BIO-METRIX AN UNIQUE ANIMAL IDENTIFICATION TECHNIQUE

Santhosh Kumar. S
Veterinary Surgeon (Project),
Sree Chithra Thirunal Institute of Medical Sciences & Technlogy,BMT Wing,
Poojappura, Trivandrum

INTRODUCTION

Individual animal identification can be achieved through branding, tail tagging, ear tagging (metal, plastic, electronic), bar-coded implantable chips or biometric methods such as nose prints, iris scanning and retinal imaging. DNA profiling can further be used to identify meat products from a specific animal.

Non-biometric methods are already widely used, with ear tagging commonly favored. Implantable chips have not been accepted by the US regulatory authorities because of the risk that the device might migrate and enter the food chain and hot-iron branding is prohibited in the UK on animal welfare grounds. None of the non-biometric methods is fully independent and they are all invasive. Biometric methods, on the other hand, provide certain advantages over mechanical and electronic devices, although not all of these technologies are without their own limitations.

MECHANICAL METHODS

Traditionally, tagging, branding and tattoos have been commonly used to identify animals for trace back programs.

Branding is deemed insufficient for individual identification for trace back purposes for a number of reasons:

1. All animals in a herd are branded with the same brand;
2. Brands may not be unique to a single herd;
3. Mature animals may carry several brands;
4. It is not recognized internationally as a valid form of ID.

The application of **tattoos**, commonly used for permanent identification of pure-bred cattle, sheep and goats, has been restricted to small herds and flocks due to the time and labor required. While **ear notching** is moderately easy to apply, it too has limited use in large-scale programs. **Ear tags** range from metal clips, basic plastic tags with bar codes to electronic identification tags. While metal ear clips are less costly and more resistant to loss from tearing than plastic dangle tags, poor application can result in infections. Ear tags are not infallible and inevitably some tags are lost.

ELECTRONIC METHODS

Electronic identification technologies have been developed which rely on a device that contains a unique identification number associated with the animal, an activation reading device that initiates communication and interprets the code, and software which compiles and collates identification codes with other collected information. Transponders in ear tags or neck chains are recognized as an official identification method in North America and the EU, although visual tags must support electronic identification in the EU and Canada.

The potential for external tags to be lost, removed or damaged has stimulated development of permanent electronic identification using injectable or intra-ruminal transponders. High-density ruminal boluses are viewed as offering a safe, tamper-proof method of electronic identification is also used. An RFID transponder also comes in a bolus form similar to magnetic boluses used to prevent hardware disease. The transponder is enclosed in a ceramic case and placed in the rumen. The technology is more widely used in other countries and is currently being tested on species like sheep and goats because of challenges with tag type methods. Research reports indicate a higher level of retention, but the cost of a rumen bolus is more than double than that of tag technology.

RFID Transponder Technology

Packaged in plastic ear tags, in a bolus, or injected under the skin. Each microchip has a unique identification number. The transponder is activated by the magnetic field of the antenna and sends a unique identification code to the reader. The code can be displayed and sent to a data processing unit such as a process control computer.

RFID Transponder Types

Electronic ear tag - a microchip and a coiled copper antenna is encapsulated in a small plastic ear tag.

Bolus - a microchip and antenna are placed inside a small glass ampoule held in a high specific gravity ceramic capsule (bolus) and inserted orally into the ruminant's fore-stomachs, usually the reticulum.

Injectable transponder - a microchip and antenna are held in a small glass ampoule and injected under the skin.

Benefits of RFID Technology

Potential to provide a more reliable and effective livestock identification system than traditional identification systems. Supports computerized and automated recording in order to manage a large volume of livestock in a cost effective and efficient manner, specially for purposes of animal disease control, surveillance, and prevention. Signal absorption is not adversely affected by adverse environments such as moisture or tissue due to the low frequency radio waves. Allows for suitable read distances for automated reading and recording in abattoirs, and sale yards.

BIOMETRIC METHODS

Biometric identification technology involves the "measurement" of a biologic feature in order to accurately differentiate one animal (or person) from another. In human technology, common applications currently include retinal scans,

iris scans and scans of facial characteristics.

Recent advances in the development of biometric technologies promise a non-invasive solution to individual animal identification. Some approaches are expected to be more successful than others. Here is some of the modern biometric method of animal identification

a) Nose prints

In the USA pedigree show dogs are nose printed to make sure there's no pre-show switching. In Africa conservationists trying to help save the gorillas use nose prints to identify each gorilla, and zoos sometimes use nose prints to identify some of their animals.

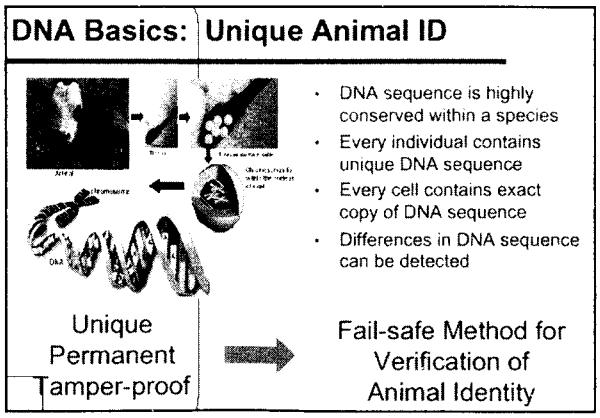
In some parts of the world livestock are nose printed. In Texas show lambs are nose printed. In Japan nose prints are used to identify cows. Cows cost a lot of money in Japan. To make sure you get what you paid for, each top quality cow comes with a set of papers that includes a nose print. This also helps make a positive identification in case a cow is stolen.

b) DNA Profiling

DNA profiling techniques are already used in pedigree animal breeding, particularly cattle horses and dogs, to confirm parentage of new registrants, and DNA verification of pedigrees is progressively replacing testing based on blood types . Wider use of DNA technology in animal identification will be limited by the time taken to process samples.

"Until scanning the DNA of an individual animal in the field and generating a nearly instantaneous result becomes possible, DNA identification is unlikely to provide a primary means of live animal identification."

However, universal tissue sampling of young animals at first tagging/identification and storage of samples offers a powerful tool of controlling the integrity of existing identification schemes and is being considered by a number of governments in Europe IdentiGEN's TraceBack system involves taking a biological tissue



sample from each carcase prior to the loss of the individual animal identity. This reference sample is given a code that links it to the individual animal identity. Specific DNA profiles are generated for each reference and verification sample, enabling comparisons to be made and samples matched to verify the identity. A potential problem with the security of DNA fingerprinting as an identification method is that data may be falsified through improper sample attribution.

c) Iris Scanning

Iris recognition technology has been developed for commercial use in humans and has been tested in animals. The process involves video-based image acquisition of the eye. The iris pattern is extracted and encoded into an Iris Code, which is stored in a database and used for recognition when the live iris is presented for comparison. Granular imperfections at the periphery of the pupil provide unique differences to individual eyes. Although iris scanning can be performed rapidly and images can be captured digitally and stored on a computer, its use in animal identification will be limited by the fact that the iris pattern does not stabilize until the animal is several months old and can undergo alteration following injury or infection.

c) Retinal Imaging

An alternative biometric, which can be used, is based on the uniqueness of each animal's retinal vascular pattern, which is present from birth and does not change during the animal's life. Retinal images are acquired through the pupil using a hand-held computer in combination with an ocular fundus digital video camera, requiring virtually no contact with the animal. The digital camera is linked to an internal global positioning satellite (GPS) receiver, which enables automatic encryption of date, time and location of image capture, making it virtually tamper-proof. The device allows for the input of additional information, such as ear tag numbers, treatment codes, or bar codes from vaccine vials. The image and data make up a unique data record – an image blob – which is stored on a removable memory card. The computerized system provides for customized memory cards for specific input data and can be integrated with legacy databases. Data archives can be rapidly searched during any stage of the production chain from farm to retailer.

"The advantages of this system are that images can be captured, stored and retrieved extremely quickly, and linked with a geopostioning system that can track time, date, and animal location."

CONCLUSION

Current methods of identification, such as mechanical methods, radio frequency ear tags, etc have many disadvantages compared to biometric methods. They are expensive and prone to falsification. This is a risk to consumers and, in the long run, to the reputation of entire markets.

Molecular-based ID methods such as DNA are still very costly and slow, requiring up to six weeks for analysis. Although technology will reduce both cost and analysis turnaround, these methods are not nearly as tamper-proof. Some countries view source verification programs as integral components of their food safety, animal health and subsidy control programs. The EU is leading the way in a world trend toward reliable source verification. Countries that have reliable systems will gain market share. Biometrics combined with a secure location indicator such as GPS provide the right animal identification package for the coming demands of the marketplace.

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