5th DairyCare Conference
Thessaloniki, Greece, March 19-20 2018
"Getting There"

Incubator grants

COST is supported by the EU Framework Programme Horizon 2020

Development of Sensor Technologies for Small Ruminants

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Development of Sensor Technologies Suitable for Monitoring Feeding and Behaviour of Small Dairy Ruminants

SWIG Workshop

November 27-28 2017, Tryp Bellver, Palma de Mallorca (Spain)

Workshop Participants

16 attendees from **7 countries**, multidisciplinary

Mario Baratta (Univ. Turin, IT)
Gerardo Caja (Univ. A. Barcelona, ES)
Andreia Castro (Univ. A. Barcelona, ES)
Wellington Coloma (Univ. A. Barcelona, ES)
Clara Díaz (INIA, ES)
Celine Domange (AgroParisTech-INRA, FR)
Özkan Elmaz (Mehmet Akif Ersoy Univ., TK)
Carles Ferrer (Univ. A. Barcelona, ES)
Sylvie Giger-Reverdin (AgroParisTech-INRA, FR)
Assaf Godo (ARO Volcani Center, IL)
Andrew Hamilton (Univ. Strathclyde, UK)
Niclas Höegber (Swedish Landtechnique Univ., SE)
Chris Knight (DairyCare Coordinator, UK-DK)
Nabil Mehaba (Univ. A. Barcelona, ES)
Joan Oliver (Univ. A. Barcelona, ES)
Aída Xercavins (IRTA, ES)

Sensors for Small Ruminants: State-of-the-art

Device	Comment
Temperature injectables	Short reading distance (contact)
Temperature ear tag	No tested in SR (*CowManager*)
Heat detector (mating harness)	Male activity, AI without hormone treatment (FR)
Activity pedometer	3A from cows. Only for adult SR?
Temperature and pH bolus	From large species (no more available?)
GPS collar	Available from other species
Positioning ear tag and activity	*Smart Bow* (A) accelerometer 3A
Activity collar for intake	*Life Corder* by accelerometer (FR), other…
Temperature bolus (new)	SR sized prototypes (ES)
Biomarker ear-tag	Under research (IT)

Sensors for Small Ruminants: Conclusions

- Current advantages of e-ID (mandatory) not fully exploited in SR practice.
- Lack of a clear need (identify!) and opportunities:
  - Health (foot-rot, parasites)
  - Feeding & drinking
  - Reproduction (mating & AI)
- Wearing problems (size, eating…).
- Current experiments on new ear sensors (temp, blood) and small rumen (temp) sensors.
- Add ons: pH, accelerometers, GPS (location), rumination (no validated).
- Alternative devices: drinking-weighing stations, pedometer.
- Cost? Benefit? Business model?.

Rumen Sensors: Available boluses

- Commonly used for long-term release of minerals and drugs.
- Today used for ruminant **e-ID**: higher retention than ear-tags.
- Sensors to measure: Temperature, pH, pressure…
- Approved by Ethics and Welfare Committees as a **desirable alternative to rumen cannulas**.
- Currently available in the market for large ruminants:

1. **SmaXtec** (AU): 35 × 132 mm, 200 g
2. **WellCow** (UK): 32 × 145 mm, 240 g
3. **eCow** (UK): 27 × 115 mm, 207 g
4. **Kahne** (NZ): 27 × 145 mm, 70 g

- **Unsuitable for small ruminants.**

Sensors for Small Ruminants: DC Events

Item	2014	2015	2016	2017	2018
Rumen sensors	Search for rumen sensors: 4 devices (cattle)				
Pedometer sensors	Accelerometer 3-axis in sheep hind leg (n = 6)				

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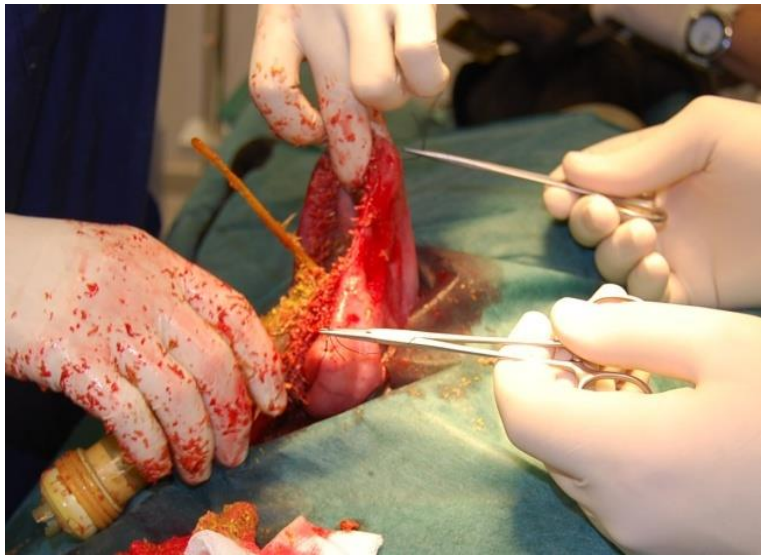


Position:
Rumen ventral sac

Monitoring pH and temperature rumen changes by wireless sensors and logistic regression in dairy goats

A. Castro-Costa[1], A.A.K. Salama[1], X. Moll[2], J. Aguiló[3] & G. Caja[1]

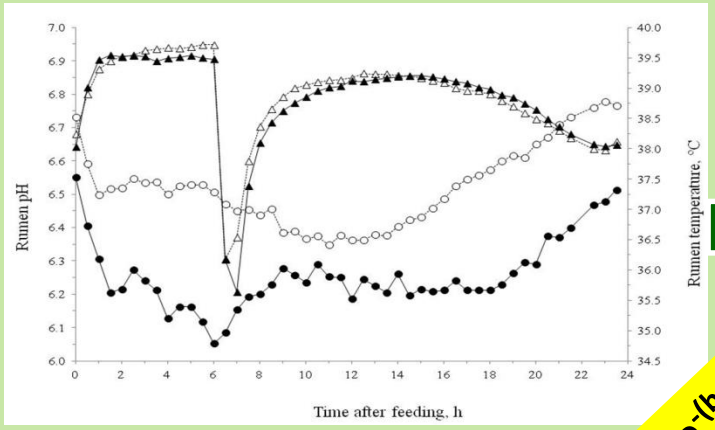
[1]G2R, [2]GRESA and [3]GAB of Universitat Autònoma de Barcelona, Bellaterra, Spain

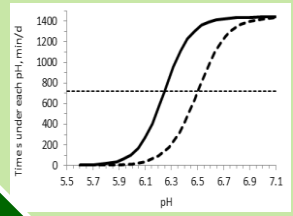
2nd DairyCare Conference 2015, Córdoba (Spain)

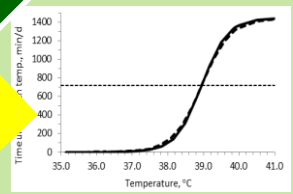
Rumen bolus (n = 8)

Needing < 70 × 20 mm !

Exp. 1 (8 goats) Diet effects (F:C ratio): 70:30 vs. 30:70

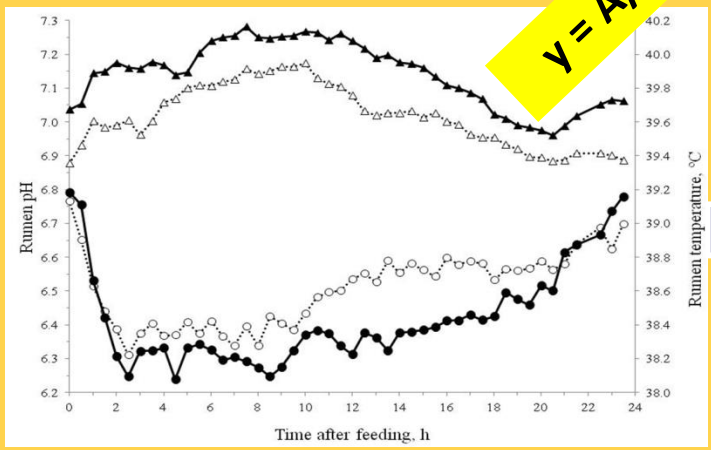


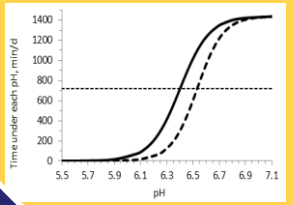


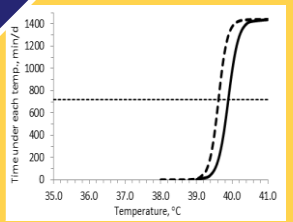


$y = A/[1+e^{-(b+cx)}]$

Exp. 2 (9 goats) Ambient: Termo neutral vs. Heat stress





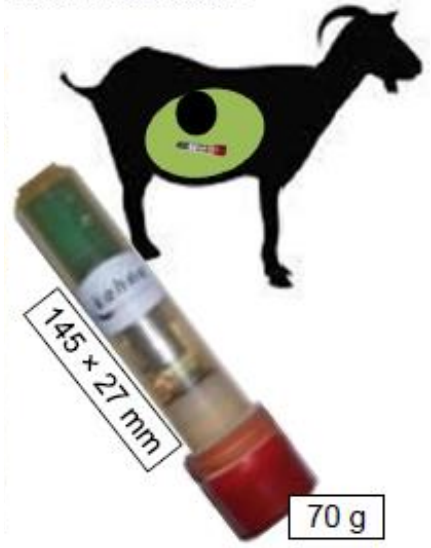


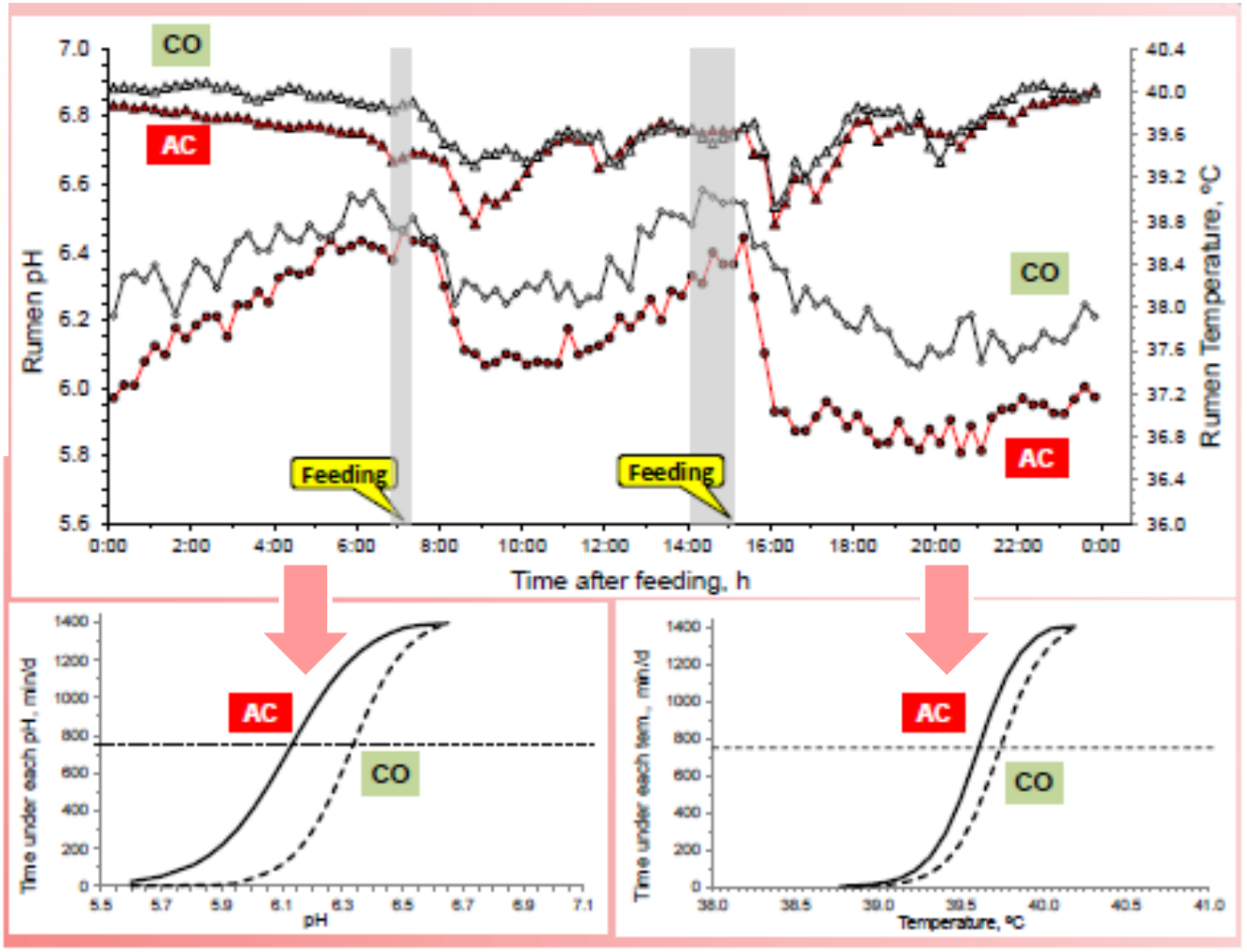
Rumen cannulas vs. wireless bolus sensors for monitoring rumen pH and temperature changes in dairy goats fed control and acidogenic diets in early lactation

Andreia Castro-Costa*[1], Sylvie Giger-Reverdin[2,3], Ophélie Dhumez[2,3], Joseph Tessier[2,3], Alexandra Eymard[2,3] & Gerardo Caja[1]

[1]Group of Research in Ruminants (G2R), Universitat Autònoma de Barcelona, Bellaterra, Spain
[2]INRA, UMR791 Modélisation Systémique Appliquée aux Ruminants, Paris, France
[3]AgroParisTech, UMR791 Modélisation Systémique Appliquée aux Ruminants Paris, France

3rd Dairy Care Cost Action Conference, 5-6 October 2015, Zadar (Croatia), Session WG3





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Biosens T (20 x 10 mm) Temperature		Design of sensor platform (UAB)	**BT1 prototype** (UAB, ES) Dry ewes (n = 4)		

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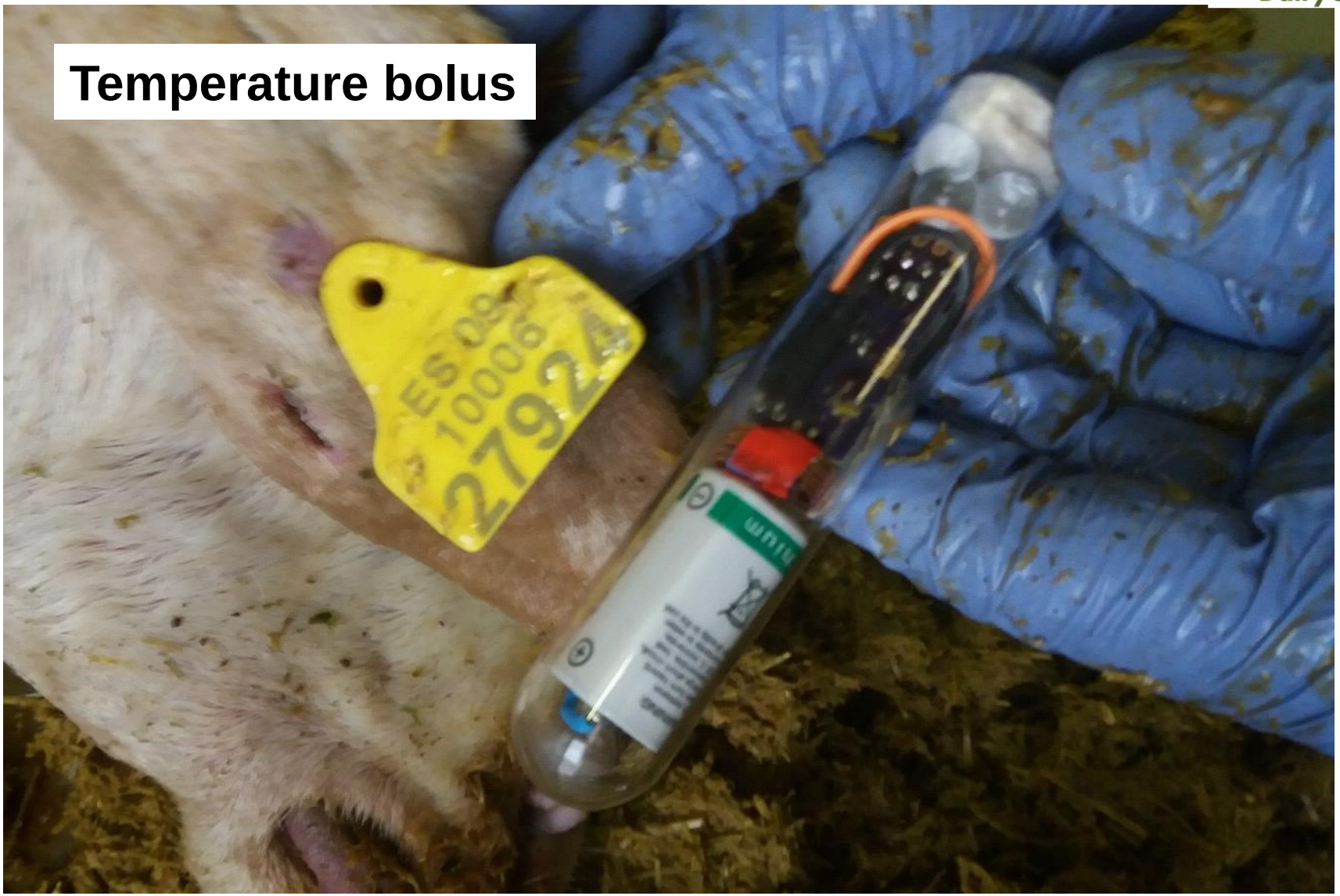
Biosens T (20 x 10 mm) Temperature		Design of sensor platform (UAB)	**BT1 prototype** (UAB, ES) Dry ewes (n = 4)	BT1 testing (168 d) and improvements	
				BT2 prototype (UAB, ES) Dry ewes (n = 6)	BT2 testing (87 d) and improvements (n = 2)
				STSM UAB at SU (UK)	**BT3 prototype** (UAB, ES) Lactating ewes (n = 5)
					BT3 offered to SWIG members for group testing (n = 50-150)

Sensors for Small Ruminants: Prototypes



"Biosens" temperature bolus prototype applied in a dairy sheep

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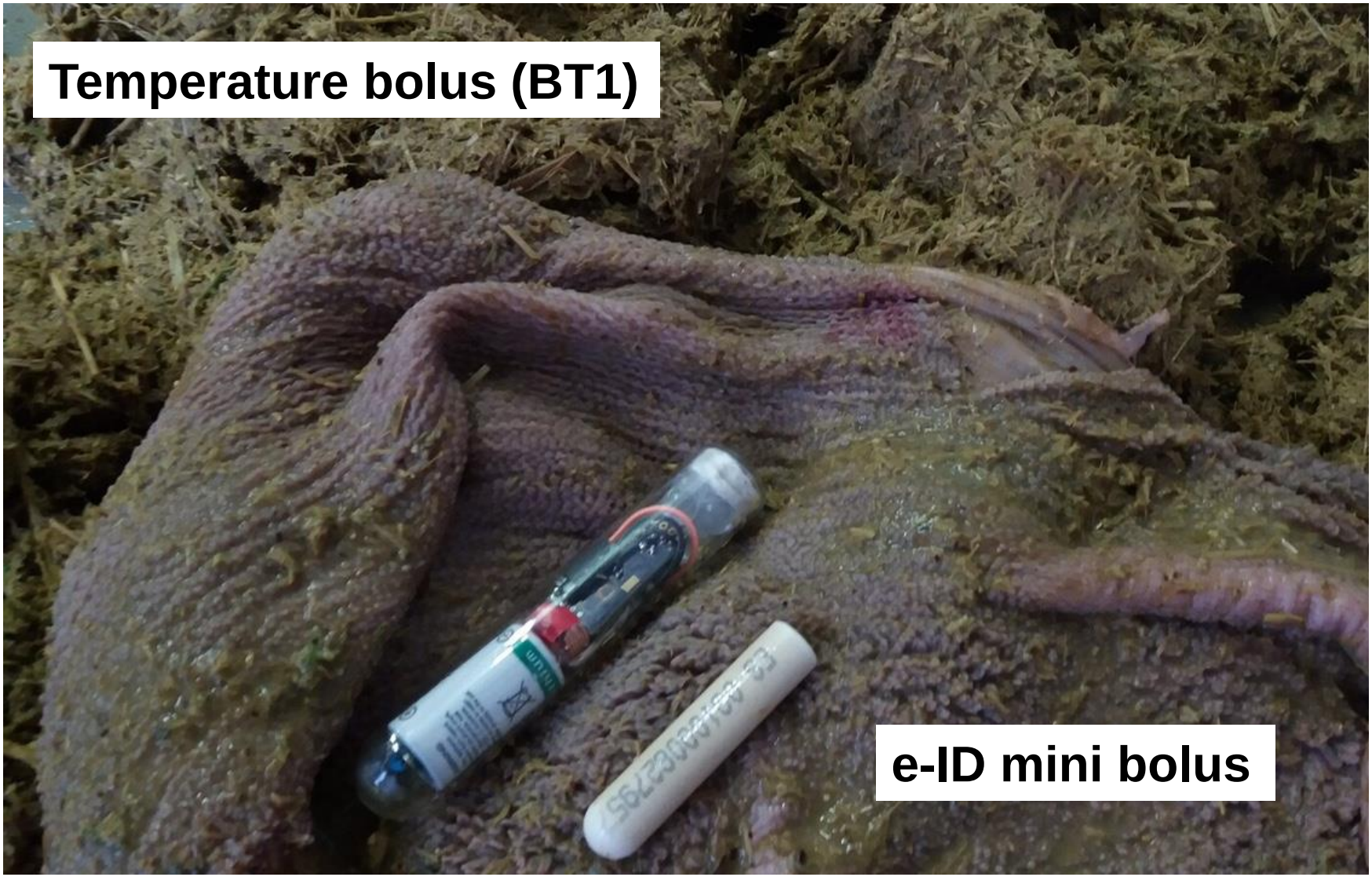

Recovery of Biosens bolus prototype from a dairy sheep after 5 mo

Biosens Pre-industrial Devices (BT3)

Facts:

50 bolus already produced
(22 x 100 mm)

Satisfactory calibration in lab.

Applied in sheep (>50 kg BW)

SWIG members (1 reader/5 bolus)

100 bolus ready to deliver

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Thanks for attention