

Review Articles

MEAT TRACEABILITY FROM FARM TO SLAUGHTER USING GLOBAL STANDARDS AND RFID

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Abstract

Meat traceability is required by EU law, this has necessitated the need for traceability of the inputs involved in meat production. This paper will recommend the use of radio frequency identification (RFID) for the identification of cattle as well as a Biotrack database which maintains biometric identifiers for individual animals. It is proposed that the EPCg Global Network be utilised for the exchange of traceability data between stakeholders and a standard format for the content of the RFID tags compliant with the EPC global standard be introduced.

Key words: meat, traceability, identification, registration, location number, cattle

INTRODUCTION

The legal framework for meat traceability has been laid down by the European Parliament in EC/1760/2000 which has been supplemented by the Food Law EC/178/2002. Traceability can be defined as “the ability to trace and follow a food, feed, food producing animal or ingredients through all stages of production and distribution (Naett, 2000)”.

Article 3 of EC/1760/2000 states that “the system for identification and registration of bovine animals shall comprise of the following elements: ear tags to identify animals individually, computerised databases, animal passports, individual registers kept on each holding (European Commission, 2000).

A competent authority in each Member State of the European Union is responsible for the implementation of the computerised database. In Czech Republic the Department for Agriculture, Fisheries and Food (DAFF) is the appointed authority. The DAFF computerised database is made up of the following main elements: A Calf Birth Registration, B Cattle Movement Monitoring System (CMMS).

The Calf Birth Registration System registers all calf births on a central national database. The database holds the following information on the origin and identity of each animal: ear tag number, sex, breed, date of birth, herd of origin and ear tag number of dam.

The CMMS system was phased in with effect from September 1998 and captures all data on births, movements, deaths and disposals since 1 January 2000. In the development of the CMMS, use was made of electronic recording mechanisms namely barcode technology. Computer equipment linked to the central database was installed at livestock markets. Meat plants and live export points to record electronically all movements of cattle to and from these premises. In the case of private sales the movements are recorded by the Department Cattle Movement Notification Agency on

the basis of notifications from farmers and subsequently loaded onto the CMMS database.

This responsibility of identifying and recording the sources of feed and any other substance intended to be incorporated into a food is on the individual producer as stated by EC/178/2000 which in this case is the herd keeper. Herd keepers need to be able to identify where and from whom they received the feed for their animals. It implies but does not state directly that they should record which animals consumed certain feed in order to avert, in the case of recall pertaining to feed or any other substance (medicines, for instance) animals consumed from entering the human food chain. The DAFF databases do not record information regarding feed they do, however have information regarding feed producers and suppliers as required by EC 83/2005 (Naett, 2000).

It is now necessary for the herd keeper to have the ability to identify the source of feed, and any other inputs that may be consumed by cattle, to provide traceability data upon request to the relevant authority in accordance with the food law, a gap exists in the current traceability infrastructure; it is this gap that this paper will address through the use of RFID for identification of cattle and EPCglobal Network for the exchange of traceability data.

MATERIAL AND METHODS

Currently barcodes are the data carriers in use on cattle ear tags in Czech Republic. However, with increases in information technology radio frequency identification (RFID) tags have also become valid electronic data carriers for use in animal identification. Sahin et al. (2002) lists a number of advantages from the implementation of RFID over barcodes in the supply chain including but not limited to: a reduction in labour cost, a more efficient control of the supply chain due to increased information accuracy, reduction in delivery

disputes, a better tracking and tracing of quality problems, a reduction in profit losses.

The use of RFID tags offers another advantage over barcodes through the ability or interconnectivity of RFID systems. GSI (Global Standards Agency) has developed system where RFIDs form part of an integrated global system through the use of EPC (electronic product codes). The EPC is a unique number that is used to identify a specific item in the supply chain. The EPCglobal Network is a set of technologies that enables immediate automatic identification of items in the supply chain, anywhere in the world.

Importantly, the Network allows trading partners to exchange such information about the goods they ship among themselves. In order for such a system to be implemented in relation to cattle and cattle products it is first necessary to define all the stakeholders involved either directly or indirectly with the production of cattle. The EPC network uses defined means to identify trading partners and locations. A SUTIN (Serialised Global Trade Item Number) is used to identify individual logistical units (cow, feedstuff, medicine), a GLN (Global Location Number) is used to identify physical locations (farms, abattoirs, marts).

Biotrack will act as an independent entity responsible for storage of individual cattle biometric identifiers which will be used to verify cattle identity at various points along the supply chain. The CMMS database tracks all movements of cattle for sale and movement to different feedlots, when ownership does not change.

The most extensive database will have to be maintained by the herd keeper, in order to record all the events over the animals lifetime, such as, feed consumed by the animal (batch number, expiry date, feed identification,

feeding system) the veterinary interventions (tests carried out, treatment medicines prescribed and over-the-counter medication administered).

When an animal is moved to another location the traceability data held by the herd keeper will have to be exchanged.

This will be achieved by utilising the EPCIS (Electronic Product Code Information Service), which uses set message outlines to transfer traceability data between stakeholders in the supply chain.

RESULTS

In order for meat traceability to be implemented there is a need to define the data content of the RFID tags to be used for the identification of cattle. EPCglobal Inc. has published a set of standard protocols for RFID tag contents (Dyer 1991). The EPC tag content has seven separate sections. It is proposed that the EPC tag for cattle identification contain the same identification number as the current ear tag but omitting the DAPF algorithm controlled check digit (due to space constraints on the RFID tag) and partitioned as shown in Table 1. The EPC tag structure shown in Table 1 is for 96 bit RFID tags, the above structure is equally valid for future 198 bit RFID tags. The current identification number composition is shown in Table 2.

At this point in time there is no agreed message structure for the exchange of meat traceability data pre-slaughter through the EPCIS. It is, therefore, necessary to develop a set of standards that can accommodate the stakeholders need for efficient exchange of traceability data.

Tab. 1: Proposed EPC encoding for cattle identification

Field Description	Header	Filter value	Partition	Company prefix	Indicator digit	Item Reference	Serial number
Bits	8	3	3	24	4	16	38
Digits		1	1	7	1	5	12
Values							0 to 274877906
	0011						943
	0000	010	6	5391234	0	37201	
Meaning	Identifies SGTIN	Standard trade item grouping	Determines the length of next two fields	DAFF assigned prefix from GS1	Default	International Region code '372' ISO-3166 & Bovine identifier '01'	Region code & Herd code & Individual animal identifier

Tab. 2: Cattle identifiers used on ear tags in Czech Republic

	Region code	Herd code	Check digit	Animal identifier
Digits	2	5	1	4

GS1 has completed work in the development of message structures for the post slaughter scenario, work is underway to modify these message structures to enable the transfer of traceability data for pro-slaughter stage.

DISCUSSION

In order for the above system to function there may be the need for new legislation as currently the on-farm herd register do not have to be electronically based. In order for the efficient exchange of traceability data using the EPGglobal Network it will be essential for all stakeholders to have databases that enable the exchange of traceability data through electronic means. Czech Republic traceability system at the moment is maintained by DAFF. It is mainly concerned with the identification of cattle by use of ear tags containing barcodes and the authorisation of movement. The system does not have any means of verifying cattle identity. It is suggested that RFID replace barcodes as the data carriers to enable the use of the EPCglobal Network for the purpose of full traceability between the stakeholders, as well as Biotrack database for verification of cattle identity.

CONCLUSION

RFID tags offer another advantage over barcodes through the ability or interconnectivity of RFID sys-

tems. However there is no agreed message structure for the exchange of meat traceability data pre-slaughter through the EPCIS.

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