharp eyes in order to enhance and improve their operations. Some producers develop refined management systems, while others keep simple written diaries or log data books. Utilization of new technologies and software aids and improves the accuracy of keeping records on vaccinations, calving, bull testing, pregnancy checks, weaning, weight gains, carcass information, and much more.

Research proves that using recent advances in livestock identification technology will add value when marketing your cattle through certification of Country of Origin Labeling (COOL), as well as source and age verification.

The three main technologies that will be discussed in this fact sheet are radio frequency identification (RFID), which is also referred to as electronic identification (EID), retinal imaging, and deoxyribonucleic acid (DNA) fingerprinting. When these technologies are incorporated into data software or programs, records can be gathered on animals with a high degree of accuracy. These ongoing record systems can be used to make management decisions, which could also give producers the opportunity to look into greater, more lucrative markets.

Radio Frequency Identification or Electronic Identification

A basic EID system requires a transponder, a transceiver/reader/interrogator, a data accumulator, and a software data system to upload it (Fig. 1). While the system should include this equipment, the transponder can come in several different forms. These can be ear tags, neck chains, implantable chips, or rumen boluses.

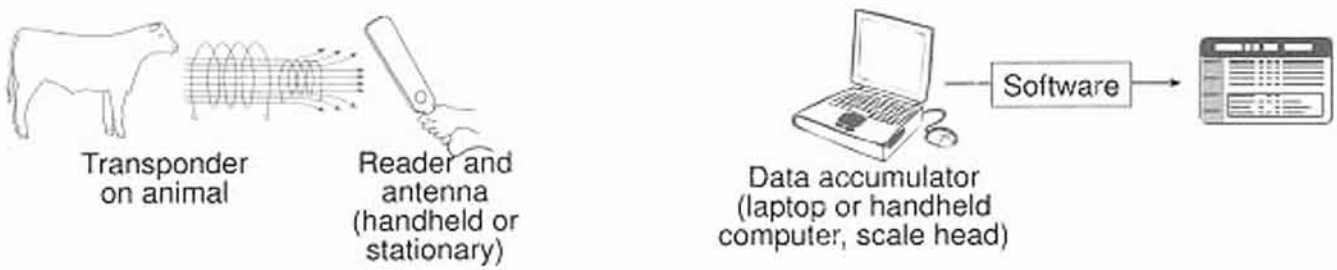

Fig. 1. Basic components of an RFID system (Blasi 2005).

The various transponders are passive and of low frequency approved by the International Standards Organization. This means there is no battery and the reader activates the transponder. The transponders can be read through tissue and wood, but not metal.

Transponders

The rumen bolus is a transponder that remains in the animal's reticulum. It is coded in a unique 15-digit number used to identify each animal. Rumen boluses are tamper proof, can only be removed by surgery, have high retention rates, and are not harmful to the animals. However, the amount of time to recover the bolus in the packing plant is excessive, and the success of recovery varies.

The chips are used mainly in small animals and horses but have not been as widely used in beef cattle operations. In beef cattle the chips have migrated from the original insertion location, essentially losing the identity of the animal and creating an issue of a potential foreign object in the muscle. This poses a problem for the producers throughout the production chain, as well as in the packing plant. Along with the recorded production records, the boluses and chips can record additional information such as body temperature.

The transponder can be incorporated into neck chains as well. The dairy industry adapts neck chain transponders to a greater degree as they incorporate them to track feed intake and milk production, in addition to the records previously mentioned. Neck chains are less feasible in a beef operation, because ear tags have fewer problems on open ranges.

In the beef industry, RFID tags are the most common form of EID. These tags also have a unique 15-character animal identification number used to individually identify an animal. The individual number can then be linked to a database and recorded as that animal's identification. Two types of EID tags are available: High Performance Half-Duplex (HDX) and Standard Performance Full-Duplex (FDX). The HDX has greater reading range compared to the FDX. Both tags have advantages and disadvantages.

The HDX tags are most useful on operations or in packing houses where tags are read more frequently. If the tags are not read often, or they can be read at a fairly close range, the FDX tags will be sufficient and cost less.

The two types of number sequences are 982 and 840 tags. The 982 tags represent the standard numbering sequence used for EID tags produced commercially. Each tag's 15-digit number begins with 982, available with FDX or HDX technology.

In order to purchase the other tag option, 840 tags, producers must have a premises ID registration number. It is a 7-digit alpha/numeric code. Premises ID numbers are assigned by each state's animal health authority, often the state's Department of Agriculture. Many state websites offer online application forms. Applicants will be required to provide name, address, and farm information, as well as descriptions specific to the property on which cattle are located. Manufacturers report sales of 840 tags to a national database, including a record of all 840 tag numbers sold and to which premises ID they were issued.

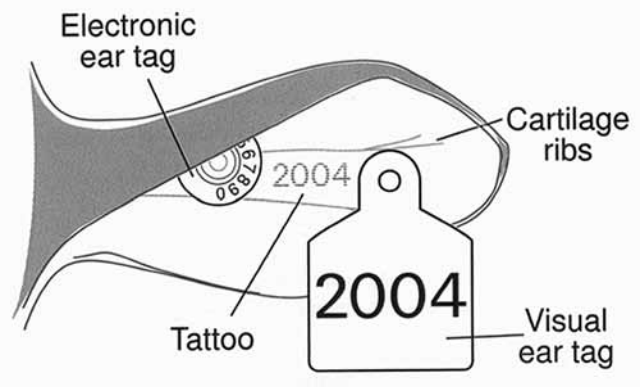

Fig. 2. RFID tag placement and other forms of identification (Blasi 2005).

High frequency tags are available, but they have not been proven or implemented in mainstream animal identification. Larger visual ear tags can also be incorporated into the record keeping in conjunction with EID just as they have been in the past. Visual tags can correspond to the EID tag, or any other form of EID.

RFID tags are more efficiently used if placed correctly in the cattle's ear. The tag should be placed within the first quarter of the animal's ear, between the two cartilage ribs. Also, be careful to close the tag in one smooth squeeze to minimize damage to the electronic portions of the tag. When placed correctly, RFID tags can be easily read by both panel and handheld readers to scan RFID tags more efficiently. Fig. 2 shows where the RFID tag should be placed as well as other forms of identification.

Readers and Data Systems

The reader triggers the transponder through an electronic signal (Fig. 3). Data are transferred to a computer into a software or data system. Many programs capture and store the data a producer wants. These data programs can be incorporated into equipment such as scales, feeding systems, and other management tools.

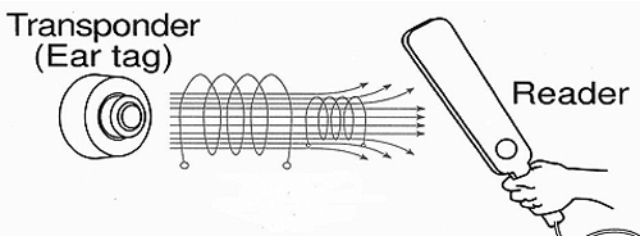

Fig. 3. Transponder and reader (Blasi 2005).

Fig. 4. Digital image of retinal blood vessel pattern (Optibrand Ltd.; Evans and Eenennaam 2005).

Software is available to download to your computer to assist in record keeping, and programs are available online. With minimal effort, individual animal data can be integrated into a software program, used to make ranch management decisions and certify compliance in marketing programs, or for various state and federal certification programs.

Retinal Imaging

Retinal imaging is a biometric identification marker, based on the distinction and uniqueness of each animal's retinal vascular pattern (Fig. 4). This pattern develops at birth and does not change throughout the animal's life. Retinal images are reached through the pupil of the animal's eye using a handheld computer in combination with an ocular fundus digital video camera, which requires almost no contact with the animal. In addition to the retina scan, the device allows for the input of other information, such as ear tag numbers, treatments, vaccines, or other records as mentioned previously with EID.

The image from the retina is stored as a binary large object file type on a removable memory card. These memory cards can be customized for specific input data and archives can be searched during any stage of production from farm to retailer. Specialized software is required to convert the file format. Figs. 5a,b show images of the retinal pattern that are saved into the memory card and used to retrieve data from the individual animal.

Images are fairly easy to capture and take less than 15 seconds; however, the animal must be restrained. Direct sunlight poses a problem with camera lenses. The glare may cause an unclear picture, therefore, facilities must be covered or modified to shade the animals while taking images. Shade sheets, large umbrellas, or tent covers are alternative shade options that are less costly.

Deoxyribonucleic Acid Fingerprinting

Deoxyribonucleic acid (DNA) fingerprinting is used to determine the parentage of beef animals, or if an animal is a carrier of specific segments of DNA for production traits or even certain diseases. A hair with root attached, tissue, blood, or semen sample are required for genotyping. In terms of new technologies and identification, DNA fingerprinting helps in determining, for instance, a calf's sire, its future feed efficiency, and its carcass quality. This information, along with other DNA marker analysis, could provide other useful data to be analyzed with production records as described previously in this paper. For more information on DNA technologies see 843.

Conclusion

In summary, several forms of updated animal identification technology can work in different situations. The important aspect is to make it work for each specific operation. Advances in technology have allowed more options for the cattle industry and the consumer. Identification should be a tool in keeping records and making managements decisions. The most effective and efficient identification should pay for itself in the end. As technology increases in the cattle industry, the end product is easily traced, therefore giving consumers peace of mind in source and age verification technology.

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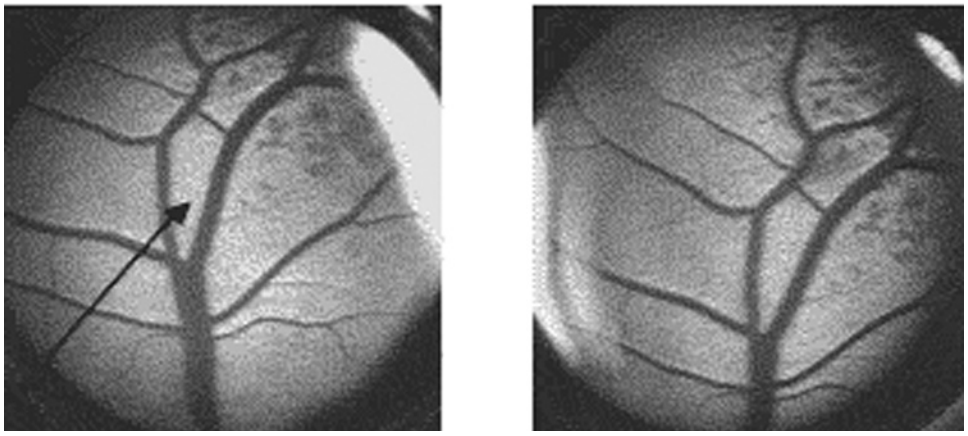

Figs. 5a,b. The arrow shows the internal structure to determine a match in the reading.

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