Loss rate and functional reliability of electronic ear tags for fattening pigs

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Electronic ear tags, electronic identification, ear tag losses, fattening pigs

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Abstract
Electronic labelling is necessary for the automatic, individual tracking of pigs. The loss rates and performance of one plastic and three electronic ear tags were analysed on 16 commercial farms with a total of 9,325 experimental animals in two different housing and production systems in each case. The functional reliability of the electronic ear tags was very good. The ear tag loss rate ranged from 1.5 to 4.1 % in the four different housing and production systems. There were no significant differences between ear tag types and housing and production systems in terms of either functional reliability or loss rates.

Problem definition and aim
Under the Swiss Epizootic Diseases Act, it is compulsory to identify pigs by an ear tag no later than at the time of weaning. Without the use of electronic systems, the registering and recording of livestock movements entail high administrative costs. To allow complete traceability of the animals from birth to slaughter, it is essential that the ear tag remains on the animal. The animal must still be wearing the ear tag when it leaves the fattening farm so that it can be positively identified at the abattoir, assigned to its slaughter result and, finally, traced back to its birth farm.
The aim of this study was to analyse the loss rate and functional reliability of one plastic and three electronic ear tags on commercial farms with different Swiss housing and production systems.

Method
Piglets on 16 farms were labelled with different ear tags. The pig farmers were classified on the basis of their housing and production system. A distinction was made between the housing systems on farms which produced pigs for a meat label scheme (label farms) and farms which produced to Swiss Meat Quality Management standards (QM farms). Classification was based on the different animal husbandry requirements during the suckling, rearing and fattening periods. We differentiated between production systems on farms operating in a closed system (those fattening their own piglets) and on farms specialising in at most two of the three production stages (piglet production, piglet rearing, pig fattening).
The study included the official Animal Tracking Database plastic ear tag (ATD ET; Fig. 1, far right) and three different types of electronic ear tag. In addition to two standardised electronic ear tags (ISO 1 ET, ISO 2 ET; Fig. 1, 1st and 2nd left), a prototype was used. This transponder had a chip with an anti-collision algorithm (AC ET; Fig. 1, 2nd from right). This algorithm allowed for the virtually simultaneous identification of several transponders by only one reading antenna [1].
One type of ear tag was affixed to each of the approximately 600 animals in a test group on each farm.

Figure 1: The electronic and plastic ear tags tested

The plastic ear tag loss rate was checked visually, electronic ear tag loss rate and functional reliability were checked visually and with mobile readers. Documentation took place during the production process, upon affixing, during the suckling period, at the beginning of rearing and fattening, and before the animals were sold for slaughter.
Loss of an ear tag is defined as the absence of an ear tag where there is a visible hole in the ear. In assessing the functional reliability of the three electronic ear tags, a distinction was drawn between a positive and negative reading result. The state of the ear tag was examined more closely when a transponder failed to read it. Three situations involving defective ear tags were characterised here:

- ear tag broken in pieces (broken),
- ear tag scratched or deformed (damaged) and
- ear tag outwardly normal (defective).

The statistical evaluation was performed with a two-factorial analysis of variance.

Results

Ear tag losses

The ear tag losses in the two housing and two production systems (Table 1) proved very different. In the piglet rearing period, the loss rates in the label / QM housing systems varied between 0.4 % and 1.0 %, and between 0.8 % and 3.4 % in the fattening stage. In the closed / specialised production systems, the range during the rearing period was somewhat greater (0.3 % and 1.1 %), whereas the results during fattening were closer (1.2 and 3.0 %). The label farms and those operating under the specialised system showed significantly fewer ear tag losses than their reference farms.

Table 1: Ear tag losses in different housing and production systems

	Ear tag losses [%]		
	Rearing	Fattening	Total
Housing system			
Label	1.0	0.8	1.8
QM	0.4	3.4	3.8
Production system			
Closed	1.1	3.0	4.1
Specialised	0.3	1.2	1.5
Total	0.7	2.1	2.8

The percentage of losses of the four ear tags tested on the different types of farm were largely similar. ATD ET losses were the lowest, those of ISO 2 ET the highest. Only on the specialised farms was the ATD ET and the ISO 2 ET loss rate reversed (Fig. 2).

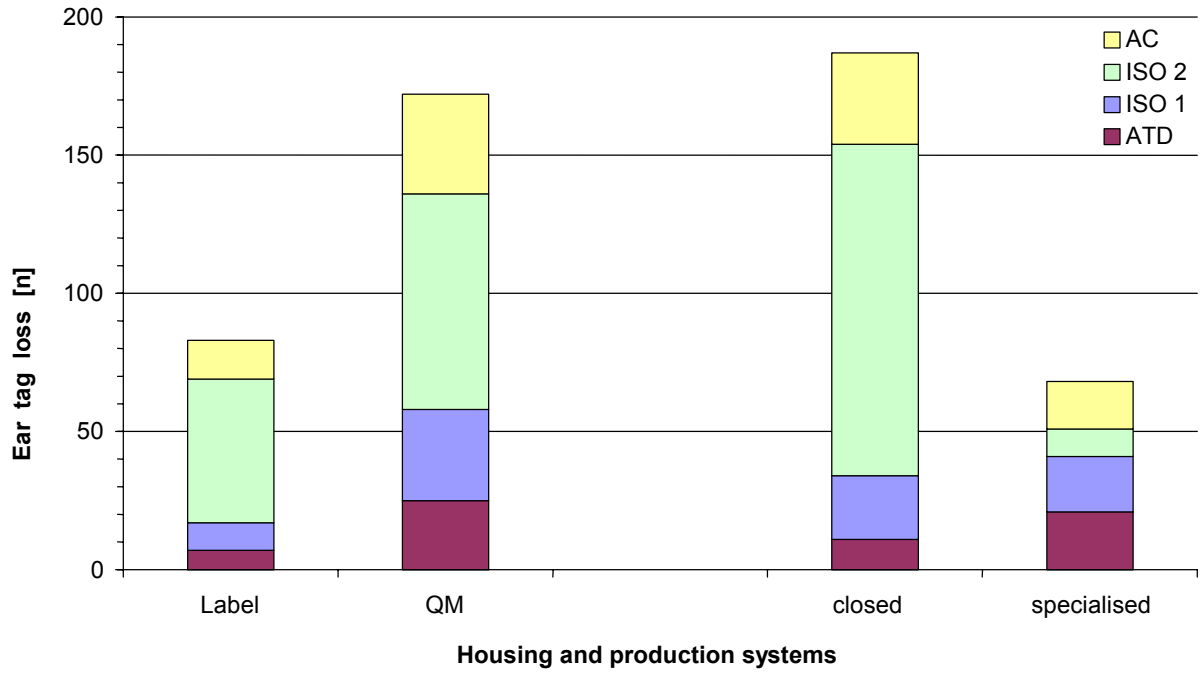

Figure 2: Percentages of all ear tag losses in the four ear tag types

There were no significant differences in ear tag loss rates between the four ear tag types and the two housing and production systems in each case.

Functional reliability of electronic ear tags

Altogether there was only a negligible difference in the functional failure rates of electronic ear tags. The label and QM farms came almost level in these statistics (0.9 % and 1.0 % respectively). In piglet rearing, the specialised farms recorded only four functional failures (0.1 %) and, in addition, at the end of the fattening phase had the lowest percentage of non-functioning ear tags (0.7 %). The farms operating in a closed system showed the highest rate of functional failure (1.2 %; Table 2).

Table 2: Functional failure of electronic ear tags in different housing and production systems

	Functional failures [%]		
	Rearing	Fattening	Total
Housing system			
Label	0.5	0.5	0.9
QM	0.4	0.6	1.0
Production system			
Closed	0.8	0.5	1.2
Specialised	0.1	0.6	0.7
Total	0.5	0.5	1.0

The analysis of functional failure in electronic ear tags presented a very uneven picture. “Defect” was the predominant cause of operational failure (90.4 %) in the ISO 1 ear tag. This ear tag is designed to be virtually unbreakable. The percentage of broken ISO 2 ear tags was striking (86 %). The percentage of broken and defective AC ear tags balanced out at 50 % each (Fig. 3).

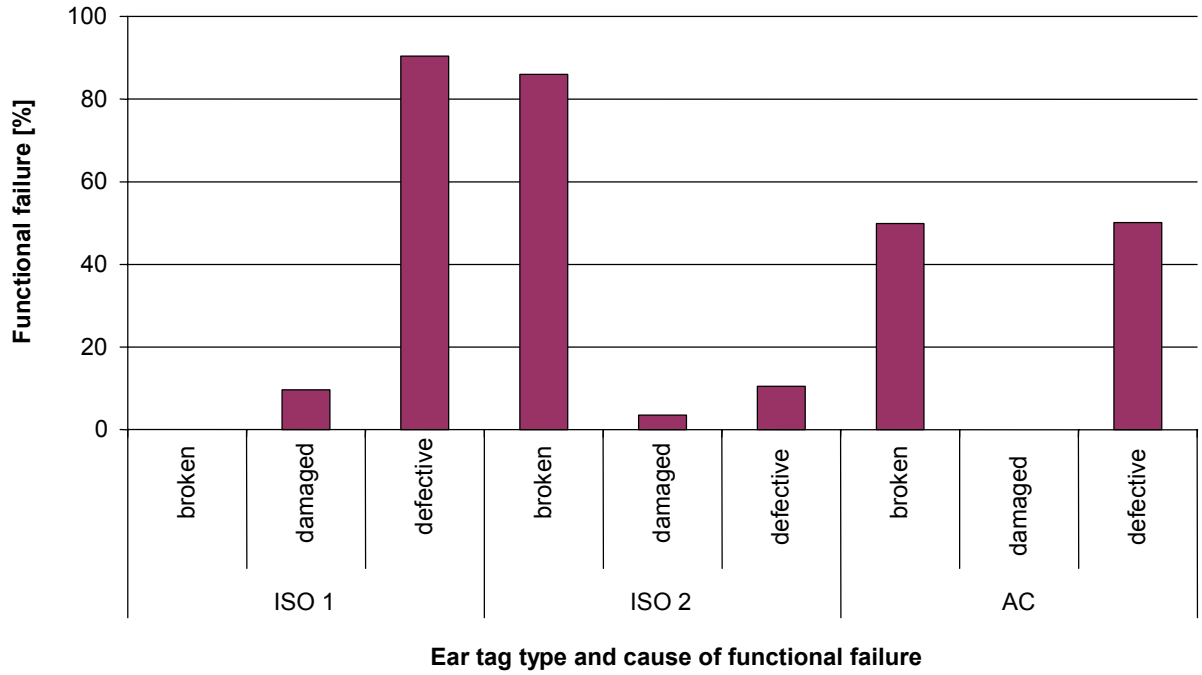

Figure 3: Functional failure of electronic ear tags

Between the four ear tag types and the two housing and production systems in each case, there were no significant differences in the functional failure rates of the three electronic ear tags.

Discussion

Some of the functional failure rates of electronic ear tags on pig fattening farms were markedly lower in the present study than in the trials carried out by [2] and [3]. Whereas in study by [3], the two electronic ear tags tested had a functional failure rate of 5.5 and 55 % respectively, the failure rates in [2] were only slightly higher than in the present study (0.6 to 2.2 % and 0.6 to 1.3 % respectively). Losses of plastic ear tags in all three studies were on a similar level (0.8 to 1.3 %). In the case of the electronic ear tags, the gap between these

values was greater. In the present study, the loss rate varied between 2.0 and 5.9 %, in [2] between 1.9 and 2.7 %, and in [3] between 8.8 and 44.9 %.
The results described are only comparable with those of [2] and [3] to a limited extent. The number of ear tags tested in the present study was approximately 20 and three times greater than in [2] and [3] respectively, that of the animal groups tested 16 and eight times greater. Whereas [3] only took measurements on one farm operating in the closed system, two housing and two production systems were included in the present study. The dimensions of the ear tags studied varied slightly. In his measurements [2] included transportation of the fattening pigs to the abattoir.
The non-significant differences in ear tag losses and operational failure rates were explained by the farm effect within the factors of ear tag type and housing and production system.

Conclusions

The label husbandry system and the specialised production system performed best in terms of ear tag loss and functional failure rate. In principle, the low functional failure rate of electronic ear tags allows a large percentage of the pigs delivered to the abattoir to be automatically identified and assigned to their farm of birth. Altogether the loss rate for electronic ear tags proved markedly higher than that of the ATD ear tags and does not allow for one hundred percent identification of the slaughtered animals. In order to achieve this target, ear tag losses must be reduced to a minimum, particularly on commercial farms.

Literature

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