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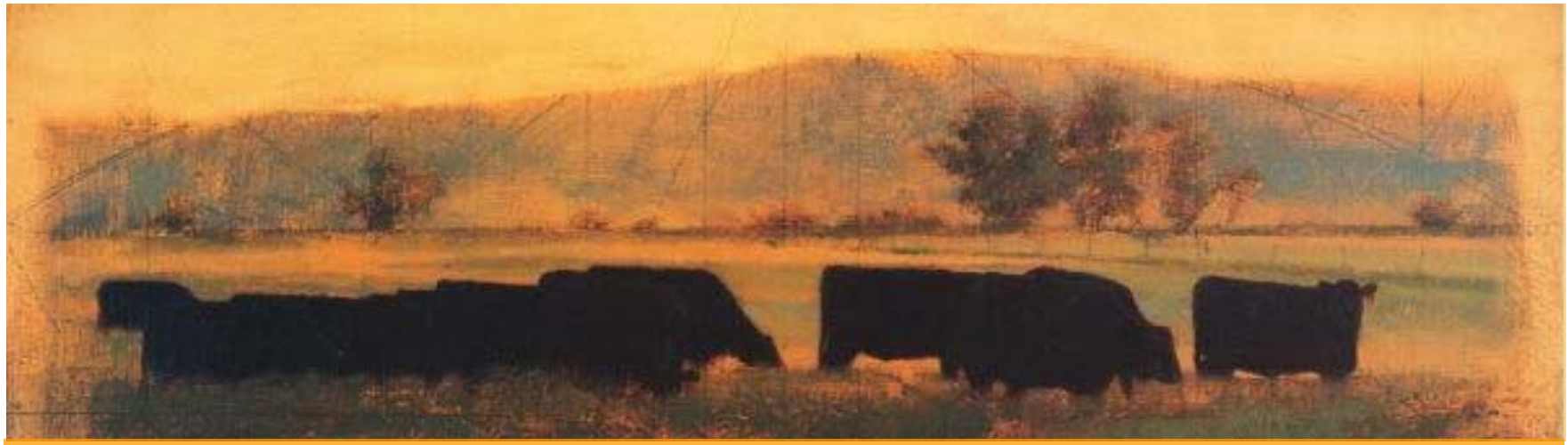
S15. Sustainable Animal Production: Productivity aspects related to milk & meat quality



Use of electronic identification and molecular markers for beef traceability from farm to retailer

(Abstract #1694)

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Traceability of lambs & calves using electronic identification (e-ID) & molecular markers (DNA): ‘e-ID+DNA’

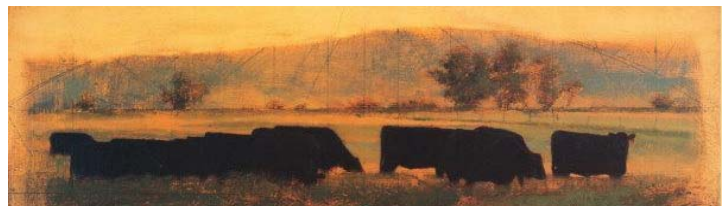
Outline:

- **Project UE FAIR5 QLk1-02229: ‘e-ID+DNA Tracing’**
- **Introduction: EU regulations**
- **Electronic ID by e-bolus: how it works and costs?**
- **Traceability implementation by ‘e-ID+DNA’**
  - **Case 2: Fattening beef calves (‘Ternera’)**
- **Conclusions**

Current European Regulations on animal ID&R and traceability: 1/2

- **Regulation EC 1760/2000: Cattle ID&R**
  - **Art. 4, #2:** All EU cattle born after **1/1/2000**,... shall wear **2 ear tags + passport at >20 d** of age or before leaving the farm where it was born.
  - **Art. 4, #7:** Decision taken on the **use of e-ID in cattle** (Recommendation, **COM 2004**).

- **Regulation EC 178/2002: Traceability**
  - **Art. 3, #15:** Ability to track any food, feed, **food-producing animal** or substance that will be used for consumption, through all stages of production, processing and distribution.



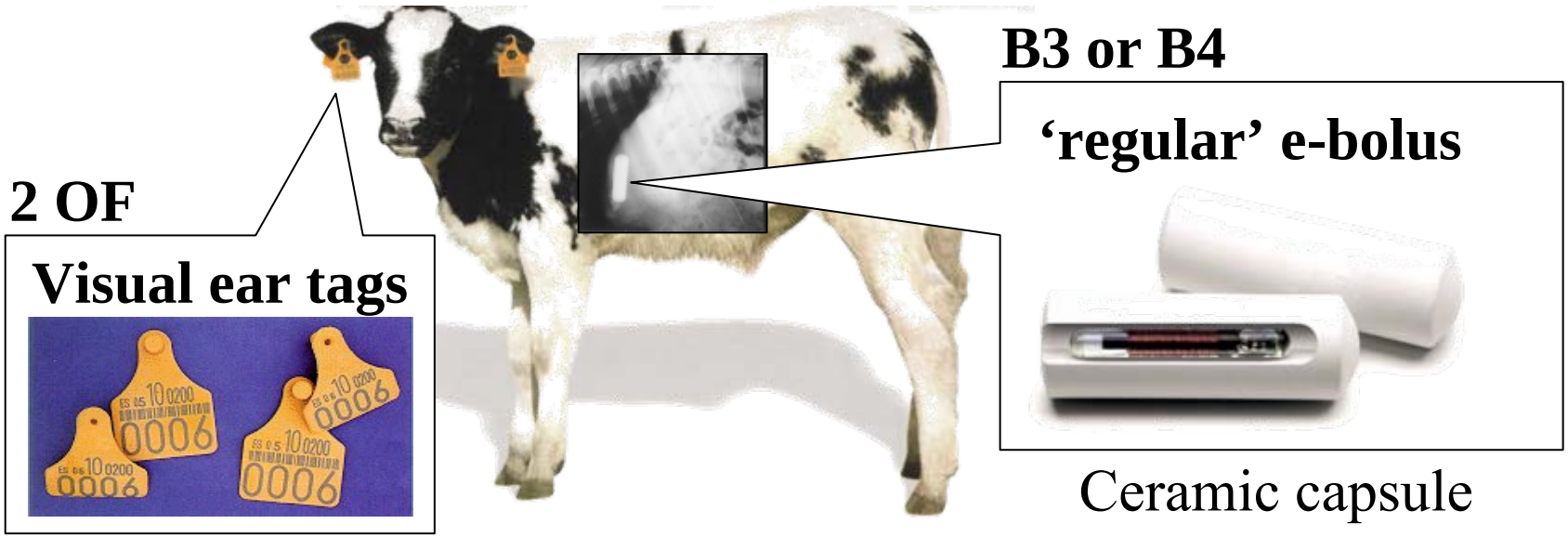
Objectives :

To study under on field conditions the:

- **Performance of visual and e-ID devices** (LF bolus, 134.2 kHz) **for meat traceability**
  - Official (calves) or standard (lambs) ear tags (flag)
  - Small ear tags (button)
- **Use of e-labels** (HF inlays, 13.56 MHz) **for automatic ID code transfer and carcass identification.**
- **Use of DNA analysis** (microsatellites) **as an independent auditing system for traceability.**
- **Case: 2) <u>Beef</u> ('Ternera')**

‘e-ID+DNA’: on farm calf identification

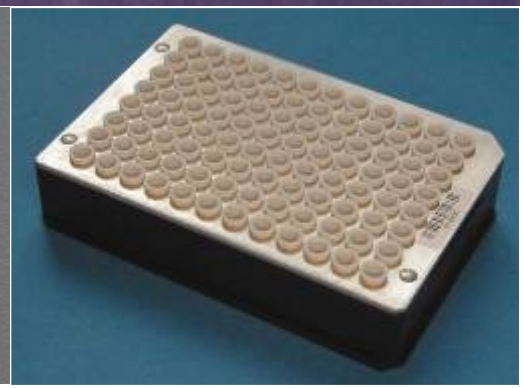
- **Animals: 3,657 bulls & heifers** of 3 breeds (Fr, As & F1), intensively milk fed & fattened in 14 holdings (B & L, Spain). Harvested at 360-480 kg BW in 2 slaughterhouses (70 cattle/h).
- **Identification:** during artificial milk rearing (< 30 d)
  - **2 official ear tags**, one on each ear (**OF, 10 g**, n = 7,314, Azasa-Allflex, Spain) already ID before leaving the farm of birth.
  - **1 e-bolus**, **B3** (**75 g**; 21×68 mm; n = 3,057) or **B4** (**73 g**; 18×77 mm; n = 600), with ISO HDX transponder (Rumitag, Spain).



‘e-ID+DNA’: DNA sampling

- **DNA tissue samples:**
  - **<u>Biopsying ear tags</u>** at bolusing (**E1**, Biopsytec, Germany; **E2**, Tipy-Fix, Switzerland) in the right ear.
  - **<u>Carcass sampling</u>** (**E1**, Biopsytec; Identigen **sticks**, Ireland) at the end of harvesting.

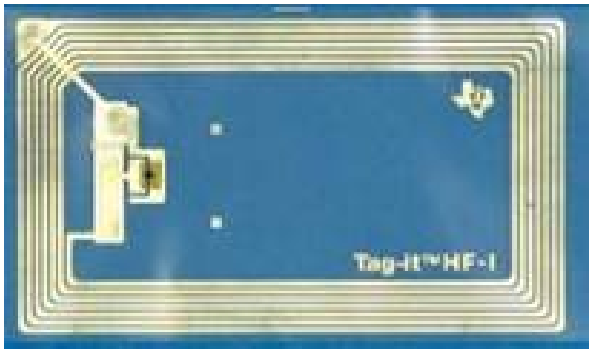


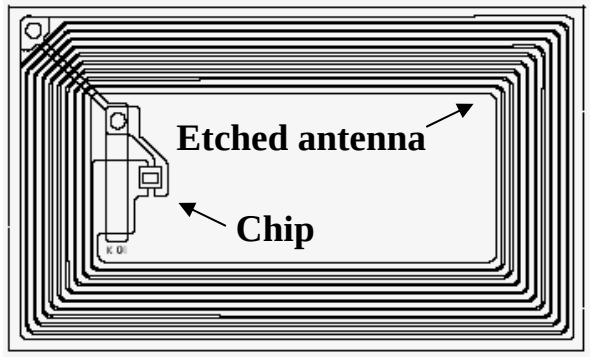



  - Samples stored frozen (-20ºC) until analysis.

‘e-ID+DNA’: ID transfer & auditing

- **Automatic recording & transfer of ID** codes from animal (e-bolus) to carcasses by **HF RF inlays** (45 × 76 mm, **13.56 MHz**; Tiris, The Netherlands) at evisceration.

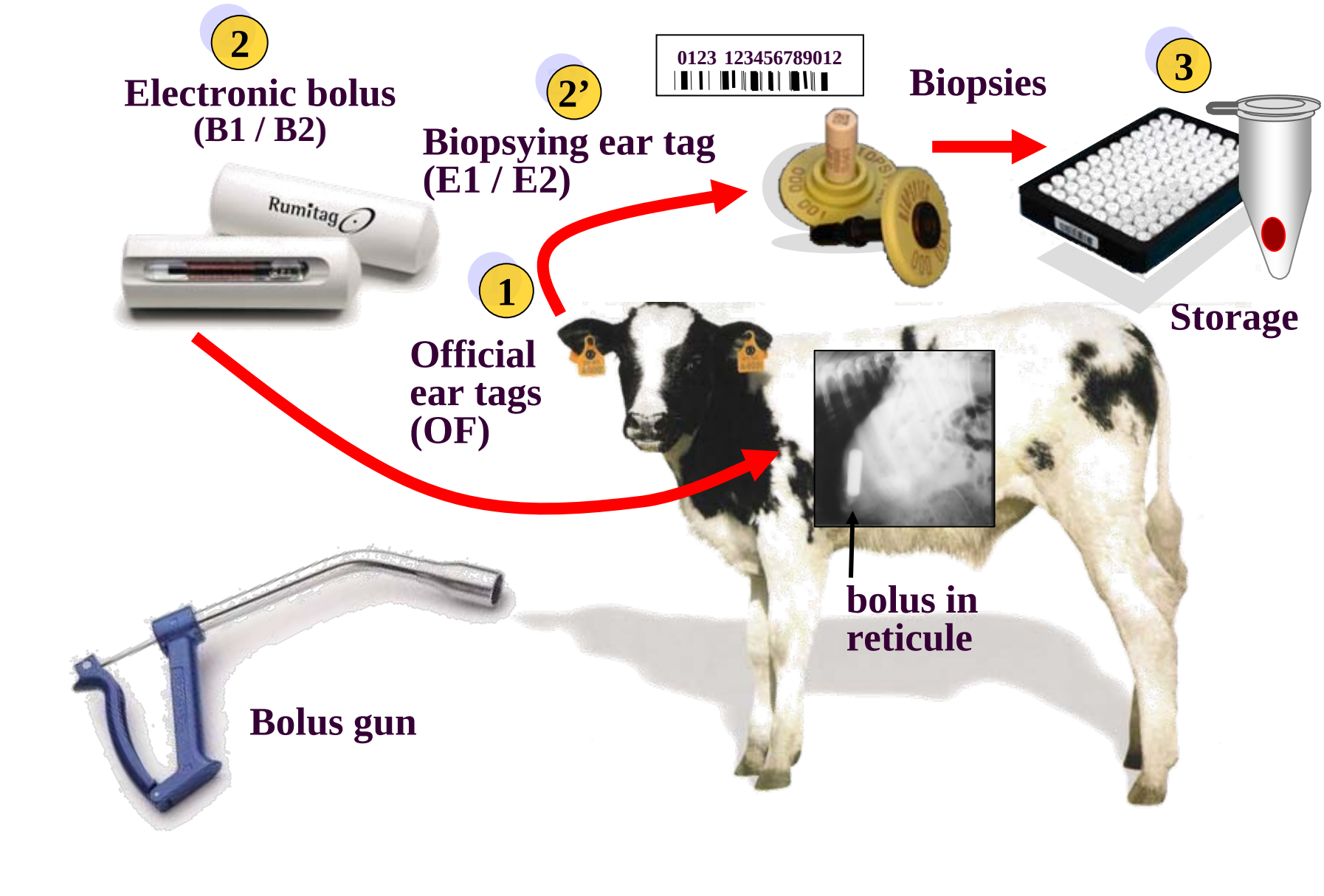




- **Retailer sampling:** 30 beef meat cuts in 9 butcheries (Barcelona)
- **DNA analysis**: 5% samples (panel of 8-12 ISAG standardized microsatellites for cattle) in the SVGM of UAB (Bellaterra, Spain).

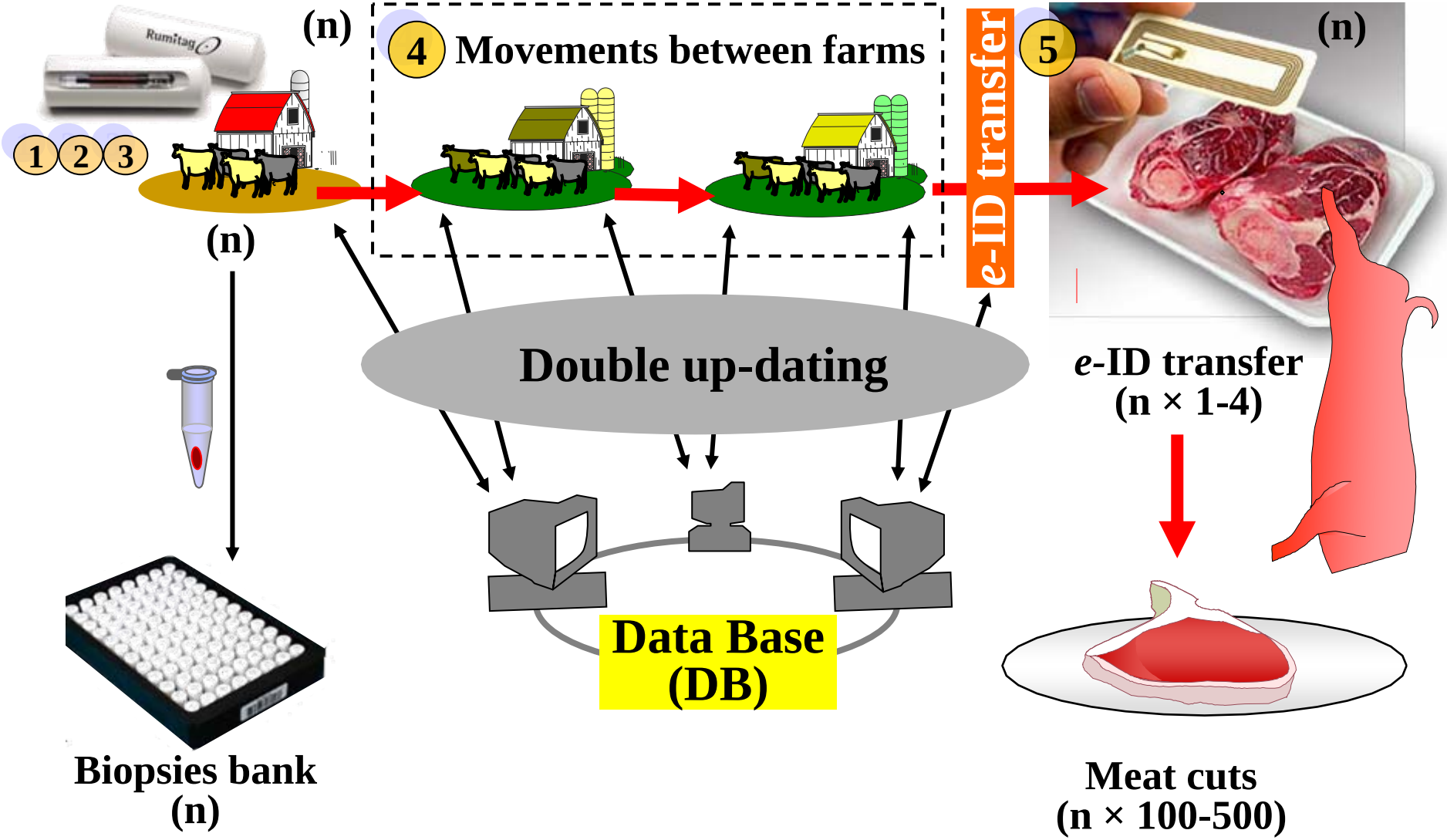
‘e-ID + DNA’ implementation: calf ID & biopsying

(EU Project FAIR 5, QLk1-02229)



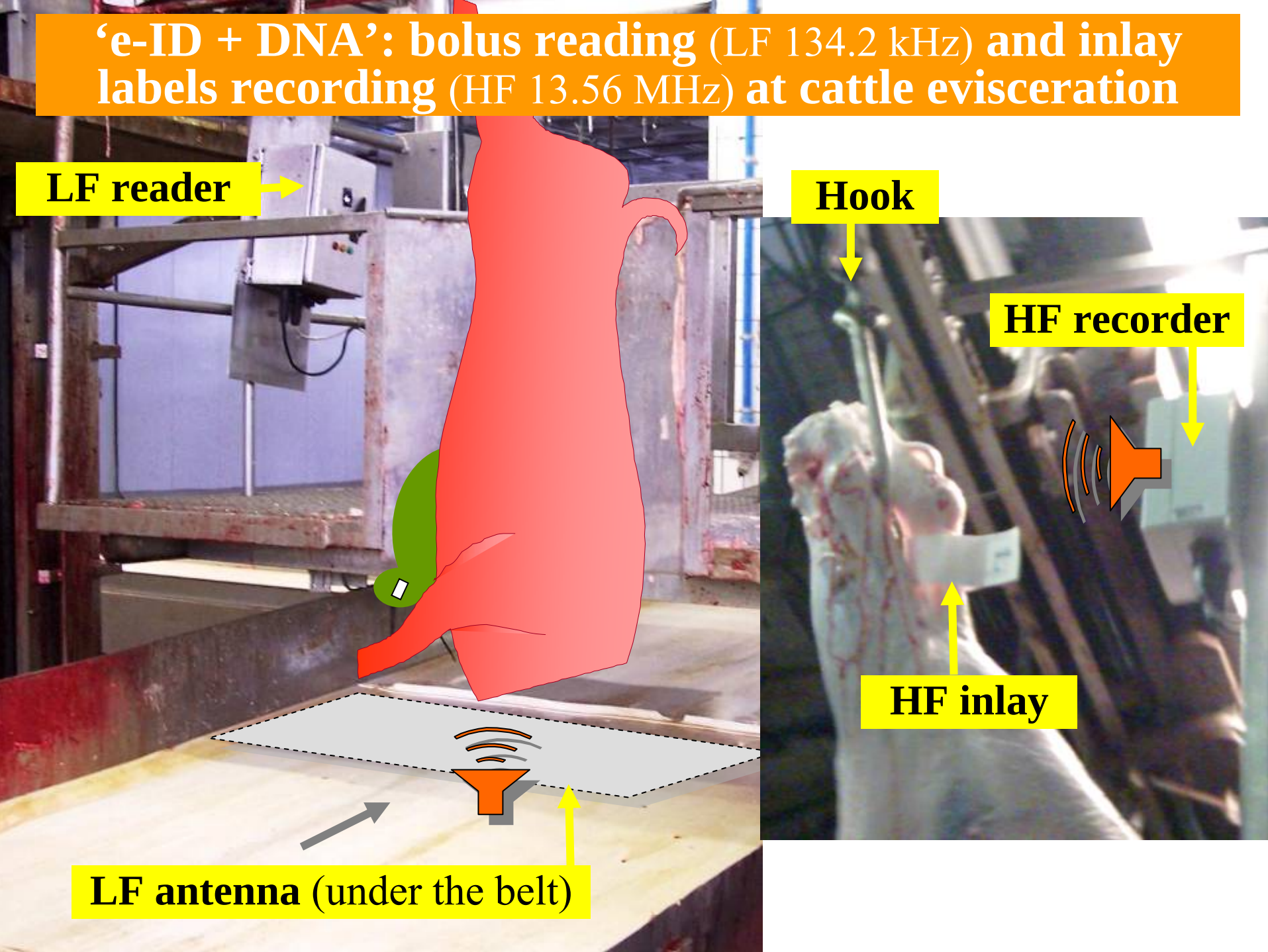
‘e-ID + DNA’ : transfer of animal ID to carcass & meat

(EU Project FAIR 5, QLk1-02229)



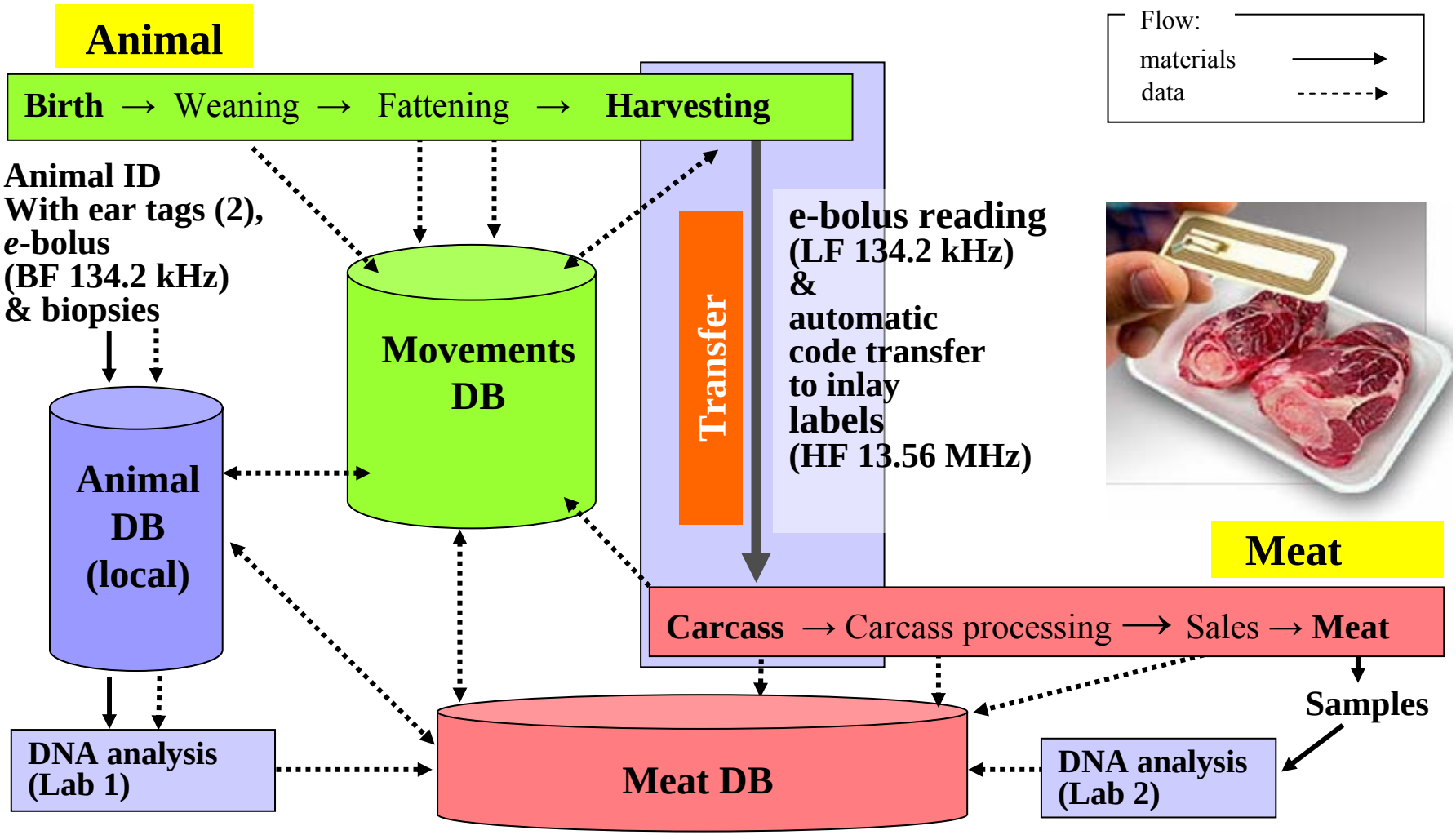
‘e-ID + DNA’: application of inlay labels (HF 13.56 MHz) for e-ID transfer from cattle to carcass

‘e-ID + DNA’: bolus reading (LF 134.2 kHz) and inlay labels recording (HF 13.56 MHz) at cattle evisceration



‘e-ID + DNA’: Data management from animal to meat

(Project FAIR 5, QLk1-02229)



From ‘farm to fork’ Data & DNA matching

‘e-ID + DNA’: Results of traceability in intensively fed ‘Ternera’ (n = 3.657)

(Project FAIR 5, QLk1-02229)

	Ear tags			‘Regular’ e-bolus	
	OF	**E1**	**E2**	**B3**	**B4**
Applied, n	7,314	2,562	1,095	3,057	600
Lost, %	3.6	1.6	0.9	0.2	0
No readable, %	0	0	0	0	0
On farm traceability, %	**96.4^{c}**	**98.4^{c}**	**99.1^{b}**	**99.8^{b}**	**100^{a}**
Harvested, n	←	3,273	→	2,737	536
Bolus read on-line, %				99.3	99.6
Labeled carcasses, %				98.6	98.5
Not recorded inlays, %				1.4	1.5
Harvesting traceability, %				**98.0**	**98.1**
Retailer traceability, %				**100**	**100**
Total traceability, %				**97.8^{b}**	**98.1^{a}**
Biopsies, n (%)			900 (2.8)		
Analyzed DNA, n (%)			176 (8.7)		
No matching samples, n			5 (2.8)		
Matching, %			**97.2**		

Ear tags: OF = Official; E1 & E2 = Biopsiers; Bolus: B3 = 75 g, B4 = 73 g (^{a,b,c} $P < 0.05$)

Conclusions:

- **On farm traceability:**
  - 'Official ear tags' (flag) < 97% retained in calves for 1 yr.
  - 'Button ear tags' (biopsiers) better retained (>98%) than official, but difficult to read.
  - e-Bolus retention varied according to bolus type and was >99% by using the appropriate bolus design.
- **Automatic e-ID reading** (LF, 134.2 kHz) **& transfer to inlays** (HF, 13.56 MHz): was possible under slaughterhouse conditions (> 98%), but should be improved.
- **Unmatching DNA was found in the 'farm to harvesting' process.**
- **Total traceability with the double 'e-ID + DNA' system was 97% (beef).**

Thanks for your attention. For more information visit:

http://www.uab.es/tracing/

The European Commission (5th Research Program)
Project QLk1-2001-02229: 'EID + DNA Tracing'