Livestock Science 180 (2015) 233–236

Contents lists available at ScienceDirect

Livestock Science

journal homepage: www.elsevier.com/locate/livsci

Short communication

Individual identification of pigs during rearing and at slaughter using microchips

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ARTICLE INFO

Article history:
Received 20 March 2015
Received in revised form
25 June 2015
Accepted 28 June 2015

Keywords:
Swine
Ears tags
Electronic ID
Traceability

ABSTRACT

Identification of individual pigs is essential for management, traceability, breeding, trading and disease control in commercial pig production. Conventional identification methods used for pigs, such as ear tags and tattoos, are not sufficiently reliable due to losses and code erasing. This study investigated the retention rate, functionality and tissue damage of microchips compared with conventional electronic ear tags and assessed the effects of chip size and pig age at microchip injection. A larger proportion of small (95.2%) than large (82.5%) microchips were readable throughout the rearing period ($p < 0.031$). It was better to inject microchips when the piglets were 9–10 weeks old compared with 1–2 weeks ($p = 0.058$). Ear tags caused significantly more tissue damage than microchips ($p = 0.001$). However, although microchips met the requirements of an identification system for pigs that is unique, easy to read, does not produce apparent disturbance to the animals and causes minimal pathological changes, the proportion of lost microchips was unacceptably high. Further research on chip type, pig age at marking and marking site is needed to find suitable methods for identification of individual pigs.

1. Background

Besides identification of pigs for biosecurity reasons when moving between herds and to slaughter (EU, 2008; SJV, 2013), individual identification is essential in breeding and research (Madec et al., 2001). An efficient identification system should be easy to apply, permanently fitted, low cost, and easy and reliable to read (> 98% readability; ICAR, 2012). The most common identification methods in pigs today are tattoos, ear tags, ear notching and electronic ear tags. These methods are useful for identifying pigs during rearing, but the link between live animal and carcass is often broken in the slaughterhouse.

Electronic ear tags with an embedded electronic transponder are becoming more popular, especially for identification of breeding animals. External identification methods are not tamper-proof and the losses can be extensive. For ear tags, losses of 5–60% have been reported (Madec et al., 2001; Caja et al., 2005; Babot et al., 2006; March et al., 2007, Santamarina et al., 2007). Pigs may lose their ear tags if they become caught on interior fittings in the pen, on the way to slaughter or be lost at the slaughter line after slaughter (Stärk et al., 1998). Moreover, ear tagging can be painful for the pig and lesions with subsequent infections are relatively frequent (Leslie et al., 2010). A novel reliable individual identification method could improve monitoring of production and health through connecting information from the rearing period with information on slaughter performance and slaughter remarks. Such information could also improve phenotyping in breeding evaluation.

This study evaluated one such novel method for individual identification in pigs during rearing and at slaughter, namely use of microchips. The aims were to investigate retention rate, functionality and tissue damage with microchips compared with conventional electronic ear tags and to assess effects of chip size and pig age at marking.

2. Methods

The pigs used in the study were reared at the Swedish Livestock Research Center, Uppsala, Sweden. The study was approved by the Swedish Ethical Committee of Experimental Animals in Uppsala (Dnr: C166/12 and C381/12).

In total, 80 pigs from 10 birth litters entered the study. The

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http://dx.doi.org/10.1016/j.livsci.2015.06.025
1871-1413/

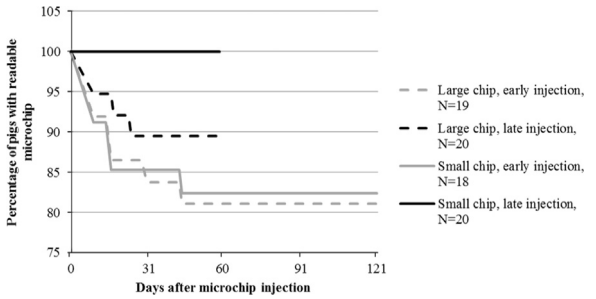

Fig. 1. Small and large microchips with disposable syringe and male and female part of the electronic ear tag, with microchip inside the female part.

piglets came from nine litters of F1 crosses between Yorkshire (dam)-Hampshire (sire) and one purebred Yorkshire litter. All piglets were identity-marked with a tattoo in the right ear on the day of birth or the day after birth, and with a conventional plastic tag including an electronic ear tag (23 mm Combi E®, Stallmästaren, Lidköping, Sweden) (Fig. 1) in the left ear at 4 days of age. All pigs were additionally identity-marked with a microchip subcutaneously injected into the auricle base of the right ear using disposable syringes provided with the microchips. The choice of microchip injection site was based on findings in previous studies (Merks and Lambooij, 1999), and the fact that the ear and microchip can be easily removed from the carcass at the slaughterhouse (Caja et al., 2005). The microchips were injected at 1–2 or 9–10 weeks of age, all by the same veterinarian. All pigs included in the study were checked daily for general health problems or problems in connection with ear marking.

Eight pigs from each litter were selected to be injected with a microchip. Three piglets died before weaning at 5 weeks of age and were excluded from the study, which thus included 77 pigs (37 castrates and 40 gilts). Balanced gender groups were formed to compare microchip size and pig age at injection. Two sizes of microchips (different brands) were used: large 2 mmx13 mm microchips (LifeChip, Destron Fearing, Langeskov, Denmark) and small 1.4 mmx8 mm microchips with barbs (MICRO ID Mini, Swevet AB, Sjöbo, Sweden) (Fig. 1). Pig age at microchip injection was varied by injecting early or late in the rearing period. The early group was injected with a subcutaneous microchip at 2–13 days of age (6.9 ± 3.66 days, mean ± Std) and the late group was injected at 64–75 days of age (68.9 ± 3.61 days, Mean ± Std). A total of 18 pigs were injected with small microchips early and 20 with small microchips late, and a total of 19 pigs were injected with large microchips early and 20 with large microchips late.

Scanning of microchips and of electronic IDs in ear tags was performed using a HHR 3000 Pro scanner with 10-cm antenna (BioControl, Rakkestad, Norway). If a microchip did not read from the ear, the whole body of the pig was scanned to ensure that the microchip had not migrated to another part of the body.

Readability was recorded once a week for the first four weeks after injection and thereafter every second week until slaughter. The pigs were slaughtered at on average 120 kg live weight, at a slaughterhouse connected to the Research Centre. Ears were removed from the carcass at the slaughter line, after bleeding and scalding but before weighing and classification of the carcass. Ears were checked visually for ear tag number, and the readability of the microchip and electronic ID was checked with the scanner. The ears were then paired, placed in individual plastic bags and saved for further examination.

Macroscopic evaluation of skin lesions and tissue damage to the ears was performed on the day after slaughter. The readability of the ear tag number, tattoo, electronic ID and microchip was checked again. The ears injected with microchips were first evaluated for skin lesions (0=no lesions, 1=mild swelling) arising from the injection and then dissected to find the microchip. The surrounding tissue was macroscopically evaluated for tissue damage (0=no damage, 1=alteration in the connective tissue, 2=grey discoloration in surrounding tissue). The ear tag was removed and skin lesions surrounding the hole were evaluated (0=no lesions, 1=partially mild redness, 2=mild swelling, 3=swelling of the whole ear, 4=severe swelling).

3. Statistical analysis

Statistical analysis was performed using the programme Statistical Analysis Systems (SAS) version 9.2. Before statistical analyses, all data on wounds were transformed to a binomial scale with 0=no wounds and 1=wounds.

Descriptive statistics were estimated using proc FREQ and proc MEANS. Differences in readability of identity between microchips (right ear) and electronic ear tags (left ear) was analysed with a chi square test in proc FREQ, with each pig being its own control (right and left ear). () Differences in the frequency of readability and incidence of wounds post-slaughter between microchip size, pig age at injection and gender were analysed with a mixed logistic regression model in proc GLIMMIX. For the logistic regression analyses, interactions between the variables and the effect of birth litter were investigated and the following three statistical models developed:

Readability of microchip during rearing (% of pigs)=Microchip size+Pig age at injection+Gender+Pig age at injection*Gender+Observation occasion (pig)+e (residual)

where microchip (small or large), pig age at injection (1 or 9 weeks), gender and pig age at injection*gender were included as fixed effects and observation occasion (12 times over the growing-finishing period) within pig (subject) was included as a repeated random effect using a binomial distribution and a logit link.

Readability of microchip post slaughter (% of pigs)=Microchip size+Pig age at injection+Gender+Pig age at injection*Gender+e (residual)

where microchip size, pig age at injection, gender and pig age at injection*gender were included as fixed effects using a binomial distribution and a logit link.

Presence of wounds (% of pigs)=Microchip size+Pig age at injection+Gender+e (residual).

where microchip size, pig age at injection, gender and pig age at injection*gender were included as fixed effects using a binomial distribution and a logit link.

4. Results

Microchip size and pig age at injection influenced the proportion of lost microchips as shown for the four combination groups of chip size and pig age at injection in Fig. 2. Logistic regression analysis revealed that a significantly higher proportion ($p < 0.001$) of small microchips (95.2 ± 1.02%, LSM ± SE) were readable throughout rearing compared with large microchips (82.5 ± 2.12%, LSM ± SE). Accordingly, there was a significant difference ($p = 0.031$) in post-slaughter readability between small (96.0 ± 3.01%, LSM ± SE) and large microchips (78.7 ± 7.12%, LSM ± SE). There was a tendency ($p = 0.058$) for higher readability throughout rearing of the microchips injected later (93.3 ± 1.50%, LSM ± SE) compared with earlier (87.0 ± 1.63%, LSM ± SE). However, there was no significant difference in readability post slaughter between early and late injection. None of the microchips had migrated to other parts of the body.

On average, the proportion of readable microchips post slaughter was 85.7%, while the proportion of readable electronic