STUDY OF THE INCIDENCE OF MEDICAL PROBLEMS IN NEWBORN LAMBS ON ARTIFICIAL LACTATION AT UAB EXPERIMENTAL FARMS

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INTRODUCTION:

Newborn small ruminants have a very immature immune system and, therefore, colostrum ingestion (IgG and IgM) is important for their survival. In addition, for artificially reared animals, the presence of microorganisms in the lactation machine will be very important in the incidence of problems such as **diarrhea** (*E. coli*, *Salmonella* spp., viruses and, *Cryptosporidium*), **pneumonia** (*Mannheimia hemolítica*), **enterotoxemia** (*Clostridium perfringens*) and, **abomasal bloat** (*Sarcinia* spp. and *Clostridium sordelli*) (Menzies, 2007; Crawford, 2013)

OBJECTIVES:

- To detect the presence or absence of **microorganisms** in the components of the artificial lactation machine of newborns.
- To determine whether proper **cleaning** of the lactation machine influences the occurrence of microorganisms, reducing the probability of medical problems in newborns.
- To assess whether artificial and maternal lactation exerts a different effect on lambs' **survival**.

MATERIALS AND METHODS:

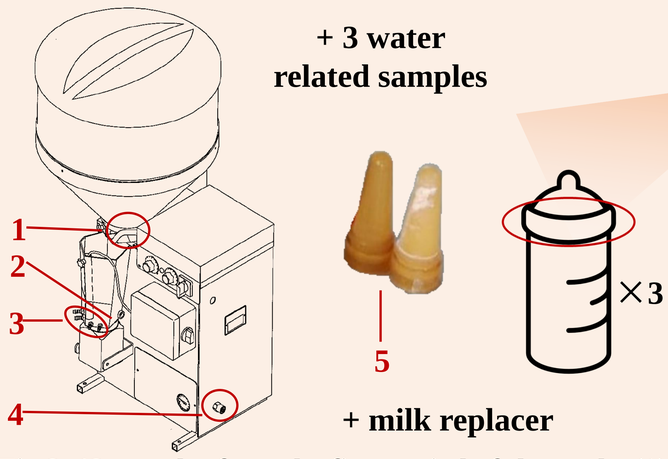

Fig 2. 13 samples from the first period of the study. (1) Collector's water tube, (2) Milk collector's bottom, (3) Milk collector's outlets, (4) Water inlet to the machine and (5) 2 old nipples. Source: modified from Grober® Nutrition Inc., and Microsoft Word.

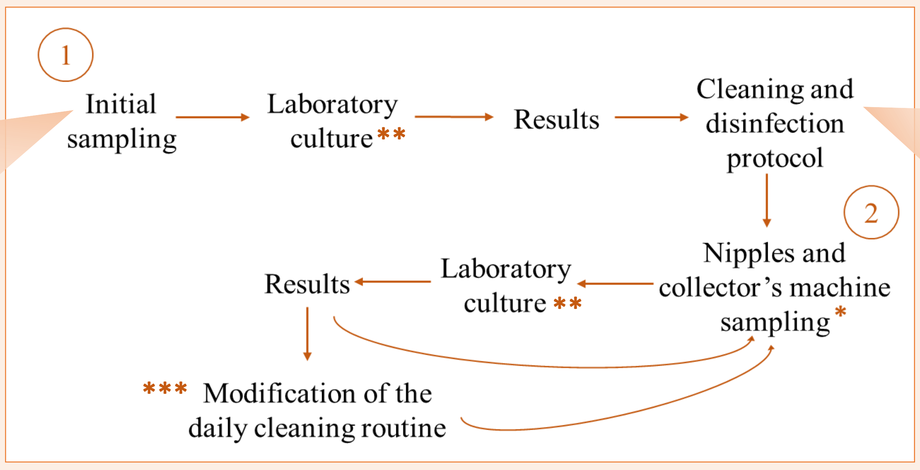

Fig 1. Experimental procedures diagram. (1) First period of the study, (2) Second period of the study, (*) First feeding day of the artificial lactation machine, (**) Baird-Parker, MacConkey, TSA (37ºC), and Sabouraud (28ºC), (***) Addition of an alkaline chlorate solution product diluted in water.

Table 1. Cleaning and disinfection protocol of the components

COMPONENT	PROTOCOL
8 milk collector's outlets + rubber tubes (plugs)	Clean with a chlorhexidine swab, leave for a few minutes and rinse with distilled water
Tap water outlet	
Water inlet to the machine	
Collector tube	
Colostrum bottle + nipple bases	
Old lactation machine nipples (1 and 2)	Soak in water and soap or chlorhexidine, leave for 12h with the container covered and rinse with distilled water
Tap tube	
Milk collector's bottom (machine)	Introduce water and chlorhexidine, leave to act for 6-12h and rinse with distilled water
Collector's water tube	

RESULTS AND DISCUSSION:

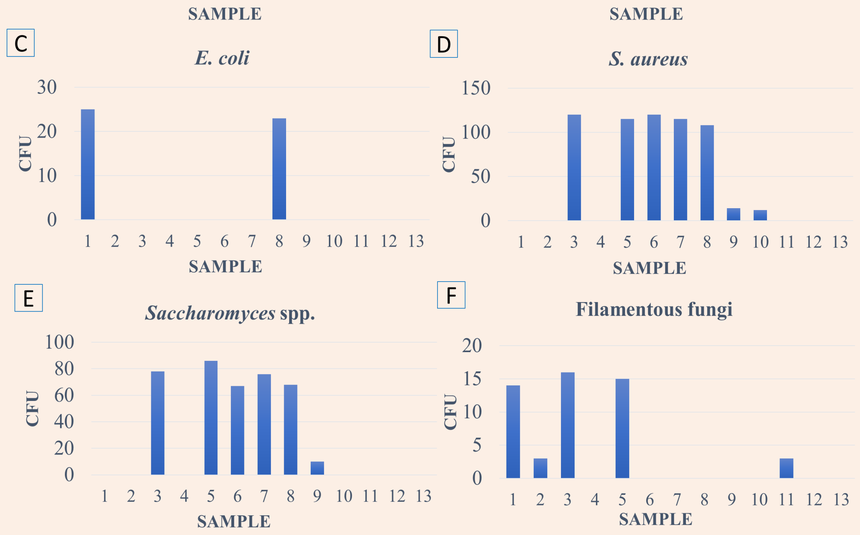

Fig 3. Colony-forming units (CFUs) of the microorganisms found in the cultures of the 13 first period samples.

P. Aeruginosa in water-related samples . (Fig. 3A) → possible contamination of the farm's water network → proper drying is needed for no biofilms formation.

S. aureus (Fig. 4D) can be found in newborns' nasal mucosa → nipples cleaned incorrectly can be a transmission vector.

E. coli briefly present after initial cleaning (Fig. 4C) → it could had caused diarrhea before the application of the cleaning protocol.

Microorganisms remaining during the whole study (Figs. 4B and 4E; orange squares) → the cleaning protocol may not be accurate enough.

Reappearance of a filamentous fungus (***Geotrichum candidum***) (Fig. 4F) → modifying the cleaning routine, the elimination of the fungus is achieved.

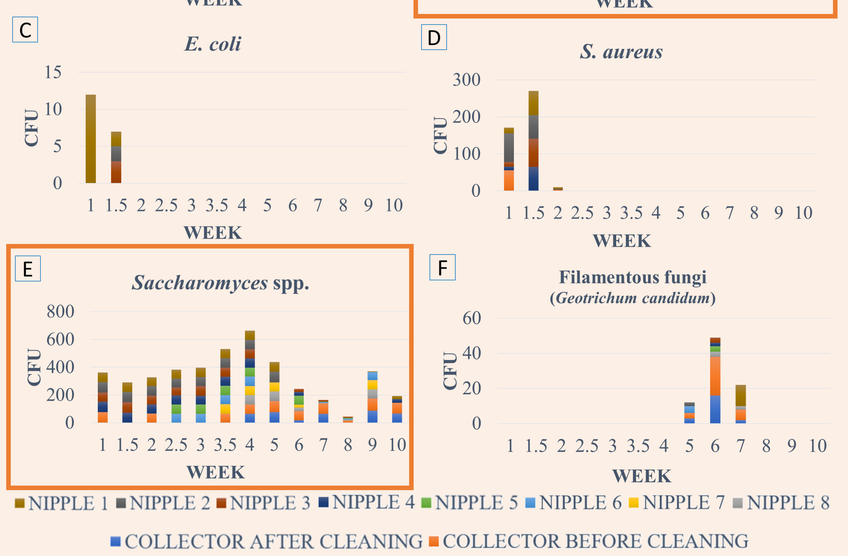

Fig 4. Microorganisms' colony-forming units (CFUs) found in the cultures of the post-cleaning protocol samples collected for 10 weeks.

Table 2. Percentage of survival through the years depending on the type of lactation.

	2018	2019	2020	2021	2022*
Maternal lactation	60%	90.5%	---	---	94%
Artificial lactation	---	---	93%	92.7%	83%

* Less number of samples in 2022 (53 & 146) compared to other years (~220 each).

External factors of the year itself (e.g., meteorological factors), can vary the % of survival of lambs (Table 2).

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B [ data$LC          -1.31E+04   1,79E+06    0.9941
    data$MN          -2.33E+02   1,70E+02    0.1711
L [ data$LPRE        -1.15E+03   2,04E+02   1.93e-08 ***
    data$LPOST       -4.50E+02   2,33E+02    0.0531 .
P [ data$P2          -2.89E+02   1,88E+02    0.1246
    data$P3          -4.34E+02   2,63E+02    0.0995 .
W [ data$W            5.14E+02   6,11E+02    0.4002
    W^2              -1.21E+02   8,44E+01    0.1536
Signif. codes:  '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
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Fig 5. Correlation and significance level between the lambs' survival data and tested factors (breed (B), type of lactation (L), ewes' prolificity (P), and weight (W)) **with coxph model.** Source: modified from RStudio (2023.03.0-386)

There is a statistical significance in lambs' survival of artificial lactation pre-cleaning protocol (**LPRE**). The orange square shows a tendency for higher survival of lambs in artificial lactation post-cleaning protocol (**LPOST**) (Fig 5).

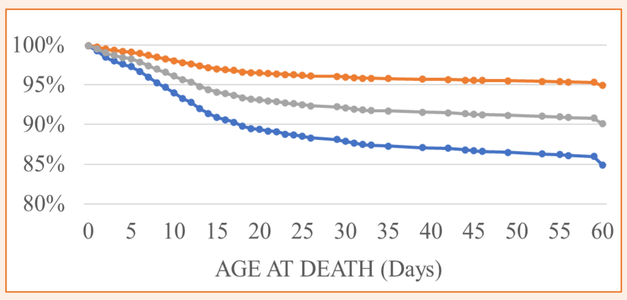

Fig 6. Type of lactation's % of survival. (orange) LPRE, (grey) LPOST, (blue) Maternal lactation.

LPRE > LPOST > Maternal lactation (Fig 6)

CONCLUSIONS:

- A proper cleaning and disinfection protocol is effective in reducing most of the microorganisms present in the lactation machine. However, more research is needed to identify the species of the remaining microorganisms and their impact on newborns, as well as to evaluate the risks and benefits of not eliminating them.
- Additionally, the study suggests that artificial lactation is better for newborn survival than maternal lactation. More research is needed to confirm the tendency for higher survival of newborns when fed after the application of a cleaning and disinfection protocol to the machine, than when not applied.

REFERENCES:

Crawford, R. G. (2013). Managing Lambs on Milk Replacer-Challenges of Nutrition, Environment and Disease. https://www.dsana.org/proceedings-lamb-rearing-systems

Menzies, P. I. (2007). Lambing Management and Neonatal Care. Current Therapy in Large Animal Theriogenology, 680. DOI:10.1016/B978-072169323-1.50094-5