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BEHAVIOUR OF
ELECTRICAL CONDUCTIVITY AND YIELD ARIMA MODELS
FOR MASTITIS DETECTION
ON DAIRY GOATS.

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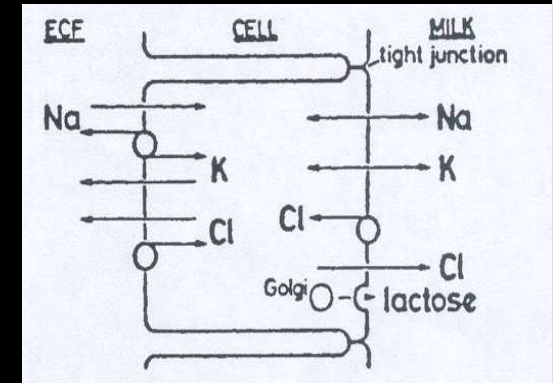


MASTITIS = Changes on milk composition

■ DAMAGE ON SECRETORY CELLS

□ DECREASE SYNTHESIS FUNCTIONS

- ↓ CASEINS, LACTOSE & YIELD



□ INCREASE PERMEABILITY FROM BLOOD

- ↑ Cl, Na, serum proteins

RESULT = INCREASE of milk EC

CHARACTERISTICS of INDIRECT ESTIMATION METHODS of MASTITIS of SMALL RUMINANTS

- Easy to apply on field-milking parlour
- Early & automatic results
- Low cost analysis

EC afford these requirements

STUDIED AND EMPLOYED IN COWS

BUT: There are other factors than mastitis affecting Goat milk EC

- Breed
- Feed
- Milking fraction analyzed (published in poster EAAP-2011)
- Milking interval
- Parity
- Individual differences
- Month of lactation
- Heat

JDS, August 2011

It needs algorithms based on individual daily measurements to get useful results

AIM

To check the behaviour of
ARIMA algorithms
for mastitis detection

- on dairy Goats
- using EC / Yield daily measurements

MATERIALS AND METHODS



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Research lines SMALL RUMINANTS:

- Mechanical milking
- Milk quality and safety
- Animal welfare



Educational and Research FARM



Educational and Research FARM

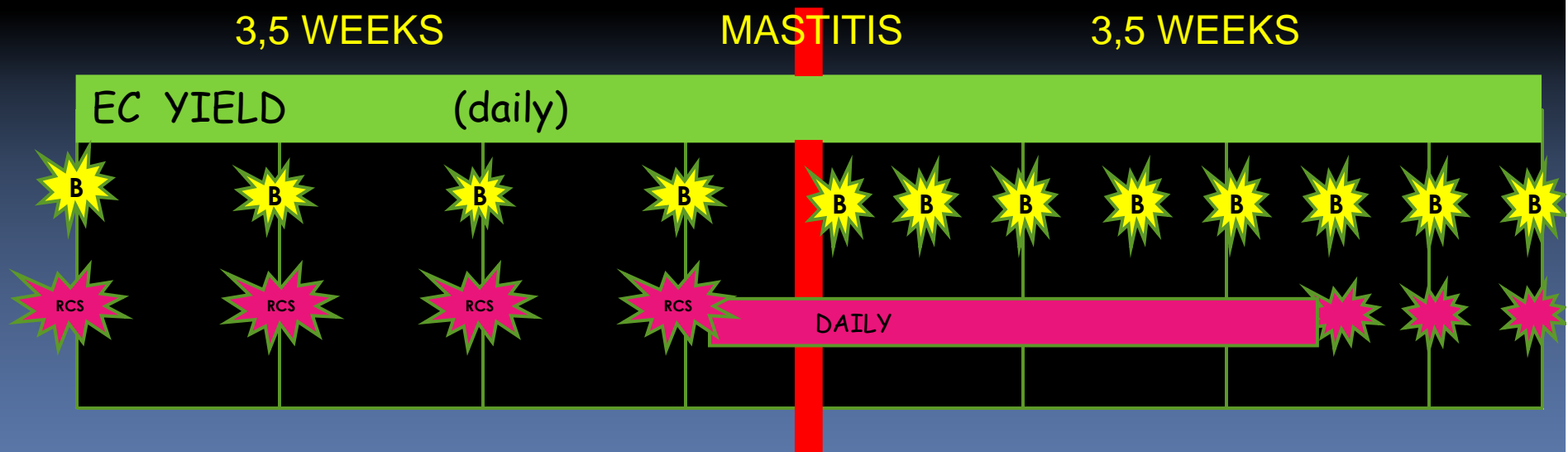


Other studies of EC of goat milk carried out by the research group

1. **Variation factors of gland milk EC of goats** (JDS, august 2011).
2. **Algorithms** for automatic mastitis detection of goats
3. Developing of a prototipe for on-line measurements of EC (during milking)

- **EXPERIMENTAL DESIGN**

- 18 Murciano-Granadina goats free of mastitis
 - 8 primiparous
 - 10 multíparous
- Milked once (morning)

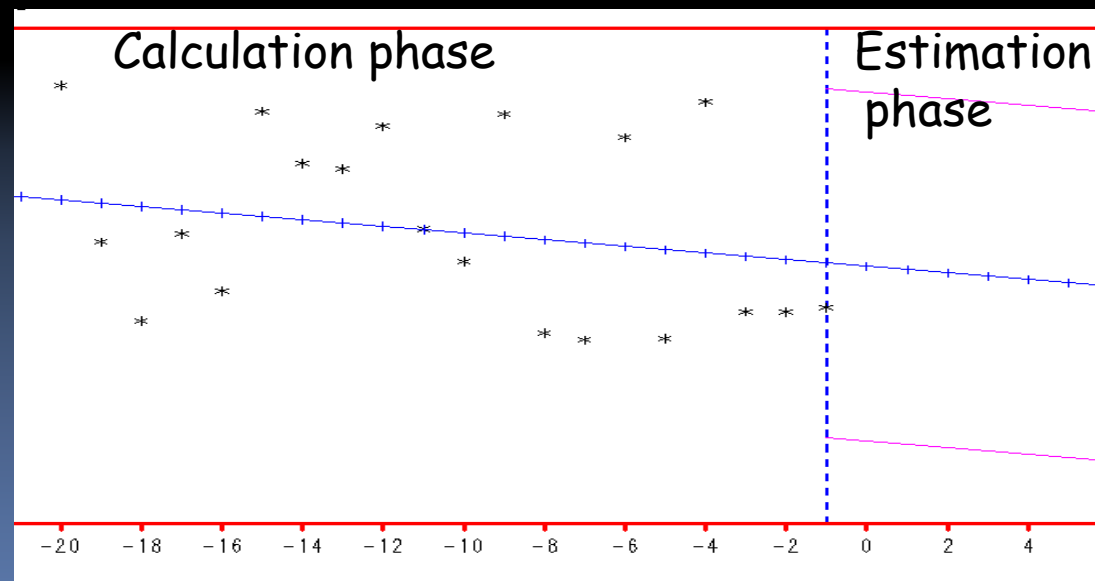


Arima

(autorregresive integrated moving average)

(least square means, SAS 9.2)

- Calculation phase: all days previous to infection
- Estimation phase: PREDICTION 5 DAYS thresholds



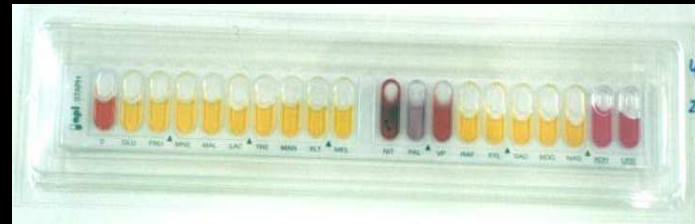
Arima

(autorregresive integrated moving average)

- POSITIVE CASE:
 - **EC**: measured EC was higher than predicted
 - **Yield**: measured yield lower than predicted
- Results calculated
 - Sensitivity
 - Specificity
 - PPV
 - NPV

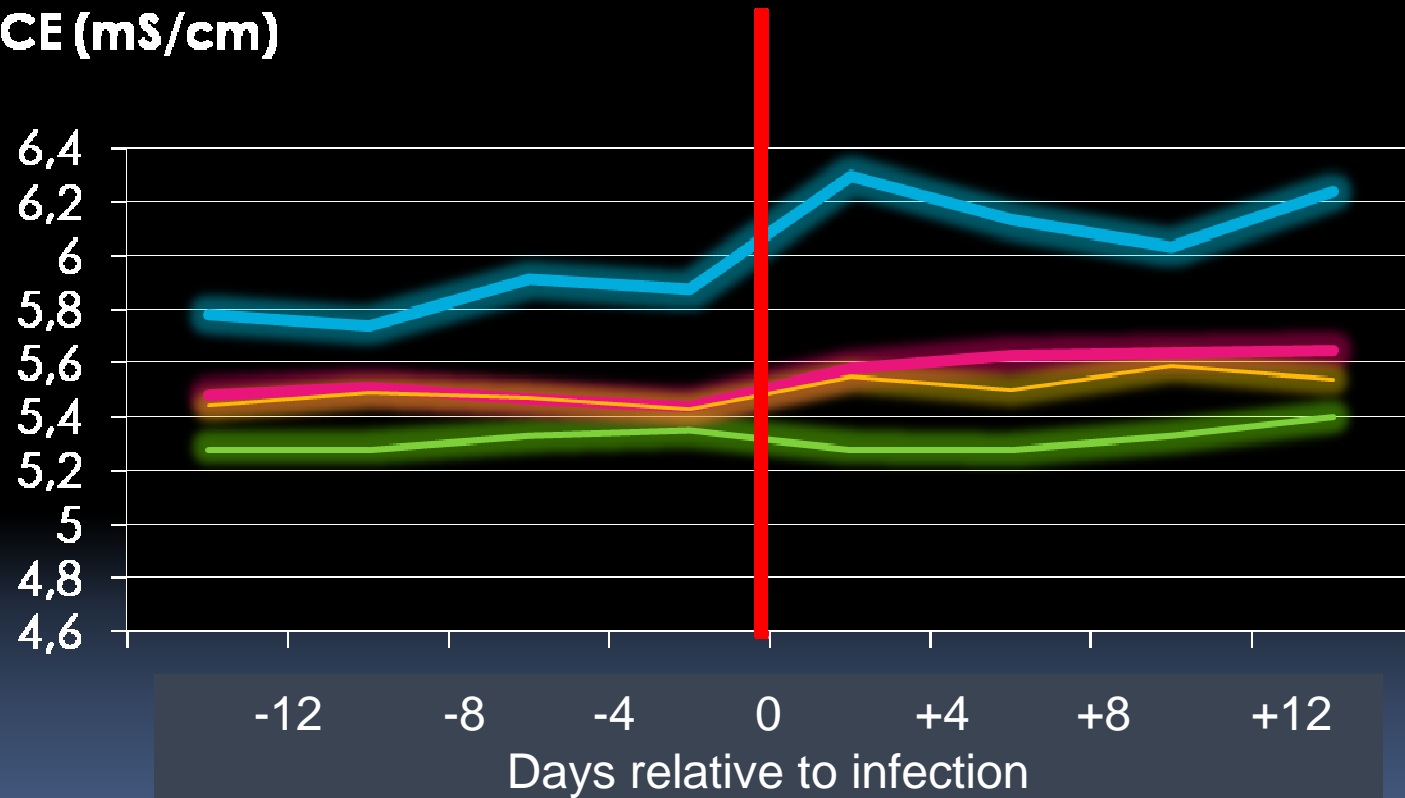
ISOLATED PATHOGENS

RESULTS



Infected glands / goat	PATHOGEN	N	Average EC ± SD (mS/cm)	
			4 days before infection	4 days after infection
1	<i>S. caprae</i>	1	5,32±0,09	5,30 ± 0,04
	Streptococci spp.	1	5,18±0,03	5,37±0,16
	<i>S. xylosus</i>	2	5,94±0,34	6,03±0,24
	<i>S. chromogenes</i>	1	5,41±0,09	5,37±0,05
	Bacillus Gram -	1	5,09±0,14	5,52±1,25
2	<i>S. aureus</i>	1	5,58±0,09	8,61±1,65
	<i>S. xylosus</i>	2	6,04±0,06	6,09±0,54
	<i>S. caprae</i>	2	5,71±0,09	5,61±1,65
	Stafilococci spp.	1	6,54±0,09	6,48±0,02

CE (mS/cm)



— Healthy

— Healthy
(collateral of inf)

— Unilaterally infected

— Bilaterally infected

RESULTS

	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	N
EC	30	96	80	68	36
YIELD	30	80	44	68	36

- Both variables detected 4 / 12 cases of infection
- 100% of clinical cases were detected (2 cases)
- Yield was very variable and low specific (high false positives)

CONCLUSIONS

- It is needed a compromise between sensitivity and specificity
 - High sensitivity: reduces losses due to mastitis
 - High specificity: reduces costs of unnecessary treatments
- **EC detected:**
 - all the clinical cases
 - Subclinical cases with higher composition changes
- **EC not detected:**
 - infection cases of lower affection of glands that might cause lower economic losses

CONCLUSIONS

This was just an experiment, we consider it is needed a higher study with complete lactations and several farms

Needing equipment for measuring EC on-line at gland level
(prototipe developed by research group
in registering phase on office of pattents)

- Measurement of EC by glands
- At short milk tubes
- Designed for small ruminants (small flow)
- Without noise due to air
- Sanitary
- Easy cleaning

THANK YOU
FOR YOUR ATENTION



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