E A A P 2013

64th Annual Meeting of European Federation of Animal Science

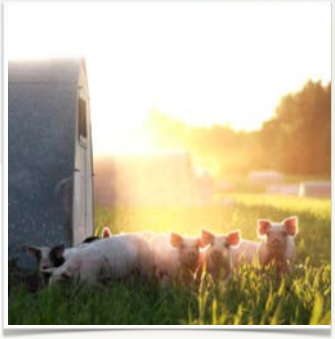
26th – 30th August, Nantes, France

On-field and laboratory performances of electronic ear tags used for tracing pigs from farm to carcass

Grassi, P.[1], Caja, G.[1], Mocket, J.H.[1], Xuriguera, H.[2], González-Martin, S.[2], Soler, J.[3], Gispert, M.[3] y Tibau, J.[3]

[1]Ciència Animal i dels Aliments, Universitat Autònoma de Barcelona, Bellaterra, Barcelona, Spain.
[2]DIOPMA, Universitat de Barcelona, Barcelona, Spain.
[3]Institut de Recerca i Tecnología Agroalimentàries, Monells, Girona, Spain.

Regulations on pig ID



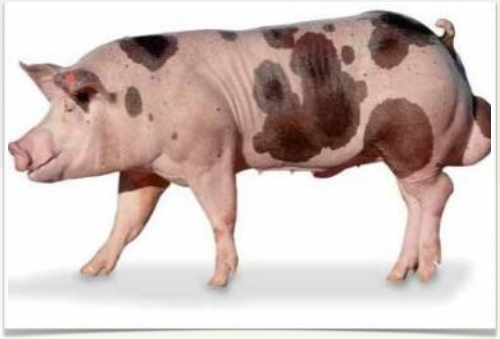
Traceability on **groups** of animals

Directive **92/102/CEE**

Farm ID

Tattoo

Ear tag



Spanish RD **205/1996**

Farm ID

Tattoo

Ear tag

Spanish RD **360/2009**

Individual identification

Aujeszky

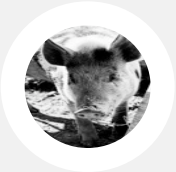
Objectives

To study the:

- **On-farm, transportation** and **slaughterhouse performances** of 3 types of commercial RFID ear tags of different technologies (FDX-B and HDX) in 3 experiments (under commercial and experimental conditions).

- **Traceability** (live pigs, slaughterhouse and overall) using the 3 RFID ear tag types in 3 experiments (under commercial and experimental conditions).

- **Technical features** and **electronic performances** of the 3 ear tag types under **laboratory** conditions using different commercial **transceivers** (6).



Materials & Methods

Detail of the experiments

Item	Exp.1	Exp.2	Exp.3		
Ear tag type	EF1	EH	EF1	EF2	EH
Technology	FDX-B	HDX	FDX-B	FDX-B	HDX
On-farm	Comm.	Exp.		Commercial	
No.	1	1		1	
Applied	Birth	Weaning		Weaning	
Slaughterhouse	Comm. (1)	Exp. (1)		Comm. (3)	
Body weight	100 kg (170 ± 5 d)				

EF1: Model Combi E23, OS ID, Østerdalen, Norway (2.6 g, 23.2 ×12.2 mm)

EF2: Model EI3002ID, Felixcan, Albacete, Spain (4.2 g, 27.9 ×13.5 mm)

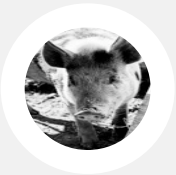
EH: HDX; model HP, Allflex Europe, Vitré, France (4.4 g, 27.3 ×12.5 mm)

Materials & Methods

Management - Transceivers

Item	Exp. 1 and 2	Exp.3
ISO Hand-held transceiver	Psion Workabout Pro 3[1]	Gesreader Smart[2]
Reading conditions	Static (from birth/weaning to carcass)	

[1]Psion España, Barcelona, Spain
[2]Rumitag, Barcelona, Spain

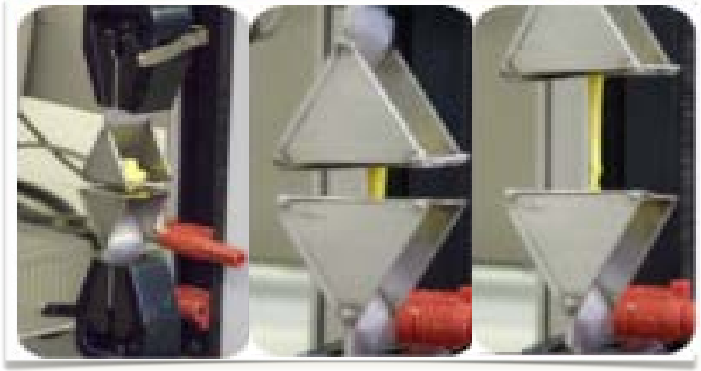


Materials & Methods

Laboratory conditions

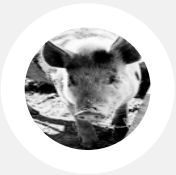
Features:

- **Physical characteristics**
- **Separation strength** (PCM Mecmesin; DIOPMA, Universitat de Barcelona, Barcelona, Spain)



Mapping and static reading distances with **6** types of hand-held transceivers (Faraday room, UAB) in favorable (0º) or unfavorable (90º) antenna orientation:

- **Gesreader Smart** (Rumitag)
- **Gesreader GES2S** (Rumitag)
- **iMax Plus** (Datamars, Bedano, Switzerland)
- **Mini Max** only reading full-duplex B technology (Datamars, non ISO)
- **Psion Teklogix Workabout Pro 3** (Psion España)
- **Felixcan Universal 2** (Felixcan)

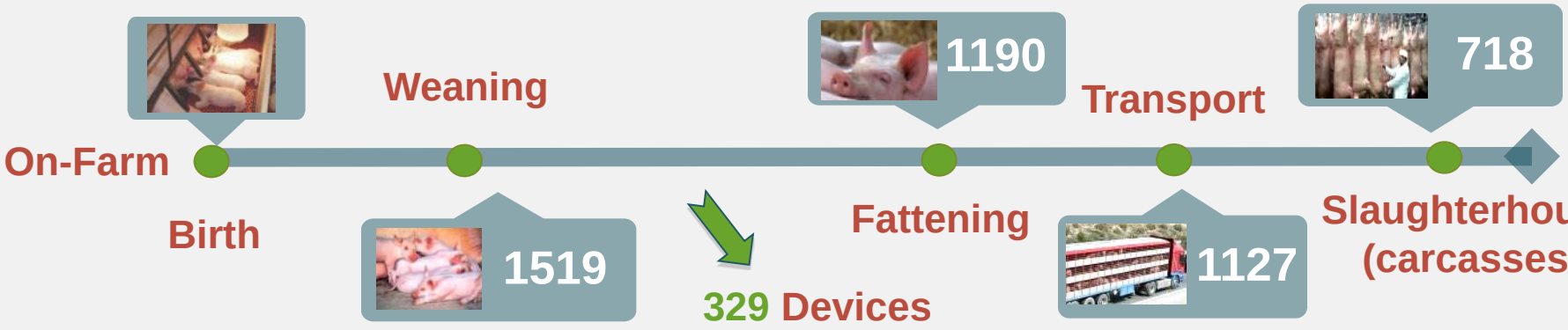


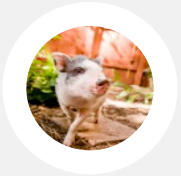
Materials & Methods

Management - Animals

Item	Exp.1	Exp.2	Exp.3*		
	EF1	EH	EF1	EF2	EH
On-Farm					
Birth	1033	-		-	
Weaned	933	133	151	140	162
Fattened	719	131	119	107	114
Transported	674	129	113	99	112
Slaughterhouse					
Initial	654	129	107	94	110
Traceable carcasses	378	128	68	60	84

* Devices



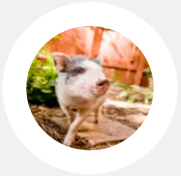


Results & Discussion

On-Farm performances

Item	Exp.1	Exp.2	Exp.3		
	EF1	EH	EF1	EF2	EH
On-Farm					
Monitored, No. [1]	719	131	119	107	114
Electronically failed, %	–	–	**5.0**	**5.6**	**0.9**
Lost, %	**6.3**	**1.5**	**0.0**	**1.9**	**0.9**
Readables, No. [2]	674	129	113	99	112
Traceability [2/1], %	**93.7^{a}**	**98.5^{b}**	**95.0^{ab}**	**92.5^{a}**	**98.2^{b}**

$^{a,b,...d}$ Mean values in the same row with a different superscript are different ($P < 0.05$).

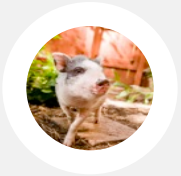


Results & Discussion

On-Farm performances

Item	Exp.1 EF1	Exp.2 EH	Exp.3 EF1	Exp.3 EF2	Exp.3 EH
On-Farm					
Monitored, No. [1]	719	131	119	107	114
Electronically failed, %	–	–	**5.0**	**5.6**	**0.9**
Lost, %	**6.3**	**1.5**	**0.0**	**1.9**	**0.9**
Readables, No. [2]	674	129	113	99	112
Traceability [2/1], %	**93.7^{a}**	**98.5^{b}**	**95.0^{ab}**	**92.5^{a}**	**98.2^{b}**
Transportation					
Initial, No. [3]	674	129	113	99	112
Electronically failed, %	–	–	**3.5**	**3.0**	**0.9**
Lost, %	**3.0**	**0**	**1.8**	**2.0**	**0.9**
Readables, No. [4]	654	129	107	94	110
Traceability [4/3], %	**97.0^{a}**	**100^{b}**	**94.7^{a}**	**94.9^{a}**	**98.2^{a}**

$^{a,b,\ldots d}$ Mean values in the same row with a different superscript are different ($P < 0.05$).

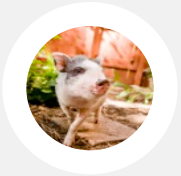


Results & Discussion

On-Farm performances

Item	Exp.1 EF1	Exp.2 EH	Exp.3 EF1	Exp.3 EF2	Exp.3 EH
On-Farm					
Monitored, No. [1]	719	131	119	107	114
Electronically failed, %	–	–	**5.0**	**5.6**	**0.9**
Lost, %	**6.3**	**1.5**	**0.0**	**1.9**	**0.9**
Readables, No. [2]	674	129	113	99	112
Traceability [2/1], %	**93.7^{a}**	**98.5^{b}**	**95.0^{ab}**	**92.5^{a}**	**98.2^{b}**
Transportation					
Initial, No. [3]	674	129	113	99	112
Electronically failed, %	–	–	**3.5**	**3.0**	**0.9**
Lost, %	**3.0**	**0**	**1.8**	**2.0**	**0.9**
Readables, No. [4]	654	129	107	94	110
Traceability [4/3], %	**97.0^{a}**	**100^{b}**	**94.7^{a}**	**94.9^{a}**	**98.2^{a}**
Live pig traceability [4/1],%	**91.0^{ac}**	**98.5^{b}**	**89.9^{ac}**	**87.9^{c}**	**96.5^{ab}**

$^{a,b,\ldots d}$ Mean values in the same row with a different superscript are different ($P < 0.05$).

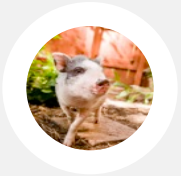


Results & Discussion

Slaughterhouse & Overall traceability

Item	Exp.1 EF1	Exp.2 EH	Exp.3 EF1	Exp.3 EF2	Exp.3 EH
Slaughterhouse					
Initial, No.	654	129	107	94	110
Not recorded, %	0.5	0	0.1	0.2	0.2
Recorded [1], No.	651	129	95	74	88
Electronically failed, %	•	•	**6.3**	**5.4**	**0**
Lost, %	**41.9**	**0.8**	**22.1**	**13.5**	**4.5**
Readables, No. [2]	378	128	68	60	84
Traceability [2/1], %	**58.1^{a}**	**99.2^{c}**	**71.6^{b}**	**81.1^{b}**	**95.5^{c}**

$^{a,b,\ldots d}$ Mean values in the same row with a different superscript are different ($P < 0.05$).

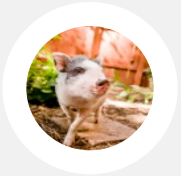


Results & Discussion

Slaughterhouse & Overall traceability

Item	Exp.1 EF1	Exp.2 EH	Exp.3 EF1	Exp.3 EF2	Exp.3 EH
Slaughterhouse					
Initial, No.	654	129	107	94	110
Not recorded, %	0.5	0	0.1	0.2	0.2
Recorded [1], No.	651	129	95	74	88
Electronically failed, %	•	•	**6.3**	**5.4**	**0**
Lost, %	**41.9**	**0.8**	**22.1**	**13.5**	**4.5**
Readables, No. [2]	378	128	68	60	84
Traceability [2/1], %	**58.1^{a}**	**99.2^{c}**	**71.6^{b}**	**81.1^{b}**	**95.5^{c}**
Overall, %	**52.8^{a}**	**97.7^{d}**	**64.4^{ab}**	**71.2^{b}**	**92.1^{c}**

$^{a,b,\ldots d}$ Mean values in the same row with a different superscript are different ($P < 0.05$).



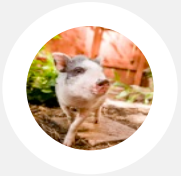
Results & Discussion

RFID ear tag features measured under laboratory conditions

Item	Exp.1	Exp.2	Exp.3		
	EF1	EH	EF1	EF2	EH
Technology	FDX-B	HDX	FDX-B	FDX-B	HDX
Devices, No.	10	10	10	10	10
Weight, g	2.6 ± 0.1^{a}	4.5 ± 0.1^{c}	2.6 ± 0.1^{a}	4.2 ± 0.1^{b}	4.4 ± 0.1^{c}
Height, mm	12.2 ± 0.1^{a}	12.2 ± 0.1^{a}	12.2 ± 0.1^{a}	13.5 ± 0.1^{c}	12.5 ± 0.1^{b}
Diameter, mm	23.2 ± 0.1^{a}	27.1 ± 0.1^{b}	23.3 ± 0.1^{a}	27.9 ± 0.1^{d}	27.3 ± 0.1^{c}
Separation strength, N	274 ± 6^{a}	279 ± 2^{a}	307 ± 6^{c}	292 ± 4^{b}	317 ± 4^{c}

ICAR (2011) > 280 N

$^{a,b,...d}$ Mean values in the same row with a different superscript are different ($P < 0.05$).

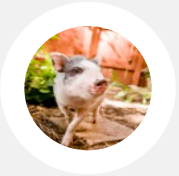


Results & Discussion

RFID ear tag reading distances (cm) under laboratory conditions

Item	EF1 (Exp.1)	EF1 (Exp.3)	EF2 (Exp.3)	EH (Exp.2)	EH (Exp.3)
iMax Plus					
Favorable	20.7 ± 0.1^{am}	20.5 ± 0.3^{am}	23.8 ± 0.2^{bl}	26.4 ± 0.2^{ck}	27.3 ± 0.2^{cl}
Unfavorable	5.0 ± 0.3^{aj}	4.7 ± 0.4^{aj}	6.6 ± 0.2^{ajl}	14.4 ± 0.4^{cm}	8.4 ± 0.3^{bj}
Gesreader Smart					
Favorable	20.8 ± 0.1^{am}	22.2 ± 0.2^{an}	24.1 ± 0.1^{bl}	27.6 ± 0.4^{cl}	27.3 ± 0.2^{cl}
Unfavorable	6.0 ± 0.2^{ak}	5.2 ± 0.3^{aj}	7.0 ± 0.5^{bkl}	9.2 ± 0.6^{ck}	8.9 ± 0.3^{cj}
Gesreader Ges2S					
Favorable	17.2 ± 0.2^{al}	16.2 ± 0.7^{al}	19.3 ± 0.1^{bk}	26.5 ± 0.2^{dk}	25.2 ±0.3^{ck}
Unfavorable	5.5 ± 0.6^{ajk}	5.4 ± 0.6^{aj}	5.0 ± 0.3^{aj}	10.8 ± 0.4^{cl}	8.0 ± 0.5^{bj}
Mini Max					
Favorable	9.4 ± 0.4^{aj}	10.3 ± 0.1^{aj}	10.7 ± 0.2^{aj}	n.r.	n.r
Unfavorable	**4.4 ± 0.6^{aj}**	5.0 ± 0.3^{aj}	5.8 ± 0.4^{ajk}	n.r.	n.r.
Psion Workabout Pro 3					
Favorable	15.0 ± 0.3^{ak}	14.3 ± 1.1^{ak}	17.8 ± 0.1^{bk}	19.5 ± 0.3^{cj}	18.8 ± 0.2^{bj}
Unfavorable	5.8 ± 0.2^{ak}	6.5 ± 0.5^{ak}	7.5 ± 0.2^{bkl}	7.7 ± 0.3^{bj}	8.8 ± 0.2^{bj}
Felixcan Universal 2					
Favorable	22.2 ± 0.2^{am}	21.8 ± 0.1^{am}	24.8 ± 0.2^{bl}	**34.3 ± 0.3^{cm}**	33.3± 0.2^{cm}
Unfavorable	6.4 ± 0.6^{ak}	5.7 ± 0.4^{aj}	6.3 ± 0.3^{akl}	12.8 ± 1.1^{cm}	8.5 ± 0.6^{bj}

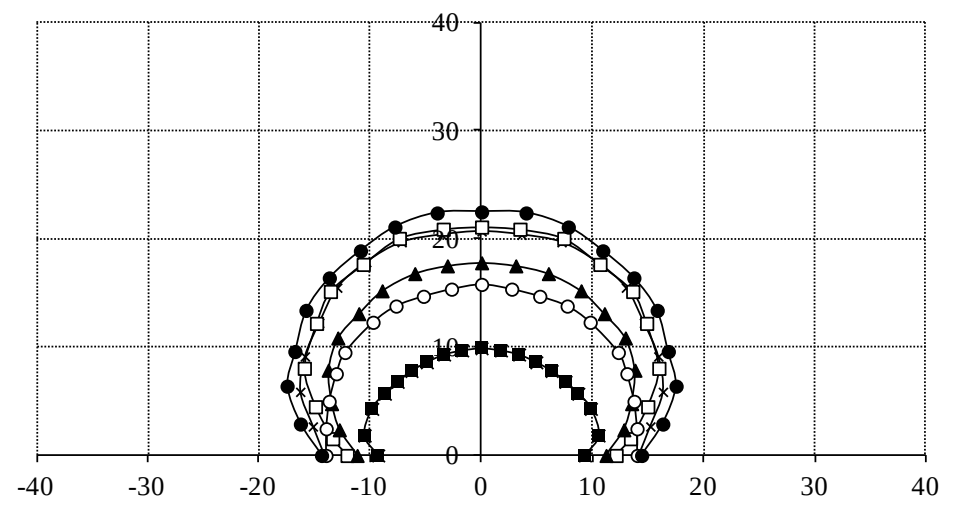
$^{a,b,\ldots d}$ Mean values in the same row with a different superscript are different ($P < 0.05$); ^{y,z} Mean values in the same row with a different superscript tended to be different ($P < 0.10$).



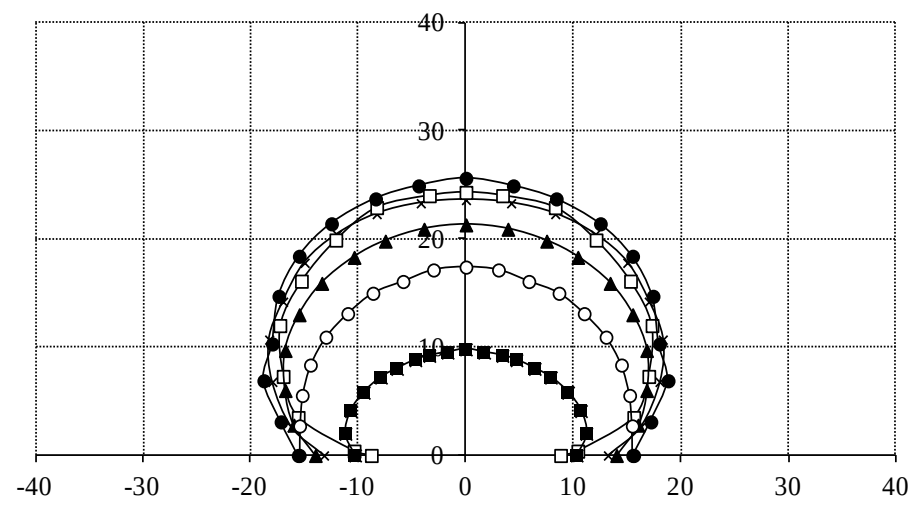
Results & Discussion

RFID ear tag performances under laboratory conditions

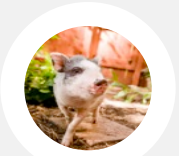
×, iMax Plus; ■, Mini Max; □, Gesreader Smart; ▲, Gesreader GES2S; ○, Psion Workabout Pro 3; ●, **Felixcan Univ. 2**



EF1



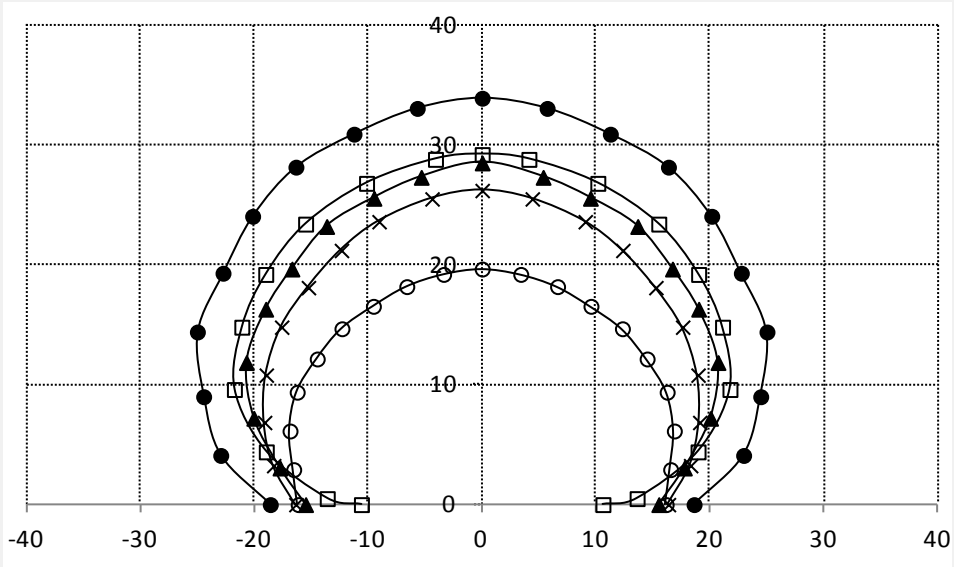
EF2



Results & Discussion

RFID ear tag performances under laboratory conditions

×, iMax Plus; ■, Mini Max; □, Gesreader Smart; ▲, Gesreader GES2S; ○, Psion Workabout Pro 3; ●, **Felixcan Univ. 2**



EH

Conclusions

1. **Overall traceability** results from farm to carcass release, under commercial and experimental conditions, showed a large variation: **53 to 98%**.

2. The most important cause for **losing** the **traceability** from farm to carcass release was **RFID losses (2.3 to 48.2%)**.

3. **Electronic failure** was identified as the most important cause **(1.8 to 8.6%)** for **losing** the **traceability** during on-farm and transportation period.

4. **Separation strength** of the ear tag pieces, identified as a key point responsible for ear tag **losses**. Ear tag type results depended on their **design** and **manufacturer**.

5. Performances of **full-duplex B** transponders were **lower** than those of half-duplex under the same conditions for all types of transceivers used. An important transponder × transceiver **interaction** was evident.

6. The **half-duplex ear tags** were more **effective** than full-duplex B ear tags for ensuring the whole traceability of pigs under commercial conditions.

THANK YOU

Merci beaucoup
Muchas gracias