eID + DNA +RACING

QLK1-2001-02229

Using EID+DNA traceability for tracing pigs under commercial farm conditions

Hernández-Jover M, Caja G, Ghirardi J.J, Reixach, J.[3] and Sánchez A

Marta Hernández-Jover
Farm Animal and Veterinary Public Health
University of Sydney

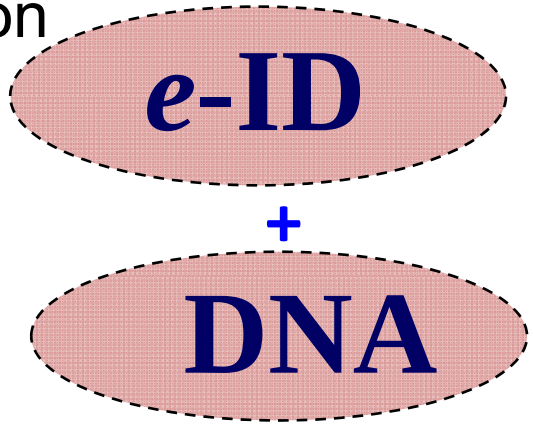
Universitat Autònoma de Barcelona

GRUP BATALLÉ

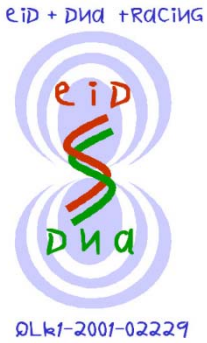
University of Sydney

Animal and animal product traceability

- Property identification and register
- Animal identification: Individual and tamperproof
- Record of movements and documentation
- Data storage & real time data usage
- Data verification process



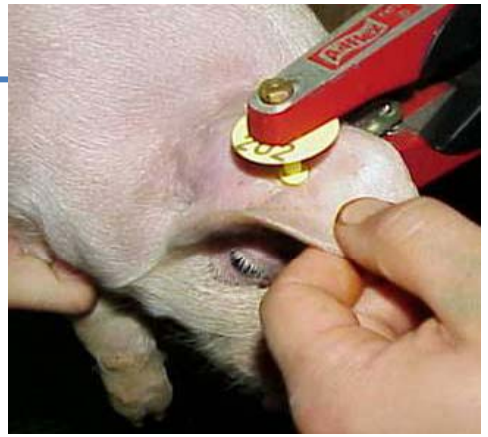
- Disease surveillance - Control and eradicate disease
- Safeguard public and animal health
- Ensure market access
- Implement quality assurance systems
- Public demand (food born diseases)



Identification systems for swine

Traditional systems:

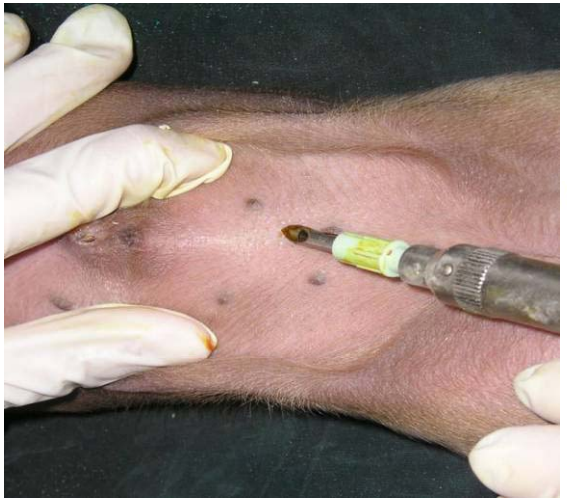
- Ear notches
- Tattoos
- Fire marks
- External devices (ear tags, collars...)



- High and very variable losses
- Low data capacity
- Mistakes in data recording & transmission
- Easy replacement and fraud

Electronic Identification used in pigs

- Collars: Automatic feeding systems
- Electronic ear tags *(Teixidor et al., 1995; Huiskes et al., 2000; Caja et al., 2005; Babot et al., 2006; Schembri et al., 2007)*
- Subcutaneous injectable transponders *(Lambooij 1992; Stärk et al., 1998; Caja et al., 2005, Babot et al., 2006)*
- Intraperitoneal injectable transponders *(Caja et al., 2005; Babot et al., 2006; Santamarina et al., 2007)*



EID Performances in pigs

Item (%)	Ear-tags		Injectables		
	Plastic	Electronic	Ear auricle	Ear base	Intraperitoneal
Piglets:					
Losses	1.7-15	1.6-8.8	0-35.5	0-9.1	0-1.5
Failures	-	0-5.6	-	-	0
Readability	85-98.3	85.6-98.4	64.5-100	91.1-100	98.5-100
Recovery	96.4	76.6-95.0	76-100	64-100	81.4
Sows:					
Losses	3.7	1.6-3.2			
Failures	-	0.4-1.6			
Readability	96.3	94.2-96.3			
Recovery	-	-			

ICAR:
Retention >98%
Recovery >99%

QLk1-2001-02229

Intraperitoneal transponder injection

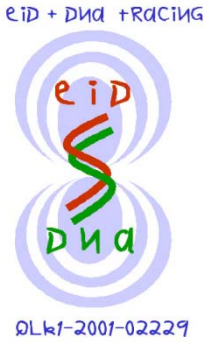
Comparison of conventional and electronic ID systems - *Caja et al., 2005*

On-farm performance of electronic devices - *Babot et al., 2006*

Slaughterhouse performance of electronic devices - *Santamarina et al., 2007*

Comparison of IP transponders and ear tags - *Marchi et al., 2007*

Welfare implications of ear notching, ear tagging & IP injection - *Leslie et al., 2009*



Objetives

Implementation and validation of a traceability system and quality monitoring using Electronic Identification (EID) and DNA analysis for pig production under commercial farm conditions:

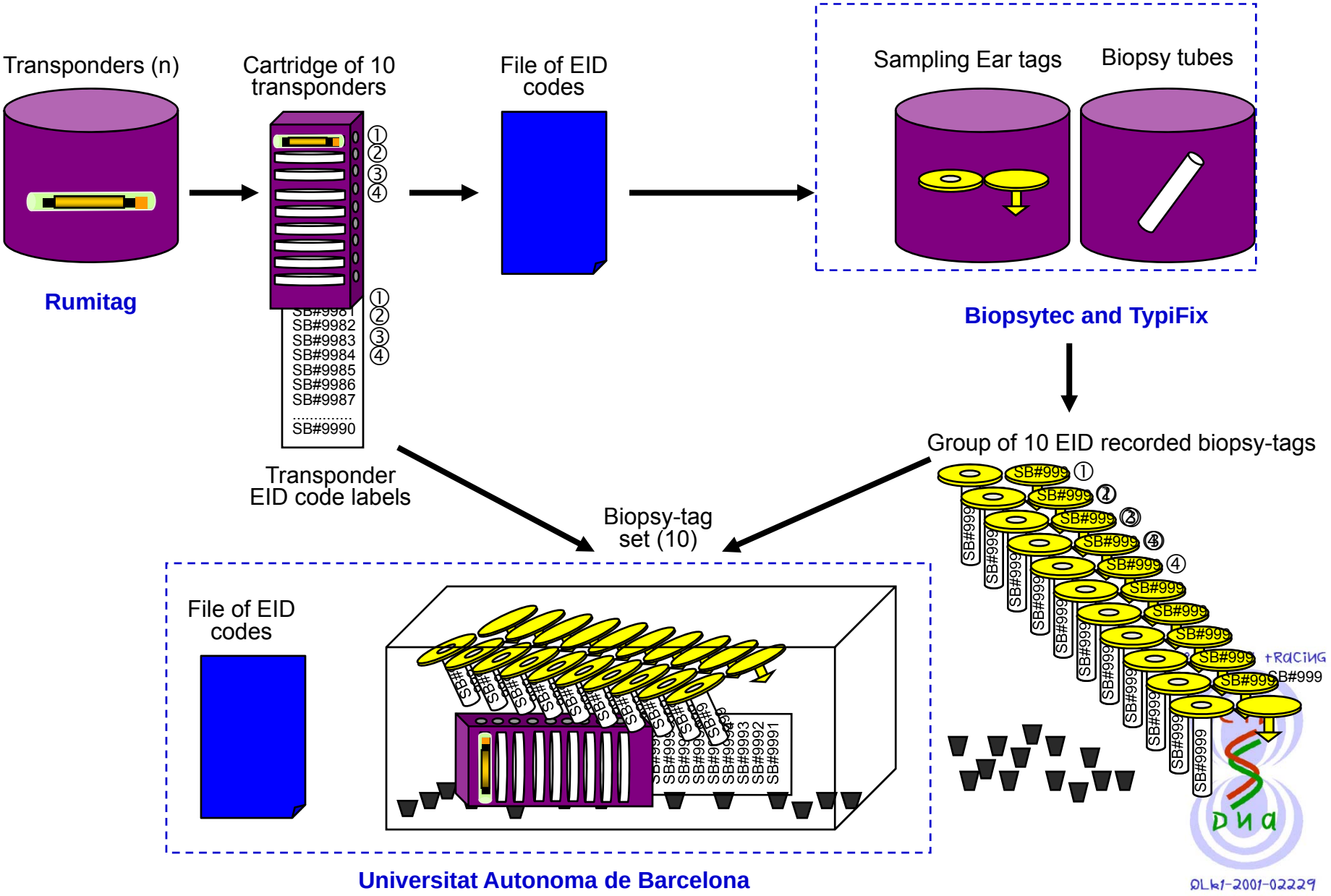
→ Implementation of the intraperitoneal injection

→ Validation using molecular markers

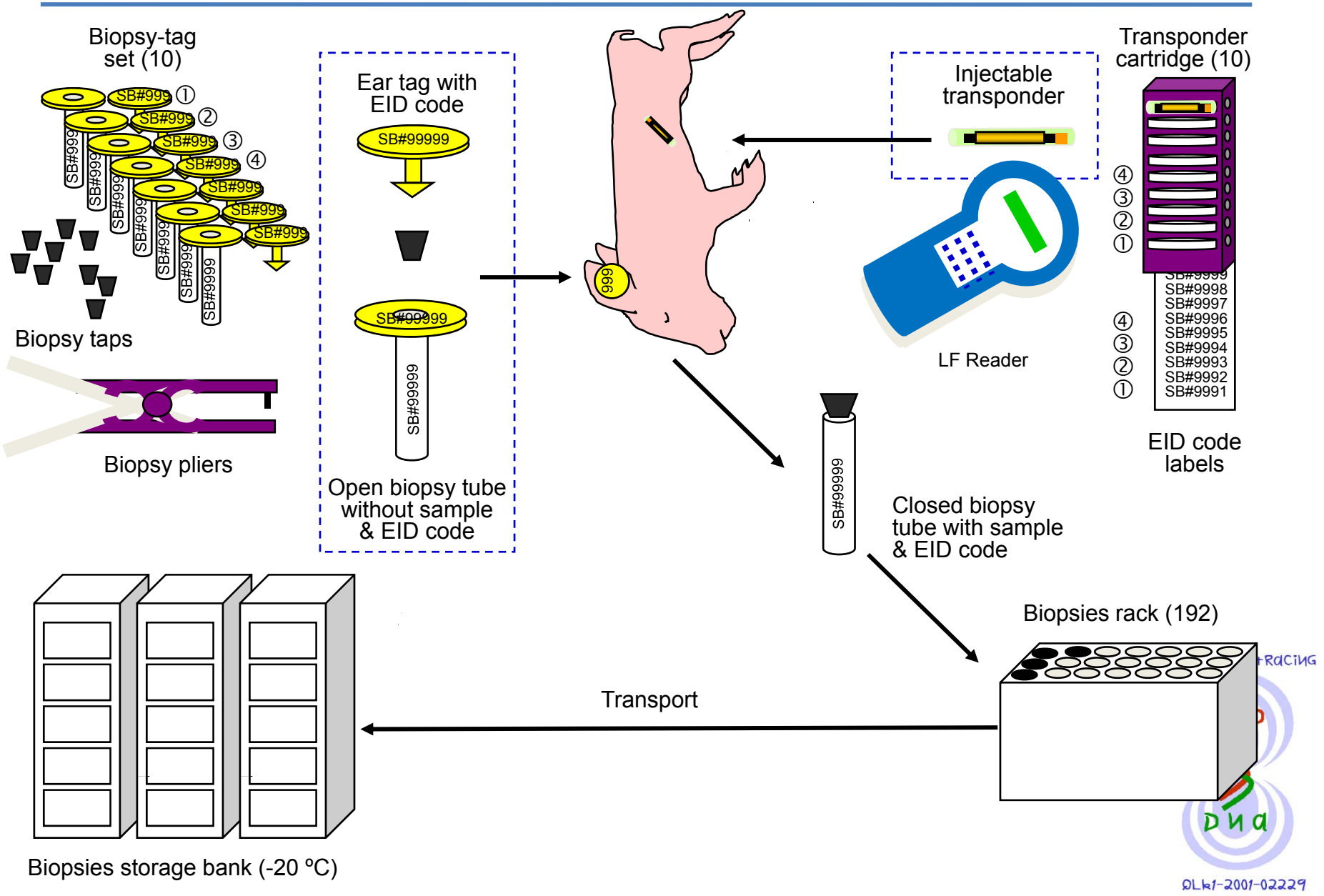
eID + DNA +RACING

QLK1-2001-02229

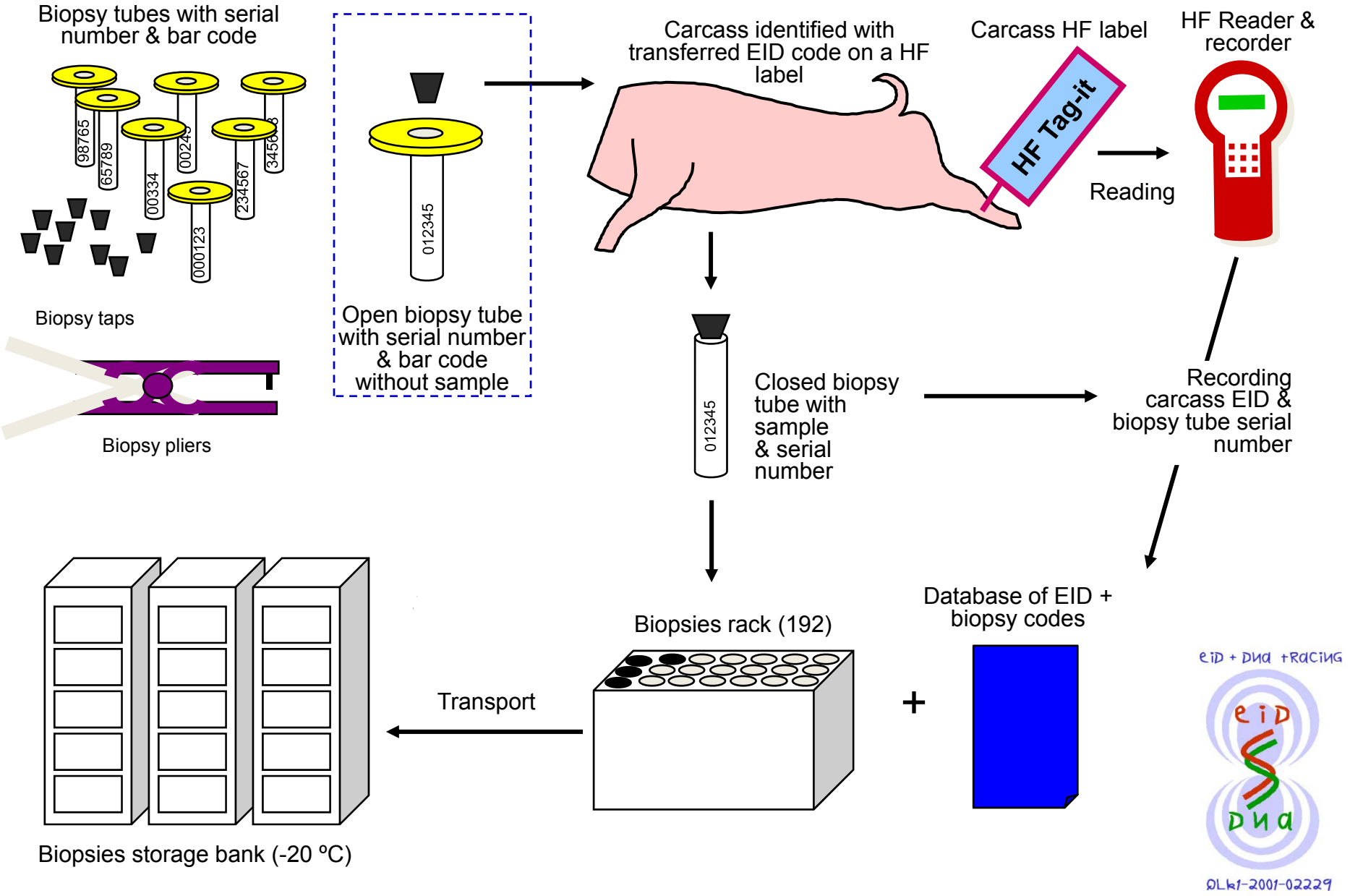
Implementation schema for pig tracing:
1) Coupling EID & biopsying devices



Implementation schema for pig tracing:
2) Identifying & biopsying piglets



Implementation schema for pig tracing:
3) Biopsying pig carcasses



Material and methods

Animals:

- → 2,108 male Duroc
- → Selección Batalle (Girona)
- → Identification at 9.5 ± 3 d old
- → Slaughter at 7 month old (120 kg BW)

Animal Identification:

- → HDX Injectable transponders (32 mm, Rumitag)
- → Intraperitoneal injection
- → Single use needles (23 × 4.6 mm)
- → Reading controls (d 0, 1; weaning; end of growing & fattening, abattoir)
- → Handheld reader (Ges2S, Rumitag)

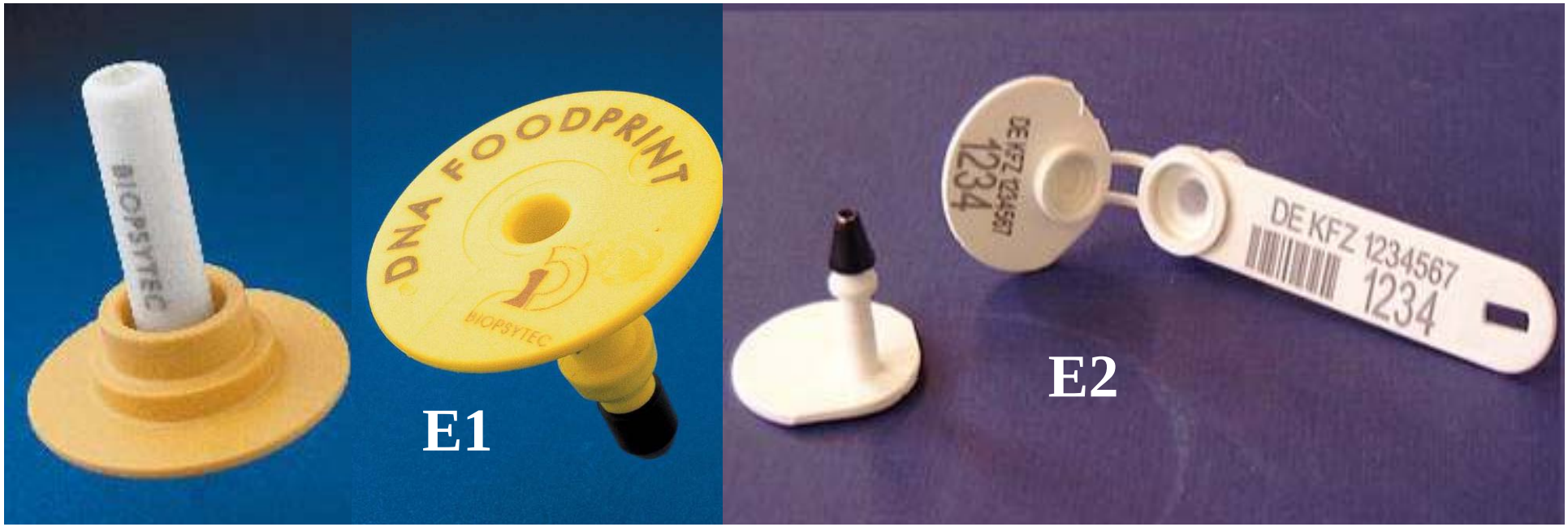
eID + DNA tRACING
eID DNA
QLK1-2001-02229

Material and methods

Biopsying ear tags:

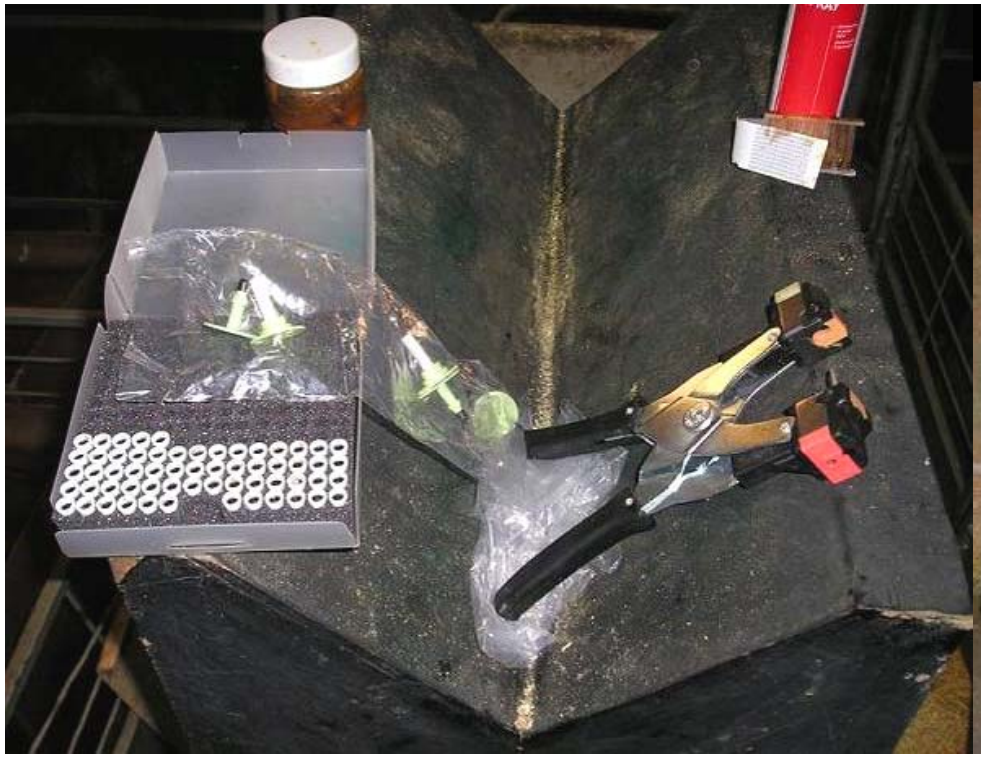
- → Biopsytec ear tags (E1*; Biopsytec Analytik und Logisttik, Germany*)
- → TypiFix ear tags (E2*; Agrobiogen, Germany*)

***Biopsytec*, n = 979** ***TypiFix*, n = 1129**



Biopsying ear tags and pliers

Biopsytec (E1)

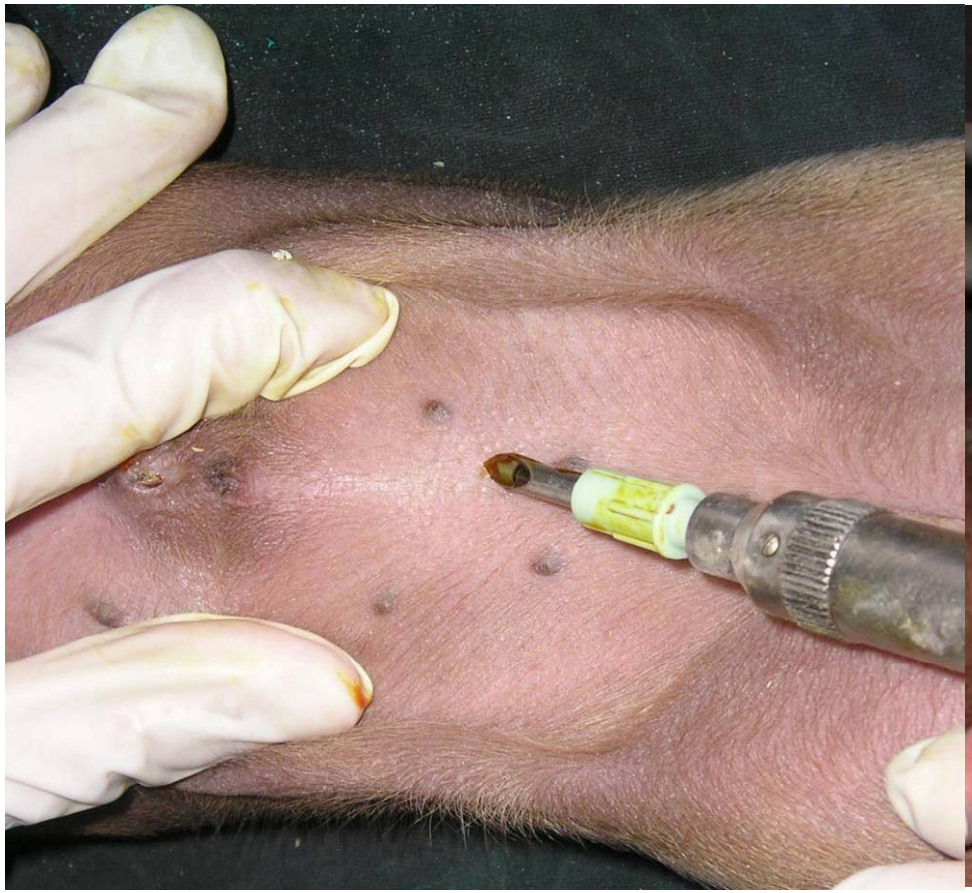


TypiFix (E2)

QLK1-2001-02229

Material and methods

Intraperioneal injection



Ear biopsy

Material and methods

e-ID transfer to the carcass:

→ HF 13.56 MHz labels: (*Tiris, Almelo, The Netherlands*)

Slaughter line equipment:

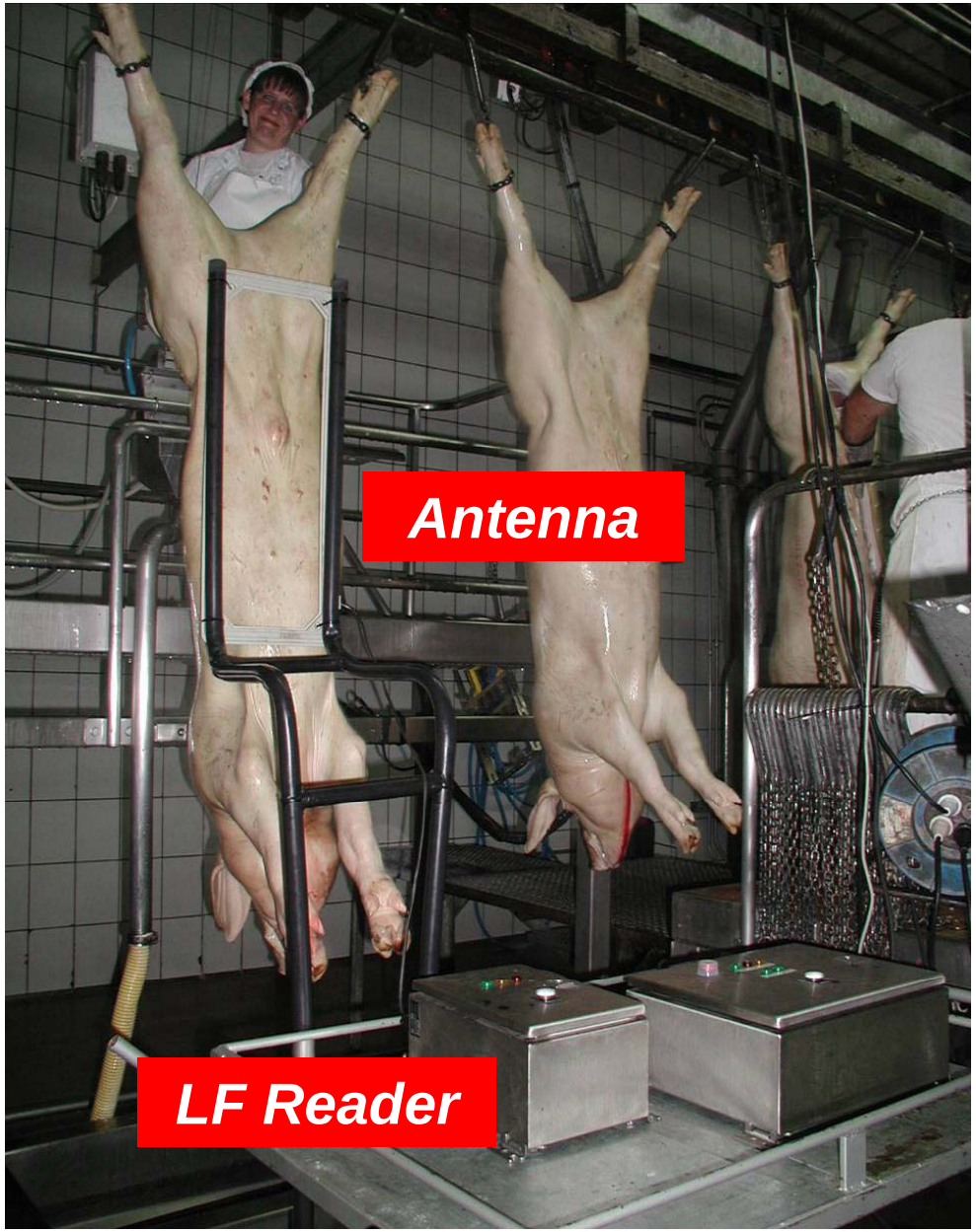
→ Low frequency reader (*F110, Rumitag*) → intraperitoneal transponder reading

→ Host equipment (Processor; *Host 1, Rumitag*)

→ High frequency reader *(S6350, Tiris)* → Recording of the high frequency labels with the intraperitoneal transponder code.

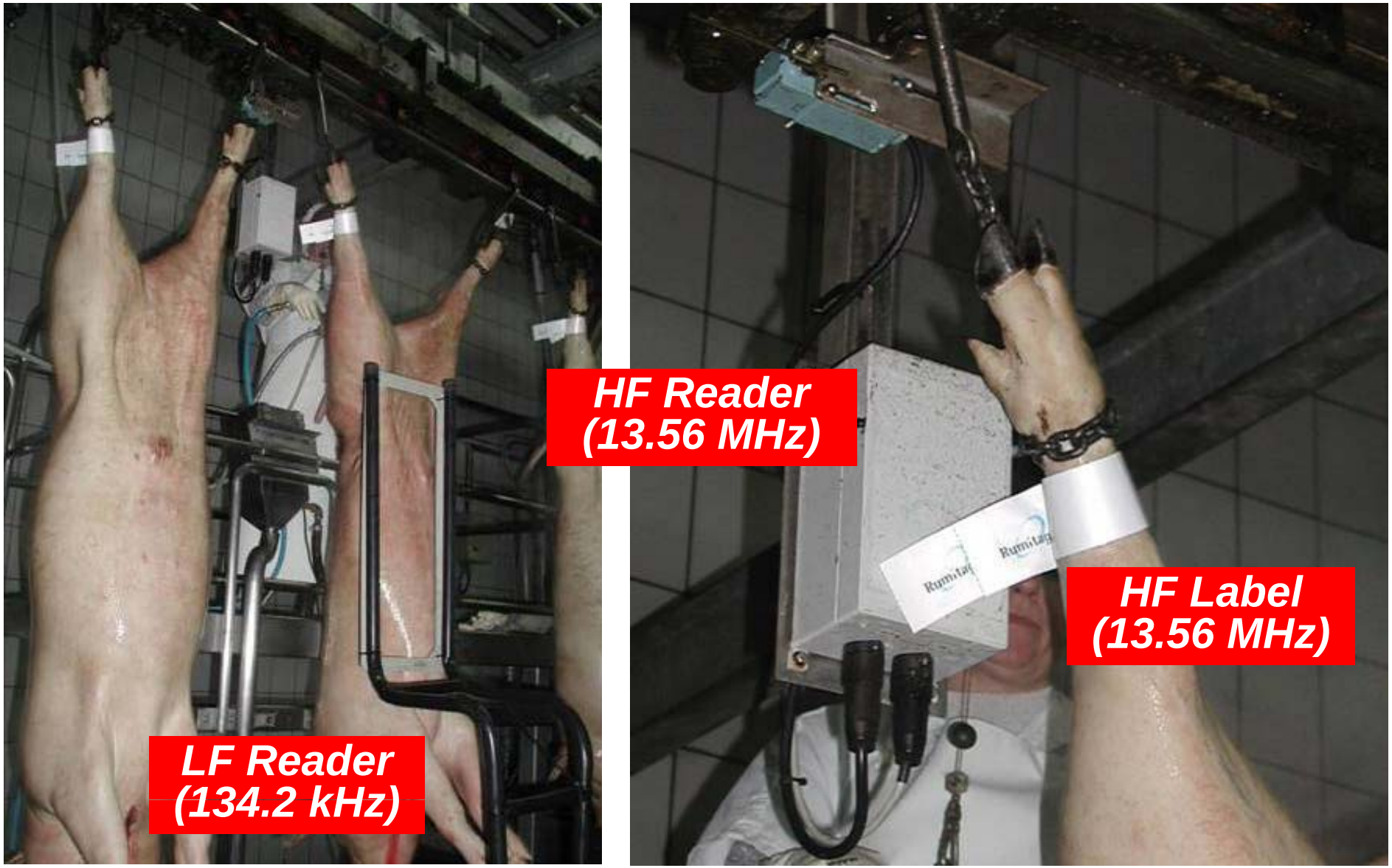
eID + DNA +RACING
QLK1-2001-02229

Intraperitoneal transponders reading



‘Norfrisa’ Slaughterhouse (550 pigs/h; Riudellots de la Selva, Girona)

e-ID transfer from the animal to the carcass



'Norfrisa' Slaughterhouse (550 pigs/h; Riudellots de la Selva, Girona)

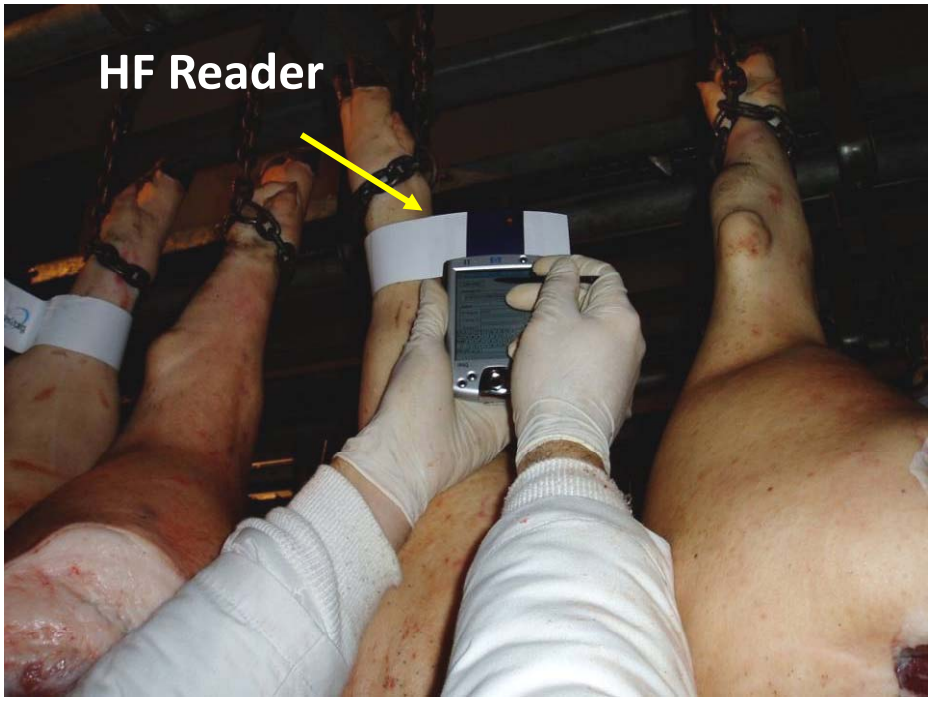
Material and methods

Sampling of carcasses:

- → Samples from 1,207 carcasses (Biopsytec)
- → HF reader connected to a pocket PC (*i-Paq, Hewlett Packard*): → reading of HF label and linking of carcass ID with biopsy code
- → Biopsy tubes stored at -18°C
- → Analysis of 5% of the samples for the e-ID system verification

eID + DNA tRACING
eID DNA
QLK1-2001-02229

Sampling of carcasses



Storage at -18ºC

Laboratory

eID + DNA +RACING

QLK1-2001-02229

Results: On-farm performance

Item, n (%)	Ear tags		Intraperitoneal	Pigs, n (%)
	E1	E2	IP	
On-farm				
Applied	979	1129	2108	2108 (100)
Mortality	122	130	252	252 (12.0)
Animals to trace	857	999	1856	1856 (88.0)
Losses	6 (0.7)	4 (0.4)	12 (0.6)	-
Traceability, %	99.3	99.6	99.4	-

Productive cycle: 217 ± 7 d

Mortality: Pre-weaning 1.1%; 'Wean to finish' 10.9%

Biopsy process was easier with TypiFix than with Biopsytec

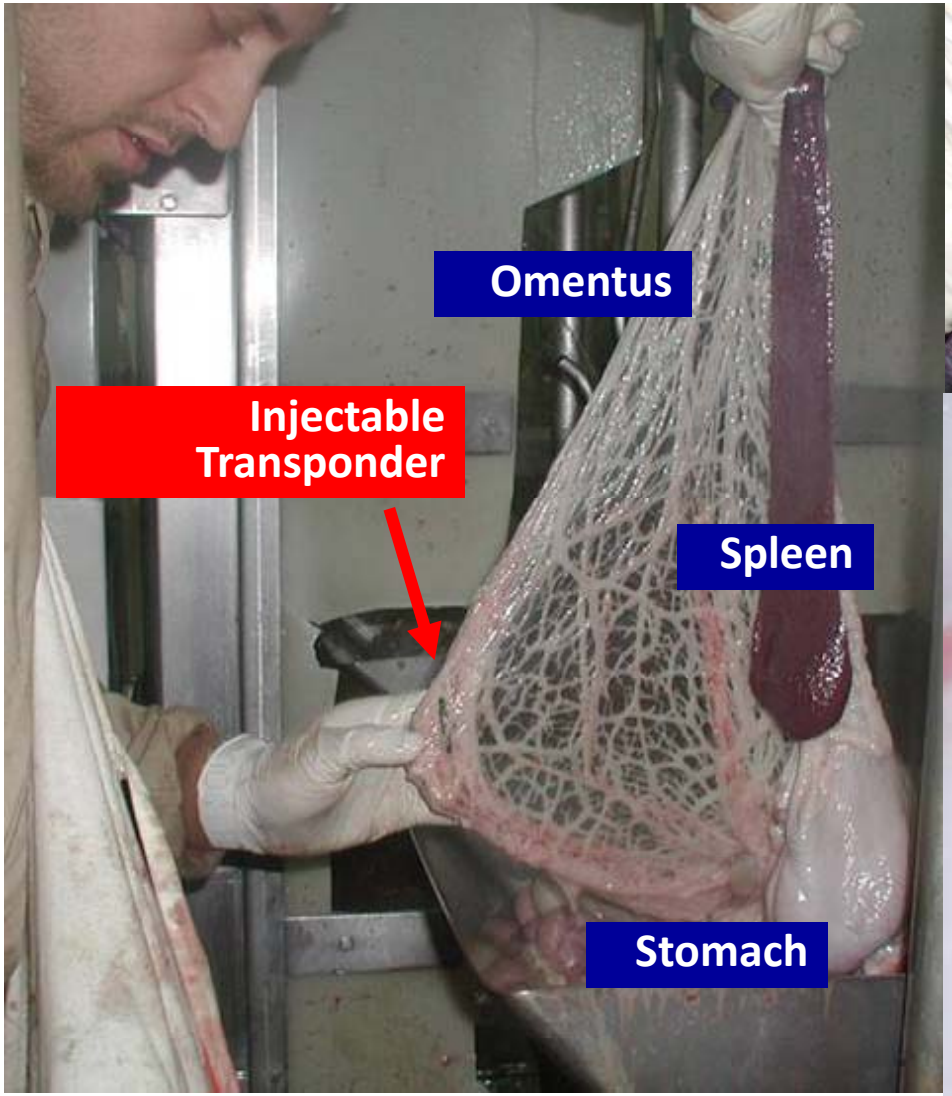
eID + DNA tRACING
eID DNA
QLK1-2001-02229

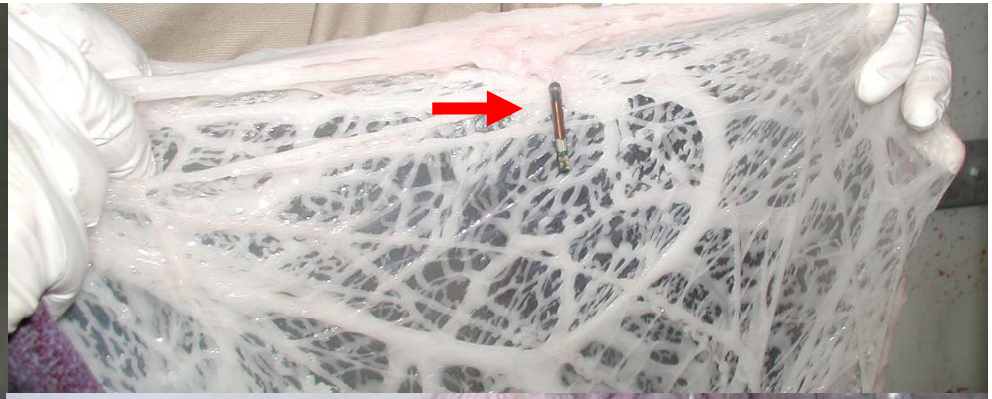
Results: Abattoir performance

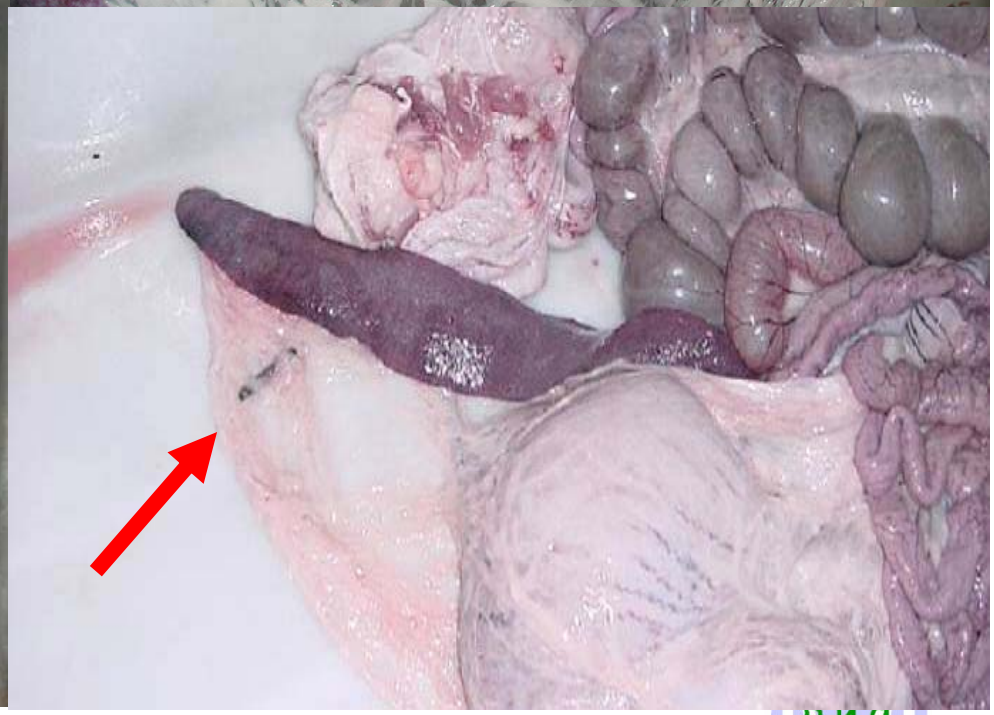
Item, n (%)	Ear tags		Intraperitoneal
	E1	E2	IP
Abattoir			
Identified	269*	117*	1844
Lost	95 (35.3)	44 (37.6)	472 (25.3)
Recovered	174 (64.7)	73 (62.4)	1376 (74.7)
Adhered	-	-	1159 (84.2)
Illegible	65 (37.4)	1 (1.4)	0
Traceable	109 (40.5)	72 (61.5)	

** Only a sample of ear tags was evaluated*

Results – Intraperitoneal transponders recovery







‘Norfrisa’ Slaughterhouse (550 pigs/h; Riudellots de la Selva, Girona)

QLK1-2001-02229

Results: e-ID transfer and DNA verification

Item, n (%)	Ear tags		Intraperitoneal	Pigs, n (%)
	E1	E2	IP	
Abattoir				
Slaughtered, n	856	999	1856	1856
Injectable retained, n	-	-	1844	1844
Labeled, n (%)	-	-	1570[1] (95.1)	1570 (95.1)
Non-recorded labels	-	-	81 (4.9)	81 (4.9)
Traceability, %	-	-	95.1	95.1
DNA audit				
Samples	1207			1207
Analyzed	100 (8.3)			100(8.3)
Incoherence	4 (4.0)			4 (4.0)
Compliance	96.0			96.0

[1] e-ID transfer results from the 1st day not included

Resistance test of the HF labels during the ham curing process (in salt for 12 d)

	n	%
HF Labels	79	
Losses	3	3.8
Recovered	76	96.2
Non-readable	1	1.3
Readability	75	94.9

QLK1-2001-02229

Conclusions

- Intraperitoneal transponders provide traceability > 99% from suckling period to slaughter
- Low ear tag visual readability and retention at the abattoir
- e-ID transfer from the animal to the carcass > 95% under high speed slaughter line
- Biopsying systems need to be better adapted for on-farm and abattoir conditions
- DNA analysis showed to be an efficient verification system
- Validation of the e-ID system using DNA analysis showed 4% matching incoherence

eID + DNA tRACING
eID
DNA
QLK1-2001-02229

Further needs

- Improve recovery of IP transponders
  - → Promote adherence of IP transponders
  - → Develop an automatic recovery system
- Improve e-ID transfer from the animal to the carcass:
  - → Automatic labeling of the carcass
  - → Enhanced HF label design
- Conduct a cost-benefit analysis to evaluate the implementation of the system for the pig industry

eID + DNA +RACING
eID DNA
QLK1-2001-02229

Thanks for your attention