Traceability of extensively produced Iberian pigs using visual and electronic identification devices from farm to slaughter

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ABSTRACT: A total of 351 Iberian pigs with equal numbers of both sexes from 2 commercial farms were used to study the ability of various identification devices to guarantee the traceability required for labeled meat products from Iberian pigs reared under extensive production conditions in Spain. The performance of tattoos, visual ear tags, electronic ear tags, and i.p.-injected transponders of half duplex and full duplex technologies were compared during a production cycle from nursery to slaughter at 15 mo of age (156 ± 3 kg of BW). No major health reactions to any of the identification methods were detected. Results showed that tattooing was not an adequate identification procedure due to reading difficulties as a consequence of dark skin, soiled appearance, and figure deformation. Ear tag losses and failures were affected by fencing type and increased in one of the farms (20.4 and 15.7% for losses and failures, respectively; P < 0.05) as a consequence of using barbed-wire fences. Ear tag losses decreased when fences changed to stone blocks at 365 d of age. Visual and electronic ear tag losses during transport and slaughter were low (3.7% for visual and 3.1% for electronic tag). Results of injectable transponders during the growing-fattening period were variable and were more readable for the half duplex than for the full duplex i.p. transponders (92.0 vs. 68.7% ± 1.5; P < 0.05). Handheld transceivers worked properly under extensive conditions, although the body size and skin characteristics of the Iberian breed might limit the performance of reading devices, and the use of transceivers with longer reading distances is recommended. The main problem observed with i.p. transponders was their low recovery rate at slaughter due to the lack of adherence of the transponders to the omentum.

Key words: ear tag, electronic identification, extensive production, Iberian pig, intraperitoneal transponder, traceability


INTRODUCTION

The Iberian pig is representative of traditional Spanish pork production, is heavier with thicker fat depots than current industry breeds, and produces quality products. Iberian pigs imported to the United States in the 19th century contributed to the Duroc-Jersey breed (Fabuel et al., 2004). Iberian pigs are usually reared outdoors in long production cycles (12 to 18 mo) under extensive conditions (Oliart, 1992; López et al., 2000). Fall finishing is based on grass and acorns in the Dehesa, a typical ecosystem of meadows and trees from Spain and Portugal. Slaughter is usually done in winter at 150 to 160 kg of BW. Iberian pig production is regulated by Spanish laws (Real Decreto 1083/2001), including traceability requirements for pigs and meat to ensure quality and safety standards.

Traceability requires adequate identification and certification methods (Nieuwenhuijsen, 1991; Van Houwelingen, 1991; Caja et al., 2000; McKean, 2001). Conventional identification systems, such as ear marks, branding, tattoos, brass, and visual ear tags are also used in Iberian pig production but do not satisfy the traceability requirements of the modern swine industry, and alternative systems are being investigated.

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Pig electronic identification (e-ID) based on injectable transponders was proposed as an alternative to conventional ear tags (Lambooij et al., 1995; Lammers et al., 1995), although results were not conclusive (Stärk et al., 1998). New approaches for e-ID of intensively produced pigs have been recently proposed (Caja et al., 2005; Babot et al., 2006; Santamarina et al., 2007), but little research has been conducted using Iberian pigs (Hernández-Jover et al., 2005). To our knowledge, no studies on e-ID in Iberian pigs under extensive commercial production conditions exist. The aim of this experiment was to evaluate the use of visual and electronic identification methods for traceability of Iberian pigs produced and slaughtered under extensive conditions in Spain.

MATERIALS AND METHODS

The experimental procedures and animal care conditions were approved by the Animal Experimentation Ethical Committee of the Universitat de Lleida, Lleida, Spain.

Animals and Handling

A total of 351 pigs from 2 commercial farms (farm A, n = 155; farm B, n = 196) were used. Animals used in this study were the offspring of purebred Iberian boars and crossbred (Iberian × Duroc) sows, which allowed them to be certified as Iberian pigs according to the Spanish legislation (Real Decreto 1083/2001). Farm A was a multisite pig farm (including farrowing, nursery, growing-fattening, and finishing units) located in Aroche (Huelva, Spain), where piglets were weaned at 35 d of age and housed as a single group at low animal density (2 piglets/m²) in a nursery unit provided with an outdoor yard. Environmental control in the nursery was carried out manually by means of sliding windows. Commercial starter concentrate (3,200 kcal of ME/kg and 19% CP) was fed ad libitum, and animals had free access to bowl drinkers. Ninety days later (4 mo of age), piglets were moved to a Dehesa paddock (10 pigs/ha) located at the same farm and surrounded by a galvanized iron, wire mesh fence (4-mm o.d. wire; 25 × 25-cm mesh), for traditional growing-fattening under extensive conditions. Pigs were kept in the same paddock until slaughter.

Farm B was a single-site, pig growing-fattening unit using an all-in and all-out management system, located in Arroyo de la Luz (Cáceres, Spain), and in which weaned piglets were acquired from other farms after the nursery period. Piglets (approximately 124 d of age) were transported to the farm and, after recovery and adaptation to the new conditions for 5 d, were moved to a Dehesa paddock (5 pigs/ha) delimited by a 3-wire, barbed-wire fence (110-cm total height) for traditional growing-fattening under extensive conditions. After 150 d (approximately 9 mo of age), pigs were moved to a finishing paddock with a stone wall fence at the same farm, where they were kept until slaughter.

At both farms, feeding during the growing-fattening and finishing periods was based on natural meadow grass and acorns from Holm oak and cork oak trees, which were distributed on the land at an average density of 20 to 25 trees/ha. Diet was completed with a commercial concentrate (3,050 kcal of ME/kg and 13.5% CP) supplied outdoors in metal and concrete troughs, according to the nutrient requirements reported by López Bote et al. (2000).

All pigs were slaughtered at approximately 15 mo of age (156 ± 3 kg of BW). Slaughter was carried out according to traditional procedures (electric stunning, bleeding, scalding, dehairing, evisceration, and carcass processing) in a different slaughterhouse for each farm (farm A, Maguisa, Guijuelo, Salamanca, Spain; and farm B, Montesano, Jerez de los Caballeros, Badajoz, Spain). Distance between farm and slaughterhouse was 380 and 170 km for farm A and B, respectively. Pig transport was performed under similar conditions and meeting the European Council Regulation (EC) No. 1/2005 on animal transportation. Slaughter yield of traditional Iberian pig slaughterhouses is low compared with modern industrial plants and ranged between 600 and 1,200 pigs/d.

Identification Devices and Procedures

Pigs from farm A were identified at 35 d (6 to 7 kg of BW) and pigs from farm B were identified at 124 d of age (40 to 45 kg of BW), which corresponded to the beginning of the nursery and growing-fattening periods, respectively. Table 1 shows the number of pigs used for each farm and the identifying devices. All pigs were identified in the left ear with a visual ear tag, consisting of a polyurethane double-button (male and female pieces; n = 351; Allflex-Azasa, Madrid, Spain) and were also tattooed by means of a manual tattooing device with a 5-digit, 7-mm tattoo (prorotary tattoo Outfit 5-chains 3/8 Inch, Stone Mfg. & Supply Co. Inc., Kansas City, MO) and green ink. Additionally, each pig was also identified with an electronic ear tag containing a transponder using 1 of the 2 radiofrequency technology variants (half-duplex, HDX; or full-duplex, FDX) recognized in the 11785 standard of the International Standardization Office (ISO) on animal e-ID (ISO, 1996a). Double-button, electronic ear tags built in polyurethane with HDX (n = 172) or FDX (n = 179) technology (Allflex-Azasa) were randomly applied to the right ear of each pig. Number and features of the female piece of each type of electronic ear tag are shown in Table 1. Male pieces (28-mm o.d. and 1.8 g) were made of polyurethane and had metallic-point pins. Application of visual and e-ID ear tags was performed in the center of the ear and avoiding the ear blood vessels, by means of the tag pliers indicated by the ear tag manufacturer (Total tagger, Allflex Europe, Vitré, France).

Each pig from farm B was also identified with a glass-encapsulated transponder injected i.p. in the left ventral side, under nonsterile conditions, according to Caja
et al. (2005). Transponders of the 2 recognized technology variants (ISO, 1996a) were also randomly applied: HDX (n = 100; 32 × 3.8 mm; Rumitag, Esplugues de Llobregat, Barcelona, Spain) and FDX (n = 96; 34 × 3.8 mm; Sokymat, Granges, Switzerland). Injections were performed using 2 single-shot injectors with interchangeable needles, according to manufacturer’s recommendations: HDX (injector Model Hüther, Planet ID, Essen, Germany; needle, 28 × 4.6 mm, Rumitag), and FDX (injector prototype, Sokymat; needle, 80 × 5.0 mm, Sokymat). Needles and injection area were previously disinfected with an iodine solution (Betadine, Braun, Jaén, Spain), and a spray of 2% chlorotetacycline solution (Septo-skin calier, Laboratorios Calier, Les Franqueses del Vallés; Barcelona, Spain) was applied immediately after transponder injection. Injection time averaged 70 s/piglet.

The internal position of the i.p. transponders does not allow differentiating between losses and electronic failures, and for the purpose of this study, losses and absences of reading were considered together as failures.

**On-Farm, Transportation, and Slaughterhouse Reading Performance**

To ensure proper operation, functionality of all e-ID devices was checked before (in laboratory conditions) and after application to the animals. Reading controls of conventional (by sight) and e-ID devices (by transceivers) were performed throughout the experiment. On-farm controls were performed with animals being restrained while reading and were done immediately after piglet identification (farm A, 35 d of age; farm B, 124 d of age), at the end of the nursery period (farm A, 124 d of age), during the growing-fattening period (farm A and B, 2 controls at 240 and 360 d of age), and at the end of the fattening period (farm A and B, 450 d of age) when the pigs were loaded on the truck for transportation to slaughter. At each slaughterhouse, identification devices were checked immediately after electric stunning and after pig evisceration.

Readability of e-ID devices [(transponders read/transponders applied) × 100] was determined as a percentage, as proposed by Caja et al. (1999), in restrained animals using 3 types of full-ISO handheld transceivers powered by battery (Gesreader 2S, Rumitag; SLX15 reader, Cromasa, Berriozar, Spain; and Agrident reader, Barsinghausen, Germany) to read all e-ID devices. Serial numbers of e-ID ear tags and i.p. transponders agreed with the ISO standard 11784 (ISO, 1996b) but used the ICAR manufacturer code (ICAR, 2005) instead of the country code.

**Recovery of Identification Devices at Slaughter**

Recovery of visual and e-ID ear tags was performed in the slaughter line by cutting the pin of the male piece with scissors after evisceration. Recovery of injectable transponders (pigs from farm B) was performed immediately after evisceration, when the gastrointestinal tract was placed in the viscera tray line for veterinary inspection. If a transponder was not recovered from the viscera tray on-line after visual inspection, the corresponding tray was removed from the slaughter line for later checking with a handheld transceiver. In all cases, recovery of identification devices did not alter the throughput of the slaughter line.

**Statistical Analysis**

Losses, electronic failures, and readability of devices during on-farm periods, transportation, and slaughter were analyzed using the CATMOD procedure (SAS Inst. Inc., Cary, NC), assuming a binomial distribution of the variables. The model included type of identification device (visual ear tag, electronic ear tag, and injectable transponder), radiofrequency variant technology (HDX and FDX), pig sex (male and female), farm/slaughterhouse (A and B), their simple interactions, and the error. Sex and simple interactions were removed from the final model because they were not statistically significant (P > 0.05). To make all contrasts, at least 1 loss or failure was simulated within each
level of factor. Differences between significance levels of factors were evaluated by means of contrasts using the $\chi^2$ test of SAS. Significant differences were declared at $P < 0.05$.

**RESULTS AND DISCUSSION**

No infections, inflammatory reactions, or alterations in the ear or in the ventral injection area, including intestinal hernias, were observed throughout the experiment. Pigs were slaughtered at the usual age (15 mo) and BW (156 ± 3 kg) for Iberian pig production, which indicates that visual and e-ID devices did not negatively affect pig growth. Results agree with studies conducted by Caja et al. (2005) and Babot et al. (2006) in pigs produced under intensive conditions using similar identification systems, but disagree with results of Stark et al. (1998) and Huiskes et al. (2000), who found inflammatory reactions due to the application of visual and e-ID ear tags. Environmental and application conditions may have been responsible for differences in ear reaction among experiments. Absence of negative reactions to i.p.-injected transponders also agrees with Caja et al. (2005) and Babot et al. (2006), although pigs in our experiment were older at application (124 vs. 20 d of age). Greater reactions to injectable transponders in s.c. positions have been previously reported in pigs (Lambooij et al., 1995; Huiskes et al., 2000; Hernández-Jover et al., 2005), sheep (Caja et al., 1998; Conill et al., 2002), and cattle (Luini et al., 1996; Klindworth et al., 1999; Conill et al., 2000). Intraperitoneal injection of glass encapsulated transponders was considered more appropriate for pig welfare than s.c. injection.

All tattoos were difficult to read during growing-fattening period because of the dark color of pig coat and the soil covering them. Moreover, tattoo reading was not possible at slaughter because figures were unclear. Consequently, use of tattoos as a reference method for traceability practices.

**Identification Performance During the Nursery Period**

Results obtained with the different identification devices in farm A during the nursery period are shown in Table 2. No visual or e-ID ear tag losses were reported during this period, but 2.6% of HDX electronic ear tags failed. No significant differences between visual and e-ID ear tags for any of the studied variables were found during the nursery period. In a similar experiment in pigs under intensive indoor housing conditions, Babot et al. (2006) did not report visual or e-ID ear tag losses and failures during the nursery period.

**Performance of Identification Devices During Growing-Fattening**

Results of different identification devices during the growing-fattening period, for both farms, are shown in Table 2. Location affected most of the studied variables for all identification devices, and no effect of pig sex was found.

At 240 d of age (approximately 5 mo after the beginning of the growing-fattening period), readability of visual and e-ID ear tags ranged between 54.7 and 100% and was markedly lower in farm B than in farm A ($P < 0.05$) for all devices. This was a result of the high percentage of losses reported at farm B for all types of ear tags, which ranged between 17.8 and 22.1% (Table 2). Moreover, e-ID ear tag failures in farm B were different between technologies (HDX, 23.2%; and FDX, 1.0%; $P < 0.05$). The greatest ear tag losses and electronic failures in farm B were most likely due to the barbed wire used in the paddock fence of this farm, which could cause the ear tags to get caught on the barbed wire and facilitate their damage and loss. No ear tag losses and very low electronic failures (0.7%, on average for HDX and FDX ear tags) were observed in farm A during the growing-fattening period.

Readability of i.p.-injected transponders at 240 d was high (96.4%) and did not differ ($P > 0.05$) between transponder technologies (Table 2). Intraperitoneally injected transponder failures were low (3.6%) but greater than expected according to the range (0.4 to 2.0%) reported in previous references (Caja et al., 2005; Babot et al., 2006). Difference could be attributed to injection conditions. Failures were possibly due to placement of the transponder inside the intestines or the bladder, and subsequently by transit through the rectum or urethra (Caja et al., 2005; Babot et al., 2006).

At 360 d of age, no differences in readability were observed according to ear tag type and farm (Table 2). Ear tag losses (0 to 5.8%) and failures (1.2 to 6.8%) reported at 360 d of age were considerably lower than those found at the previous on-farm performance control of identification devices (240 d of age). On-farm performance control of identification devices at 360 d of age coincided with when animals from farm B were moved to a new paddock with a stone block wall for the finishing period. This demonstrates the effect of barbed-wire fence features on ear tag losses during growing-fattening.

During this period, FDX i.p. transponders showed a lower readability (80.4%; $P < 0.05$) than the HDX technology and the other devices. The difference between the 2 electronic technologies could be attributed to a performance problem of the transceiver, although it could not be confirmed.

Location did not affect ($P > 0.05$) readability of ear tags at 450 d of age. On the other hand, readability of FDX i.p. transponders (89.2%) was lower ($P < 0.05$) than that of HDX devices (100%), which could be due to the reading problems mentioned above.

Overall losses in ear tags observed during on-farm period in farm A were lower ($P < 0.05$) than those observed in farm B (1.3 vs. 24.7%). The ear tag losses during the on-farm period in farm B demonstrates the effect of farm, due to fence type, on tag performance.
Table 2. On-farm performance of various identification devices in Iberian pigs reared under traditional Dehesa conditions

<table>
<thead>
<tr>
<th>Item</th>
<th>Visual ear tags (^2)</th>
<th>Electronic ear tags (^2)</th>
<th>Intraperitoneal transponders (^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Farm A</td>
<td>Farm B</td>
<td>Half-duplex</td>
</tr>
<tr>
<td>Initial devices, n</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursery period</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Losses, % (n)</td>
<td>0 (0)</td>
<td>21.4 (42)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Failures, % (n)</td>
<td>—</td>
<td>1.3 (1)</td>
<td>0.0 (0)</td>
</tr>
<tr>
<td>Readability, % (n)</td>
<td>100 (155)</td>
<td>78.6 (154)</td>
<td>98.7 (74)</td>
</tr>
<tr>
<td>Growing-fattening period</td>
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<tr>
<td>240 d of age</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Losses, % (n)</td>
<td>0 (0)</td>
<td>6.0 (9)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Failures, % (n)</td>
<td>—</td>
<td>7.2 (5)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Readability, % (n)</td>
<td>100 (155)</td>
<td>94.0 (141)</td>
<td>92.8 (64)</td>
</tr>
<tr>
<td>360 d of age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Losses, % (n)</td>
<td>0 (0)</td>
<td>28.1 (55)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Failures, % (n)</td>
<td>—</td>
<td>16.9 (13)</td>
<td>24.2 (23)</td>
</tr>
<tr>
<td>Readability, % (n)</td>
<td>100 (155)</td>
<td>71.9 (141)</td>
<td>83.1 (64)</td>
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<tr>
<td>450 d of age</td>
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<tr>
<td>Overall on-farm period</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Losses, % (n)</td>
<td>0 (0)</td>
<td></td>
<td>0 (0)</td>
</tr>
<tr>
<td>Failures, % (n)</td>
<td>—</td>
<td></td>
<td>0 (0)</td>
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<tr>
<td>Readability, % (n)</td>
<td>100 (155)</td>
<td></td>
<td>83.1 (64)</td>
</tr>
</tbody>
</table>

\(^{a–e}\) Within a row, means without a common superscript differ, \(P < 0.05\).
\(^1\) Dehesa is a typical ecosystem of meadows and trees from Spain and Portugal.
\(^2\) Azasa-Allflex, Madrid, Spain.
\(^3\) Intraperitoneal transponder failures include all nonread transponders because differentiation between transponders lost and reading failure was not possible.
\(^4\) Rumitag, Esplugues de Llobregat, Barcelona, Spain.
\(^5\) Sokymat, Granges, Switzerland.
\(^6\) Readability = \(\frac{(transponders\ read/transponders\ applied) \times 100}{\}.

because losses were drastically reduced when animals were moved to a stone fenced paddock. Unfortunately, comparison of our results with other authors was not possible due to the lack of studies with a similar duration of the growing-fattening period. Nevertheless, studies with intensive production white breed pigs showed no losses when using conventional ear tags (Stärk et al., 1998; Caja et al., 2005; Babot et al., 2006) in pigs produced under intensive commercial conditions. On the other hand, average losses of electronic ear tags on farm A (1.9%) were greater than those of Teixidor et al. (1995), Stärk et al. (1998), and Huiskes et al. (2000), and similar to those found by Caja et al. (2005) and Babot et al. (2006). Average electronic failures were lower (\(P < 0.05\)) in FDX than in HDX ear tags (20.6 vs. 3.6%).

Regarding performance of i.p. transponders during the growing-fattening period and for the remainder of the study, readability was lower than results obtained previously (Caja et al., 2005; Babot et al., 2006), using the same transponders injected in the same area in intensive production white breed pigs. These differences could be explained by the larger size of Iberian pigs and the structure of their skin with thicker subcutaneous fat depots than those of intensive production white breed pigs. These characteristics should be considered as the i.p. transponders might be situated at a depth (20 to 25 cm from the skin surface), which is close to the maximum reading distance of some handheld transceivers. This fact may have contributed to difficulties in reading and recovering i.p. transponders. Moreover, the lower (\(P < 0.05\)) readability of FDX i.p. transponders compared with HDX (68.7 vs. 92.0%), could be explained by a transceiver failure on FDX reading.

**Performance of Identification Devices During Transportation and Slaughter**

No significant differences were observed between the identification devices during transportation (Table 3), although journey distance was longer in pigs from farm A. Only 1.4% of conventional ear tags from farm B were lost during transport. These results are similar to results reported by Caja et al. (2005) and Babot et al. (2006) for transported pigs weighing approximately 100 kg.

At slaughter, losses, failures, and readability did not differ (\(P > 0.05\)) between abattoirs for any of the studied identification devices. Losses of conventional (average
Table 3. Performance of various identification devices during transportation and slaughter in Iberian pigs

<table>
<thead>
<tr>
<th>Item</th>
<th>Visual ear tags&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Electronic ear tags&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Intraperitoneal transponders&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Abattoir A</td>
<td>Abattoir B</td>
<td>Abattoir A</td>
</tr>
<tr>
<td>Initial devices, n</td>
<td>155</td>
<td>141</td>
<td>64</td>
</tr>
<tr>
<td>Transportation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Losses, % (n)</td>
<td>0 (0)</td>
<td>1.4 (2)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Failures, % (n)</td>
<td>—</td>
<td>—</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Readability, % (n)</td>
<td>100 (155)</td>
<td>98.6 (139)</td>
<td>100 (64)</td>
</tr>
<tr>
<td>Slaughter</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Losses, % (n)</td>
<td>3.2 (5)</td>
<td>2.9 (4)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Failures, % (n)</td>
<td>—</td>
<td>—</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Readability, % (n)</td>
<td>96.8 (150)</td>
<td>97.1 (135)</td>
<td>100 (64)</td>
</tr>
<tr>
<td>Transport and slaughter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Losses, % (n)</td>
<td>3.2 (5)</td>
<td>4.3 (6)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Failures, % (n)</td>
<td>—</td>
<td>—</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Readability, % (n)</td>
<td>96.8 (150)</td>
<td>95.7 (135)</td>
<td>100 (64)</td>
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<tr>
<td>From farm to slaughter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial devices, (n)</td>
<td>155</td>
<td>196</td>
<td>77</td>
</tr>
<tr>
<td>Losses, % (n)</td>
<td>3.2 (5)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>31.1 (61)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0 (0)&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Failures, % (n)</td>
<td>—</td>
<td>—</td>
<td>16.9 (13)&lt;sup&gt;bc&lt;/sup&gt;</td>
</tr>
<tr>
<td>Readability, % (n)</td>
<td>96.8 (150)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>68.9 (135)&lt;sup&gt;d&lt;/sup&gt;</td>
<td>83.1 (64)&lt;sup&gt;bc&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> Within a row, means without a common superscript differ, P < 0.05.
<sup>1</sup>Azasa-Allflex, Madrid, Spain.
<sup>2</sup>Intraperitoneal transponder failures include all nonread transponders, as differentiation between transponders lost and reading failure was not possible.
<sup>3</sup>Rumitag, Esplugues de Llobregat, Barcelona, Spain.
<sup>4</sup>Sokymat, Granges, Switzerland.
<sup>5</sup>Readability = [(transponders read/transponders applied) × 100].

The performance of various identification devices during transportation and slaughter in Iberian pigs was assessed through a study that compared visual, electronic ear tags, and intraperitoneal transponders. The study concluded that visual and electronic ear tags did not affect the health and normal growth of animals, and that tattoos should not be used as an identification procedure in extensively produced Iberian pigs. Intraperitoneal transponders were found adhered to the omentum between the stomach and the spleen. A tendency toward greater levels of transponder adherence in pigs with less abdominal fat was suggested by Hernández-Jover (2006), and the lack of adherence found in the current study could be due to the high proportion of fat depots in Iberian pigs compared with intensive production white breeds.

For the overall study including on-farm and slaughter period, there is a clear effect of farm due to the fence type and the anatomical characteristics of the Iberian pig on device performance, with reading ability of the transceiver being limited for some of the technologies used and specific situations.

From the traceability point of view, tattoos should not be used as an identification procedure in extensively produced Iberian pigs. Visual, e-ID ear tags, and i.p. transponders neither affected health nor normal growth of animals. A strong farm effect was observed on losses and readability of ear tags, independently from the identifying device. High ear tag loss was obtained on the farm with barbed-wire fences, which should be avoided if good traceability results are to be obtained. On the other hand, losses and failures were reduced during transport and slaughter. Results of injectable transponders during the growing-fattening period were variable, although greater readability was observed with HDX transponders. However, the body size and skin characteristics of the Iberian breed might limit the performance of reading devices. Transceivers with greater reading distance are recommended. The main problem observed with i.p. transponders was their...
low recovery rate at the slaughter due to the lack of adherence of the transponders to the omentum. Once those problems are overcome, injectable transponders may become a valuable tool to ensure good traceability in this type of production system.

LITERATURE CITED


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