A comparative study of stem-like cells in colostrum and milk of farm animals

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A comparative study of stem cell phenotyping in colostrum and milk in farm animals

Scientific context

Background :

Several types of somatic cells are present in colostrum and milk (milk secretions): mainly immune and epithelial cells but also stem cells[1,2,3].

[1] *Hassiotou et al, 2012;* [2] *Pipino et al, 2018;* [3] *Goudarzi et al, 2020*

Defining stem cells : cells capable of self-renewal and differentiation into other cell types, giving rise to or regenerating a tissue.

Hypothesis :

The transfer of maternal cells to the offspring would participate in the optimal development of its organs (growth, maturity) and or would stimulate the immunity of the newborn during the early phase of development. An hypothesis supported in mice [4]

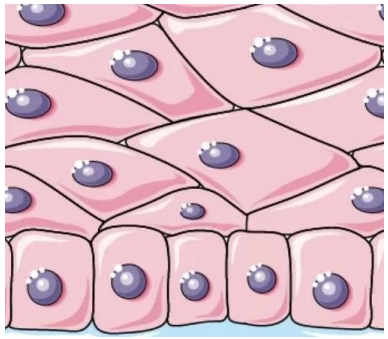
[4] *Aydin et al, 2018*

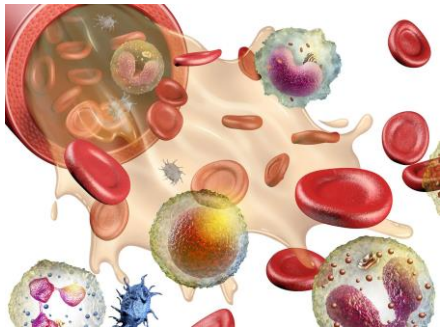
The Transmilk project : objective

Deciphering the presence of stem-like cells in milk secretions of 3 farm animals (cow, goat and sow).

What types of stem-like cells?

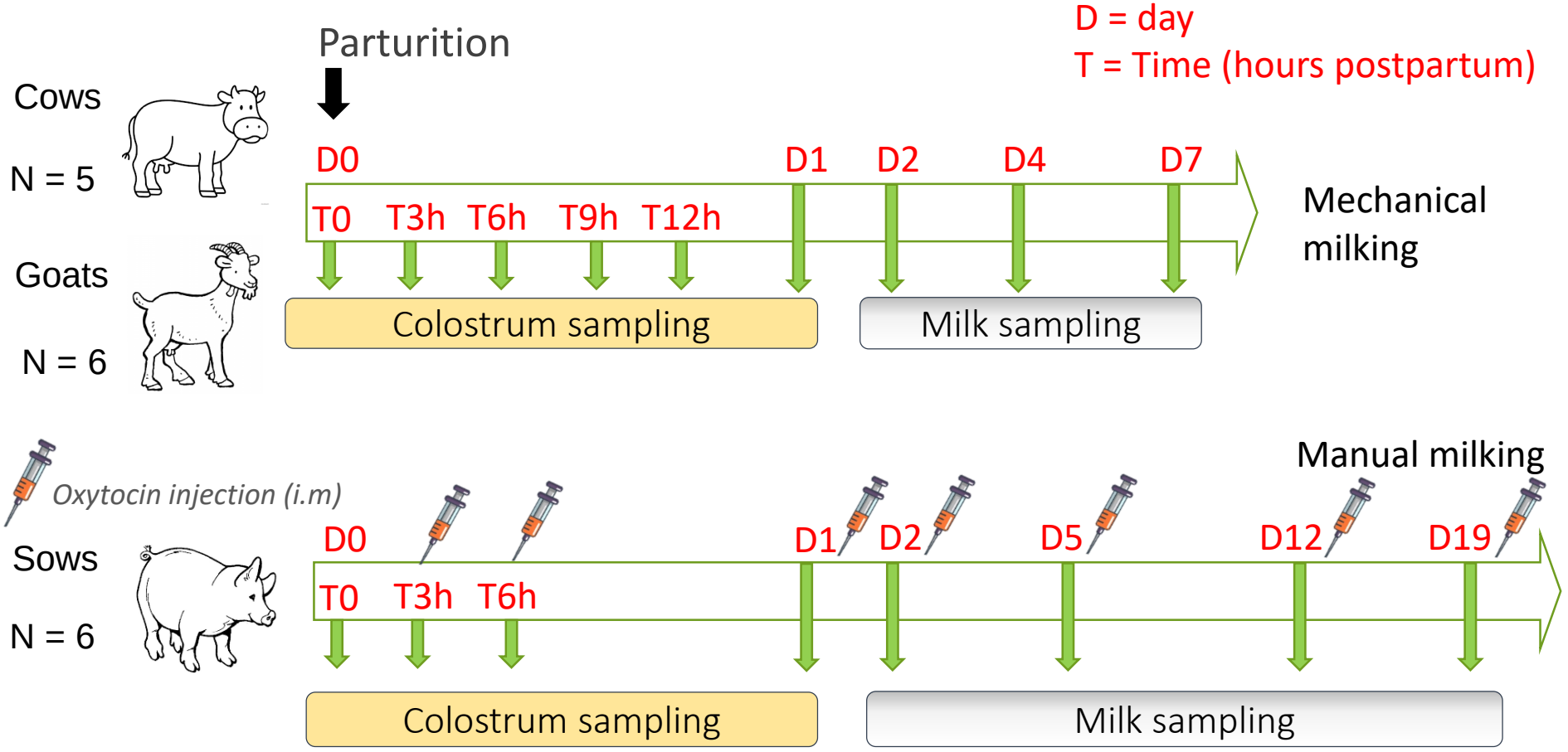
Epithelial oriented	Mesenchymal oriented	Hematopoietic oriented
Epithelium	Connective or adipose tissue	Blood and immune cells



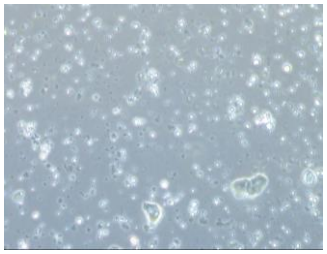


Experimental design

Kinetics of colostrum and milk collection from multiparous animals



Sampling analysis



Colostrum and milk

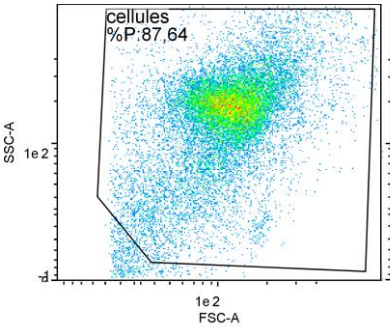
Recovery and Isolation of cells from fresh colostrum and milk

Flow Cytometry

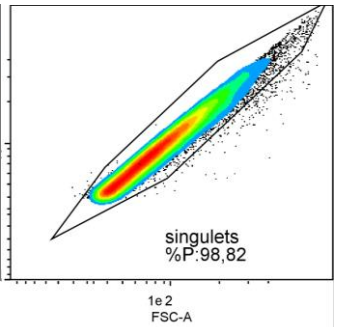
Methodologies

Flow cytometry: to **detect, identify and count specific cells** on the **basis** of the **expression of cell surface proteins (marker)** (using coupled dye-antibodies).

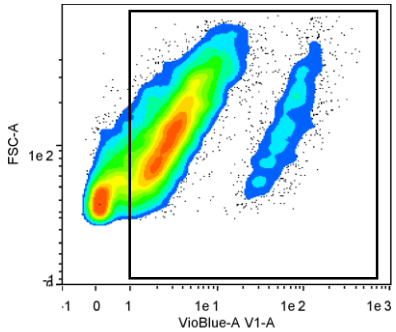
Gating strategy



Total events



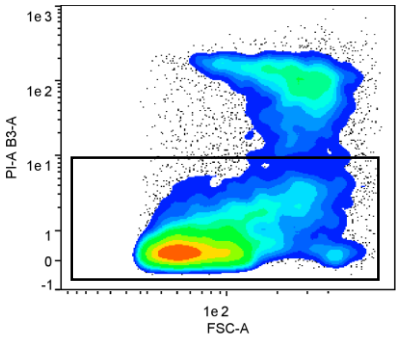
Singulets (single cell)



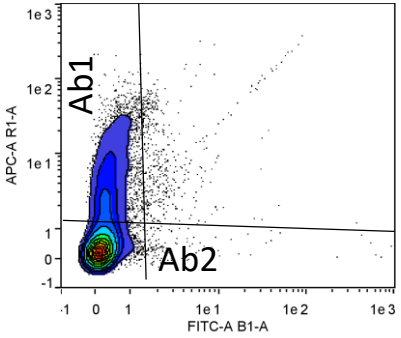
DNA labeling of cells (Hoechst 33342)

Result 1: cell concentration in colostrum and milk

Result 2: quantification of stem-like cell concentration in colostrum and milk



Live cells



Labeled cells

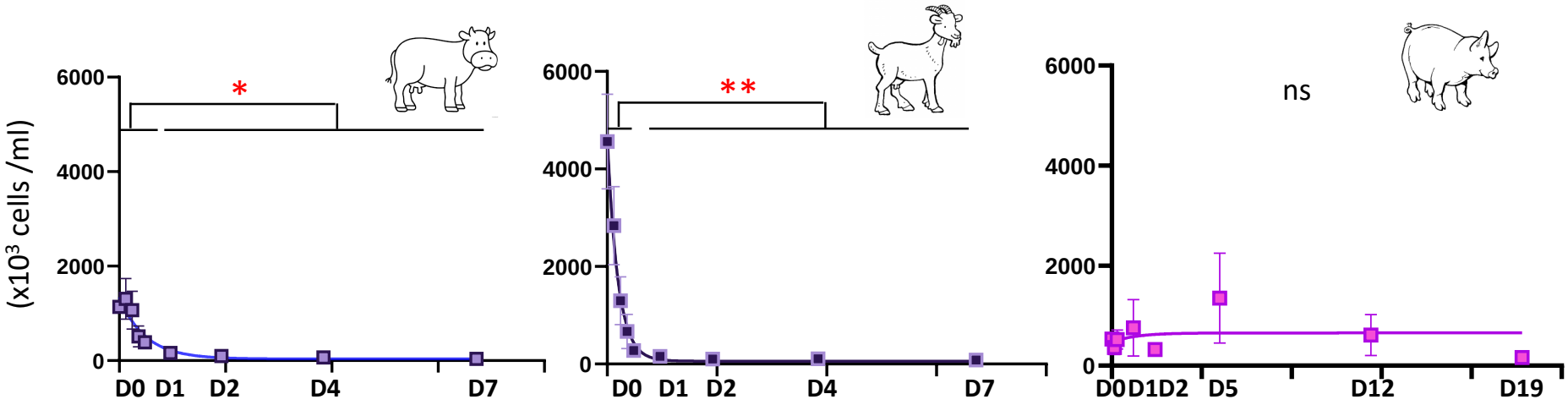
Identification of stem-like cells

Panels (combination of antibodies) for identification of stem cells

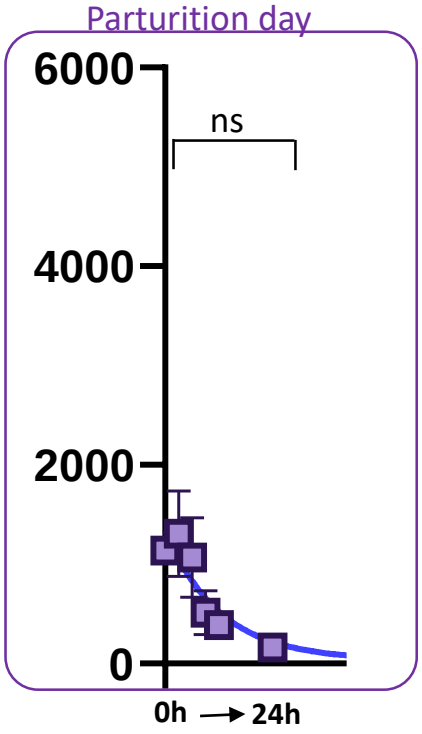
Stem-like cells	Marker 1	Marker 2	Marker 3	Marker 4	Pheno-type
Epithelial oriented	CD49f	CD24			$CD49f^{pos}$ $CD24^{pos}$
Mesenchymal oriented	CD34	CD90	CD105	CD29	$CD34^{neg}$ $CD90^{pos}$ $CD105^{pos}$ $CD29^{pos}$
Hematopoïetic oriented	CD45	CD34	CD117	CD90	$CD45^{neg}$ $CD34^{pos}$ $CD117^{pos}$ $CD90^{pos}$

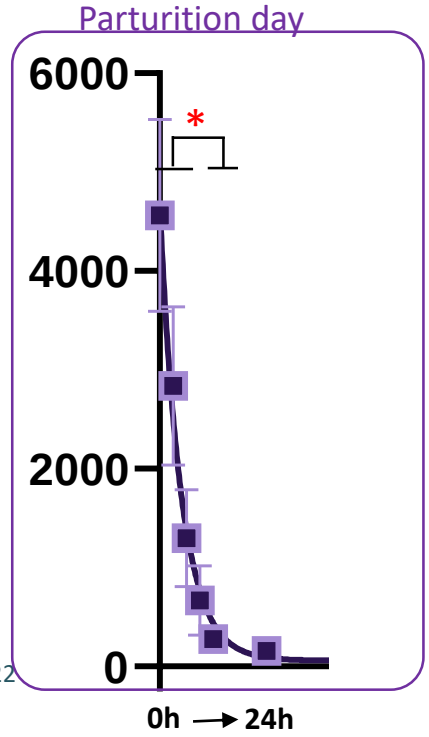
Cell concentration in colostrum and milk

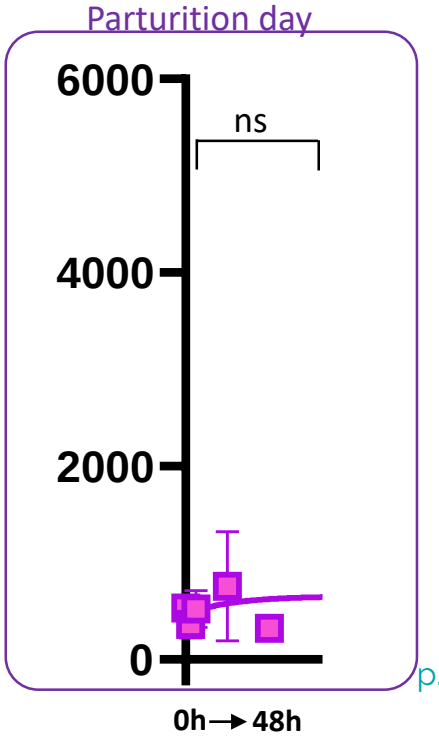
Total cells / ml of colostrum or milk (± SEM)



ZOOM

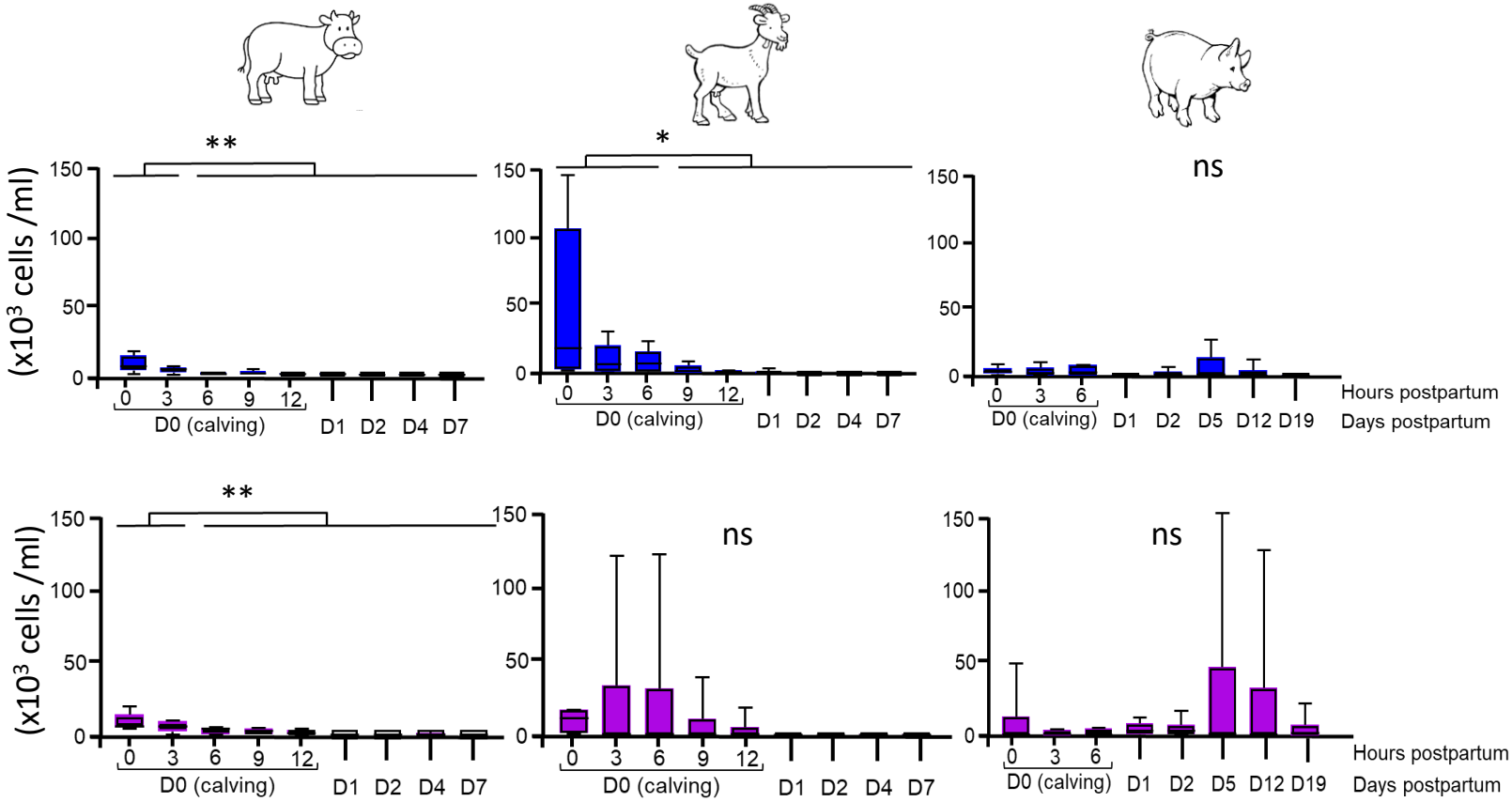






Quantification of stem-like cells

Concentration in thousand of cells related to viable cells per mL (± SEM)



Hematopoietic Stem-like cells (CD45- C34+ CD117+ CD90+)

0.01% (± 0.01)

0.00% (± 0.001)

0.06% (± 0.02)

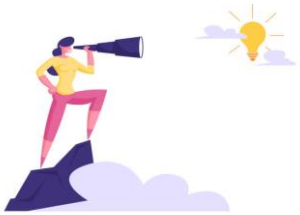
*Kinetic time effect : * p<0.05; ** p<0.001*

To conclude

- Stem-like cells are found in higher concentration in the colostrum collecting during the first hours after parturition

- Stem-like cells are mostly epithelial and mesenchymal oriented

What are the prospects of this work…



- From the offspring side

  Exploring the fate of these cells once transferred to the offspring : Do they pass through the intestinal barrier, colonize organs, strengthen the immunity of the newborn?

Thank you

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