Frank Burose and Michael Zähner, Tänikon, Switzerland

Traceability of fattening pigs by electronic ear tag

Analysis of ear-tag loss in dehairing machines

Abstract

Electronic labelling is necessary for automatic, individual tracing of pigs. To ensure unique identification of animals, the label must remain in place until the carcase has been dehaired at the slaughterhouse.

Loss rates and the reliability of an electronic and a plastic ear tag were tested in various dehairing machines. Instances of animals passing one another during carcase dehairing were analysed.

1'028 experimental animals with plastic or electronic ear tags were examined both before scalding and after dehairing of the carcase at five different abattoirs. The loss rate with the electronic ear tag was more than two and a half times greater, at 25.2 %, than with the conventional plastic ear tag (9.7 %). There was evidence that the age of the animals on application of the ear tag and the time that the tag remained on the ear both had an impact on ear-tag losses in some cases. The electronic ear tags were fully operational.

M. Sc. Frank Burose is a PhD student at the Swiss Federal Research Station Agroscope Reckenholz-Tänikon ART, Research Department Buildings, Animals and Work, Tänikon, CH-8356 Ettenhausen, email: frank.burose@art.admin.ch.

Dr sc. nat. ETH Michael Zähner is scientific assistant and project leader in the Research Department Buildings, Animals and Work at the Swiss Federal Research Station Agroscope Reckenholz-Tänikon ART.

Keywords: electronic ear tags, dehairing machine, ear tag losses.

Literature: [1] Caja G., Hernández-Jover M., Conill C., Garín D., Alabern X., Farriol B., Ghiradi J. Use of ear tags and injectable transponders for the identification and traceability of pigs from birth to the end of slaughter line (2005), Journal of Animal Science, 83: 2215-2224.

Problem

The Swiss Epizootic Diseases Act requires pigs to be identified by an ear tag on or before weaning from the sow. Without electronic tracing systems there would be high administrative expenditure on the recording and tracking of productive livestock. The presence of the ear tag at the place where the individual animal number is linked to the abattoir data is crucial for pig traceability. This interface occurs where the carcass is suspended from the gambrel hook. In modern abattoirs, hoisting takes place following dehairing of the carcass.

An ear tag implanted early on can lead to stronger growth of the ear hole than would be the case with application at a later age. Larger ear holes in turn influence the extent of ear tag

losses. The action of the dehairing machine is highly likely to rip out the ear tag, making identification of the animal and thus full traceability impossible.

Aim

Loss rates and the reliability of an electronic and a plastic ear tag were tested in various dehairing machines, taking into account two dates on which the ear tags were applied to the piglet.

Method

Piglets from a Swiss breeder had an ear tag affixed between the eighth and 30th day of life. As well as the official TVD (Tierverkehrsdatenbank – Animal Tracking Database) plastic ear tag currently in use, an electronic ear tag was also tested (Fig. 1).

Fig. 1: The tested ear tgas: plastic ear tag (left) and electronic ear tag (right).

The fattened pigs were delivered to five different abattoirs for slaughter. The presence of the ear tags was checked before scalding and after dehairing. The plastic-ear-tag loss rate was established visually, and the loss rate and reliability of the electronic ear tag was checked visually and with the aid of a portable reader. The diameter of the ear hole was recorded in carcasses that were missing ear tags after dehairing.

Results

The analysis comprised 1,028 pigs. The pigs were slaughtered over the period of 5th June to 13th November 2007 at an average age of 184 days.

Prior to the scalding of the carcasses, 972 of the 1,028 animals were reliably allocated to the experiment by visual checking of the four-digit ear-tag numbers. Of this total, 515 animals had a plastic ear tag and 457 an electronic ear tag. The 56 animals already missing ear tags before scalding could not be definitively allocated.

At the second measuring point, after dehairing of the carcasses, there were 221 untagged animals, 165 of which had lost their ear tags during either the scalding process, or the dehairing process immediately following it. Loss rates varied considerably between the two types of ear tag. The plastic-ear-tag loss rate was 9.7 %, whereas more than 25 % of the electronic ear tags were lost. Taking the average for all the experimental animals, 17 % had lost their ear tags after dehairing of the carcasses (Tab. 1).

Tab. 1: Numbers and losses of plastic ear tags (TVD) and electronic ear tags (ISO) before scalding and after dehairing of the carcases in abattoirs.

	Unit	Total	TVD	ISO	without ear tag
Slaughtered animals (before scalding)	n	1'028	515	457	56
Slaughtered animals (after dehairing)	n	1'028	465	342	221
Ear tag losses (before scalding)	n	56			
Ear tag losses (in the slaughtering process)	n	165	50	115	
	%	17.0	9.7	25.2	

Between 9 % and 31.1 % of the ear tags were lost at the five abattoirs during the slaughtering process. Electronic-ear-tag losses were in some instances over three times greater than those of conventional plastic ear tags.

86 animals with no ear tag after dehairing were found to have an average ear hole diameter of 12.3 mm. The analysis of the slaughtered animals took into account their age at the time of ear-tag application. The first group consisted of animals ear-tagged between the eighth and 18th day of life, whilst the second group were between 19 and 30 days old when ear-tagged. The ear-hole diameter varied by 0.2 mm (Tab. 2) between the two groups. Of the 165 animals in total without ear tags after dehairing, 92 could be traced to the first and 73 animals to the second group.

Tab. 2: Age of animals on application of ear tag and at slaughter; length of time ear tag remained on animal, and diameter of ear hole of the experimental animals without tags after dehairing.

	Unit	**Total**	**Group 1** (age on application: 8-18 days)	**Group 2** (age on application: 19-30 days)
Slaughtered animals	n	86	44	42
Age of animals on application of ear tag	d	18.0	14.4	21.8
Age of animals at slaughtering	d	188	185	191
Retention period of ear tag on animal	d	170	171	169
Ear hole diameter	mm	12.3	12.2	12.4

In addition to the visual recording of the four-digit animal number on the ear tag, the functioning of the electronic ear tags was checked. Measurements taken showed full (100 %) visual and electronic recognition of both types of ear tag at all the abattoirs.

Discussion

Several factors influence the likelihood of an ear tag being ripped out of the pig's ear. The size and shape of the ear tag determine the surface that may come into contact with objects. Within the production process, these objects consist of housing and slaughtering equipment. The beaters of the dehairing machine impact upon the carcass and thus upon the ear tag. A beater hitting an ear tag may split it, or rip it out of the ear completely.

There is only limited evidence that the age of the animals on application of the ear tag and the length of time the tag remains in the ear account for ear-tag losses during the dehairing of the carcasses. The differences between the two groups with respect to ear-hole diameter and the length of time the tags remained in the ear disprove the hypothesis that application at an early age makes the ear hole grow larger than application at a later age. Experimental animals ear-tagged between the eighth and 18th day of life had a 0.2 mm smaller ear-hole diameter despite early application of the ear tag and a two-day-longer growth period, whilst nearly 56 % of the ripped-out ear tags were in animals of the first group. It can therefore be concluded that, irrespective of ear-hole diameter, the age of the animal on application of the tag has an impact on ear-tag loss.

The difference in ear-tag loss between the two kinds of ear tag may be explained by factors such as the size, shape and type of material of the tag. The arch-shaped TVD ear tag measures 27 x 34 mm, whereas the electronic ear tag is round and 27 mm in diameter. The perforated part of the plastic ear tag has a hard, round cap. The perforated part of the electronic ear tag contains the transponder; it is made from hard plastic and is not flexible. The post material is flexible in both types of ear tag. Because of its smaller size and the greater flexibility of the round shape, the electronic ear tag can more readily be pulled through the ear hole. Visual inspection of the ripped-out ear tags shows that most of them were removed from the ear in one piece.

Passing occurs if at least two animals change from their original positions between the two measuring points before scalding and after dehairing. The design of the dehairing machine is a very significant factor in the occurrence of passing. The 100 % reliability of the electronic ear tags shows production of these ear tags based on the ISO standard to be mature.

At 6.4 % in study 1 [1], electronic-ear-tag loss is distinctly lower than the 25.2 % that was found in this study. The results presented are only comparable to a certain (limited) extent to those of study 1. The slaughtered animals in [1] are more than 20 days older, and the ear-tag check does not take place before the end of the slaughtering process. In study 1, all animals are delivered to one abattoir, whereas our study collected data in five different abattoirs. The wide spread (16.0 % to 41.6 %) of electronic-ear-tag loss in abattoirs clearly highlights the important effect of the design of the dehairing machine. There is a significant difference between the two studies with respect to the reliability of the electronic ear tags. Whilst [1] shows evidence of a functionality failure in 12.8 % of the electronic ear tags by the end of the slaughtering process, all ear tags in this study could be identified until after dehairing.

Conclusion

The results obtained do not allow for clear identification of all slaughtered pigs both before and after the scalding and dehairing processes at the abattoir. The absence of identification after dehairing in the case of two or more successive carcasses makes definitive tracing of the animals impossible. The analysis of ear-tag loss in terms of age on application and length of time the tag remains in the ear partly disproves the hypothesis that an ear tag applied early on and thus remaining in place for longer during the animal's growth will lead to a larger ear-hole diameter, thereby exacerbating ear-tag loss during the dehairing of the carcass at the abattoir.

Published in: LANDTECHNIK – Agricultural Engineering 2008, 63 (3), page 162-163, www.landtechnik-net.com.