Traceability from Birth to Slaughter

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for

Intermountain West Nutrition Conference, January, 2003

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Multiple forces are moving our industry toward complete traceability of our meat products. We are producing food for our consumers and their demands are evolving to include food safety, nutrient value, natural/organic production, antibiotic-free, genetic preference, animal husbandry (process verification), source verification and traceability. There is a growing world wide adoption of country mandates for traceability.

There are several questions to consider as we address the viability of tracing an animal from birth to slaughter.

Is traceability in cattle from birth to slaughter possible?

Is linked carcass assessment possible at line speeds common in the U.S.?

What are the economics of individual animal traceability?

What data collection tools are necessary at the farm level to complement labor issues?

Are individual measurements more informative than group data?

Commercial organizations have been working for several years to develop traceability models. The need for completion and implementation of traceability from birth to slaughter and eventually consumption has been elevated with the passage of the latest farm bill and specifically "Mandatory Country of Origin Labeling".

> "Section 10816 -- Requires mandatory country of origin labeling for beef, lamb, pork, fish, perishable agricultural commodities and peanuts after a two-year voluntary program. The Secretary is prohibited from establishing a mandatory identification system to verify the county of origin of a covered commodity but the Secretary may use, as a model, certification program in existence on the date of enactment, including the carcass grading and certification system, voluntary country of origin beef labeling system, and those systems used to carry out the market access program under the Agricultural Trade act and the National School Lunch act.

Beef labeled with USA as the country of origin must have *documentation* that the animal was born, raised and slaughtered in the United States. Guidelines for the voluntary program must

be issued not later than September 30, 2002, and regulations for the mandatory program must be promulgated not later than September 30, 2004." *National Food Animal Identification Plan.*

The National Food Animal Identification Plan is being developed by the National Food Animal Identification Task Force and is sponsored by the National Institute for Animal Agriculture. This is a joint effort of industry and government. The plan will serve as a template for standardization of identification numbering systems and establishment of standard format specifications of required data that is to be associated with an animal.

Individual identification of cattle will require additional input costs associated not only with the cost of the identification device but also the labor and equipment needed to read, record, and store the individual identification number and related data at each of the production segments. As individual identification is used in the future to facilitate collection and analysis of production data it will become increasingly important that the ID systems are reliable and efficient to use.

There is a need to evaluate the relative costs and efficiencies associated with the collection and recording of individual identification numbers at each level of the production chain to include: cow/calf operations, auction markets, stocker operations, feedlots, packing plants, and retail outlets. In addition to the evaluation of identification devices, the hardware used to record the individual identification number and the data collection software also must be considered.

The identification tools we use in the future will need to include a unique ID number, support the ability to manage volumes of livestock, be tamper proof, function at current production line speeds, and incorporate streamlined coordination of data management. There are a number of ways to individually identify cattle. Plastic tags are available with both visual ID numbers as well as bar codes. Metal tags have also been used for permanent individual animal identification in the past, most notably in the Brucilosis Eradication Program. In the area of electronic devices we have a couple of versions of the implantable microchips, rumen bolus, and several companies produce the more commonly used external button tags. Two other technologies include DNA "finger printing" and retinal scanning as methods of permanent identification.

Current production line speed dictates that the identification system used should be automated. The best current option is the use of radio frequency identification devices (RFID). The current draft of the National Food Animal Identification Plan includes a proposed time-line of phased in use of RFID to be completed by 2005.

Electronic identification began when we copied the number off the eartag and entered it into a computer by hand. The International Standards Organization is responsible for the document that serves as a guide for all electronic ID companies making transponders. This insures uniformity in the numbering system and avoids duplication and replication of numbers. Two documents concerning the electronic ID and the readers are 11784 and 11785, respectively. The first, 11784, is the code for the structure of the numbering system. The goal is to make sure that internationally there is no duplication of numbers.

Every ISO 9001 RFID, whether it's in a bolus, microchip or tag, carries a 16-digit number. The manufacturer or country identified by the first three digits on the code is responsible for making sure that every chip they produce has a unique number. Once you get past the first three digits, everybody starts at zero. The maximum is one number short of a trillion within each of the manufacturing groups (12 digits). In addition to usage in cattle, electronic identification is being used in horses, sheep, swine, salmon and pets.. As usage increases, it's going to become more and more important that the numbers not be truncated as they are recorded in databases.

The RFID is a silicone chip and copper wire. The antennas emit a radio frequency that creates a magnetic field that is picked up by the tag. The tags operate at a radio frequency of 125 to134.2 megahertz. All the antennas have to give off the same signal. The signal hits the chip and creates an electronic current in the first coil, which causes it to charge the microchip. The microchip has an imbedded code on it. The other coil sends a signal back to the reader, which contains the imbedded code.

Data collection Hardware

Readers can be large or small. Feedlots, sale barns and packing plants will be using the large panel and portal "walk through" readers. The perception is that everyone wants bigger read ranges on antennas so they can read the tags from a longer distance. The read range is predicated on two things: how much copper wire is in the ID device and the antenna. The way you get

longer read range with the microchips is to use bigger antennas. With the small microchips, read range is measured in inches (six inches or less). The bigger the microchip used, the more read range attained.

Antennas are available in many formats ranging from large stationary panels to a small hand-held which can be attached to hand-held computers. In their simplest form, antenna are a coil of copper wire that can send out a radio frequency signal and then read it back to get the number into the computer.

The value of source and process verification needs to be addressed beyond government mandates of the U.S. and other countries (i.e. country of origin labeling and export markets). Collecting, maintaining, and utilizing individual animal data can be used for differentiation of products "branding," to assist with supply chain management, and enhance consumer confidence by providing specific production information. At a more basic level, we can utilize collected data to make early life cycle interventions (i.e. production management decisions). These management decisions may include genetic selection, product use, feeding practices and marketing of the cattle. The success of an individual identification model will include identification at an early age and allow for data collection throughout the animal's life cycle. Software for collection of individual animal data has been and will continue to be developed. Current applications are available for animal-side data collection using both hand-held devices and personal computers.

Realization of a value proposition will require the ability to coordinate and share data across all industry segments. The model will need to include both local data availability and uploads to off-site data storage. This will provide for disaster data protection and consolidated data reports. The use of large coordinated databases in conjunction with the inter-net will also allow real-time reports generated on the farm or production facility as often as management demands. The model will also allow facilitation of audit or verification systems and electronic record delivery systems. The sharing of data across industry segments utilizing these large, coordinated databases and the inter-net will require stratified security access to data.

Coming Technology

There are new technologies coming down the road. Small-animal implantable microchips have been developed to sense the body temperature of the animal. Other

biosensor/bio-information technologies in conjunction with wireless communication and global positioning systems (GPS) in the microchip format are in the planning stages.

The technology is evolving and we have several companies developing these new tools for the industry. Once we get all the packing plants on line with readers, then we'll be able to get carcass data back to producers on a regular basis. There are a few packing plant reader systems in place. Visual trolley tracking systems utilize unique hole patterns and visual readers to identify trolleys. Several companies have also developed or are working on electronic identification of the trolleys for use in tracking systems in the packing plants. These systems will allow us to match the live animal to its carcass and have that data available in an electronic format. Other companies are developing systems to track products (i.e. primal cuts through packing plant fabrication facilities). This same technology will eventually allow for the tracking of beef trimming through the grinding and further processing of hamburger.

In summary, there are stakeholders in the industry that have cooperated to research, develop, and implement both cattle and swine data collection businesses to individually identify animals from birth to slaughter and collect life-cycle data. In addition, RFID readers have been coordinated at line speed to link EID to carcass data. Industry participants have already begun to utilize the new systems to quickly access coordinated data collected from multiple industry segments allowing decisions based on individual animal information.