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

Laurence Finot, Eric Chanat, Marion Boutinaud, H el ene Quesnel

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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 mice⁴

⁴ Aydin et al, 2018



> The Transmilk project : objective

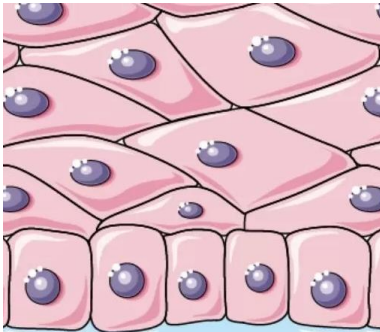
⇒ Deciphering the presence of stem-like cells in milk secretions of 3 farm animals (cow, goat and sow).

⇒ What types of stem-like cells?

Epithelial oriented



Epithelium



Mesenchymal oriented



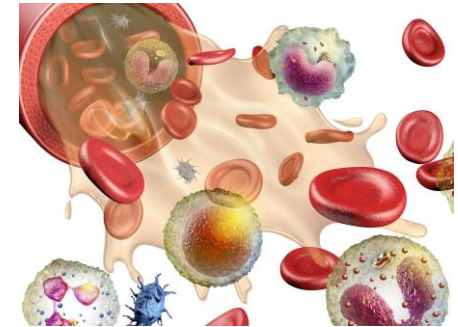
Connective or adipose tissue



Hematopoietic oriented



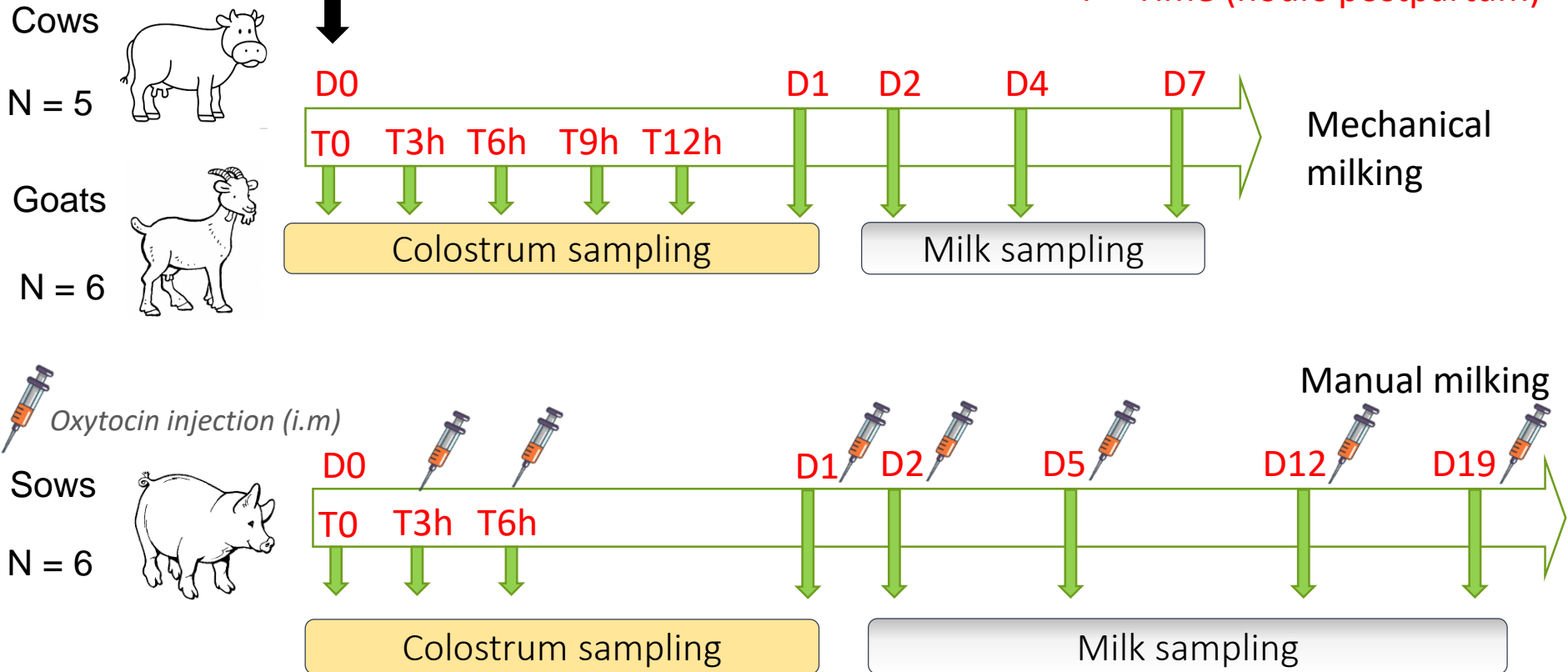
Blood and immune cells



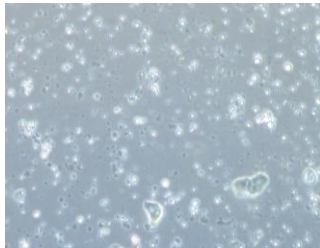
Experimental design

Kinetics of colostrum and milk collection from multiparous animals

D = day
T = Time (hours postpartum)



➤ Sampling analysis



Colostrum and milk



**Recovery and Isolation of cells
from fresh colostrum and milk**



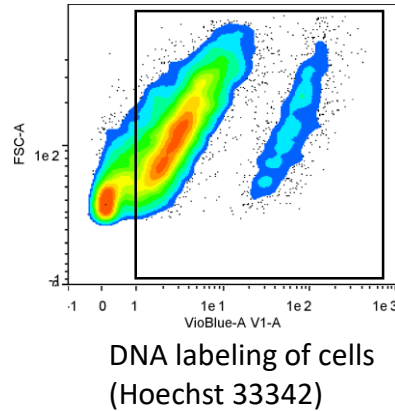
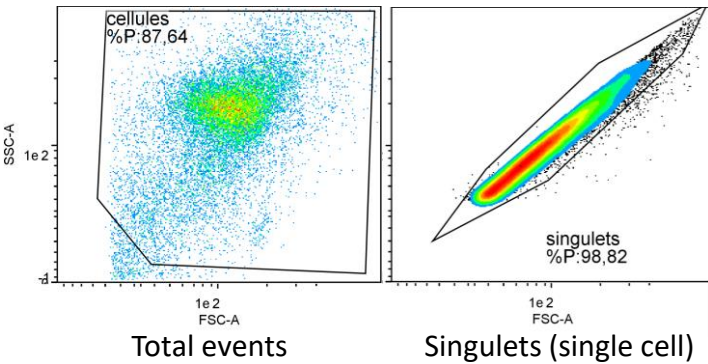
Flow Cytometry

➤ Methodologies



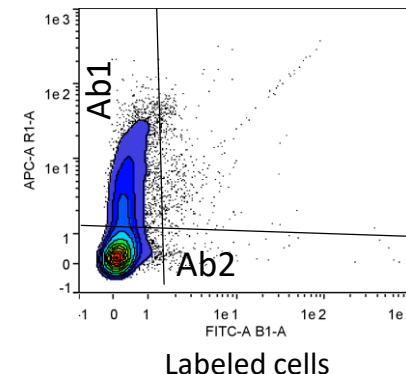
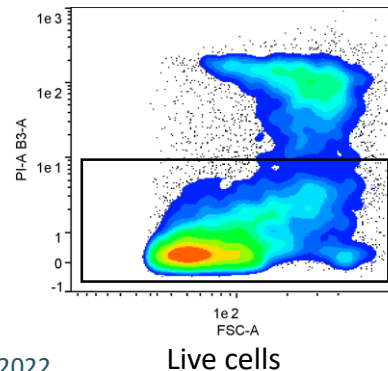
Flow cytometry: to detect, identify and count specific cells on the basis of the expression of cell surface proteins (marker) (using coupled dye-antibodies).

Gating strategy



Result 1: cell concentration in colostrum and milk

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



> Identification of stem-like cells

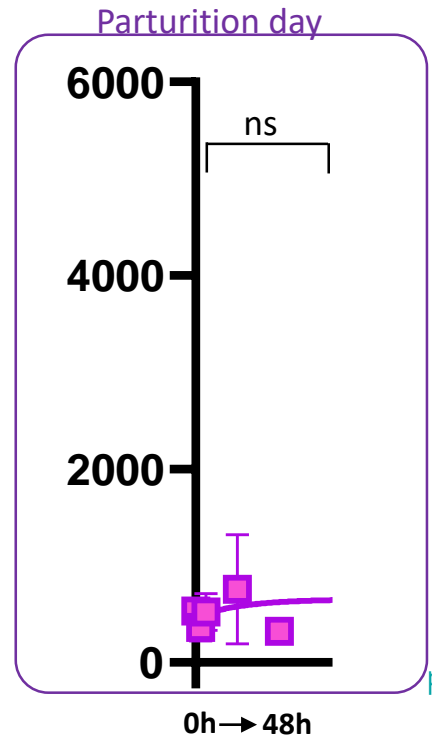
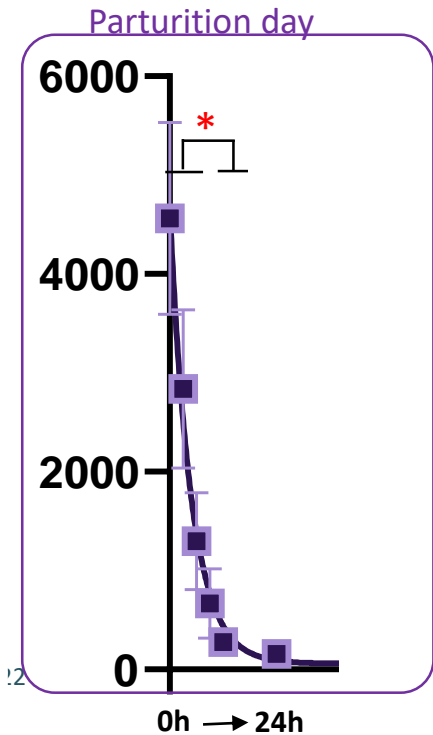
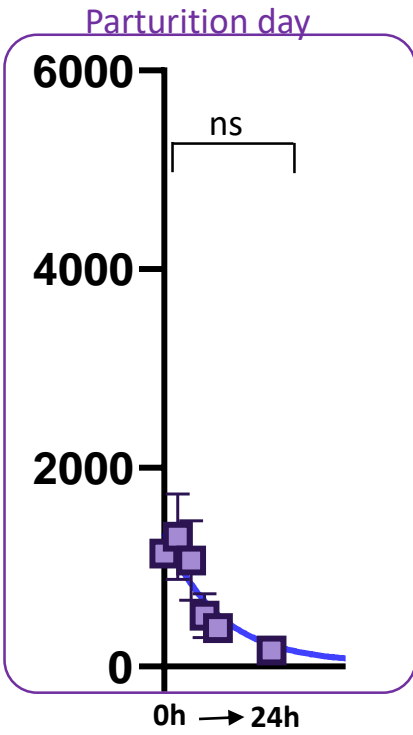
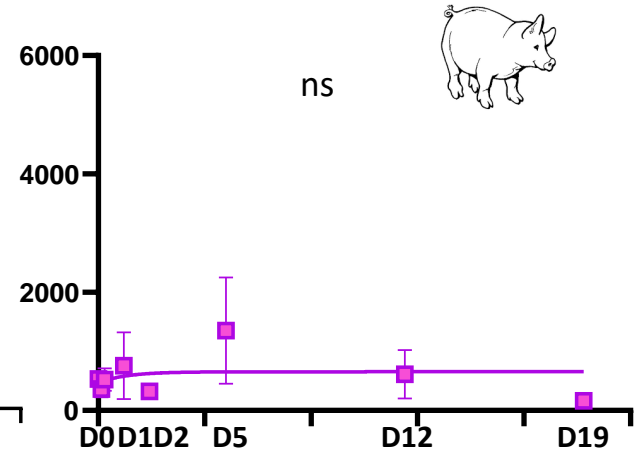
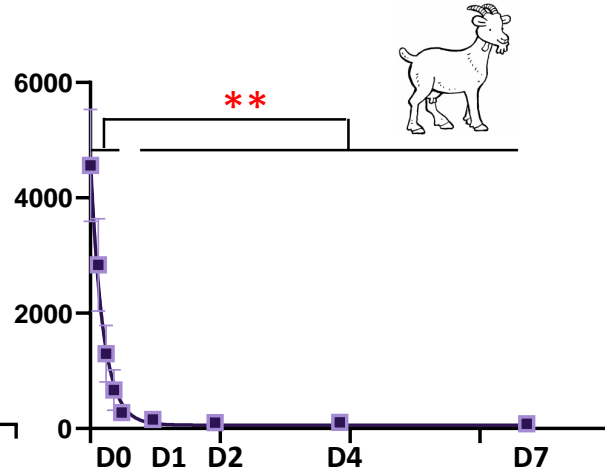
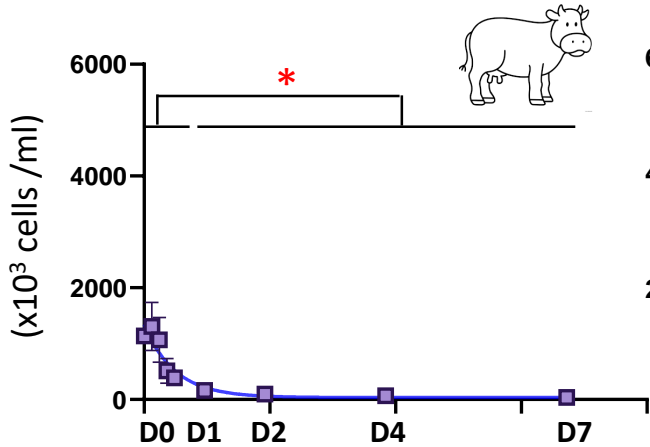
Panels (combination of antibodies) for identification of stem cells

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}



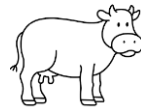
➤ Cell concentration in colostrum and milk

Total cells / ml of colostrum or milk (\pm SEM)

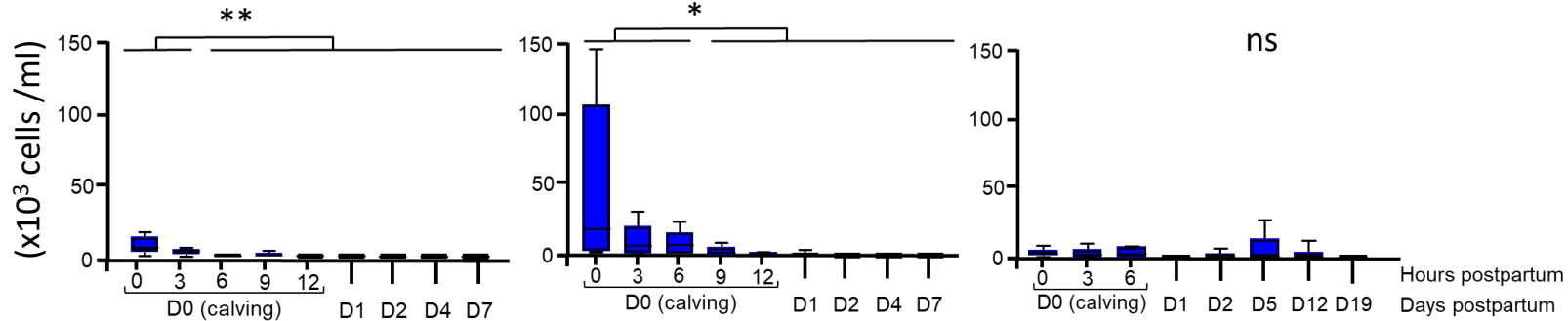


Quantification of stem-like cells

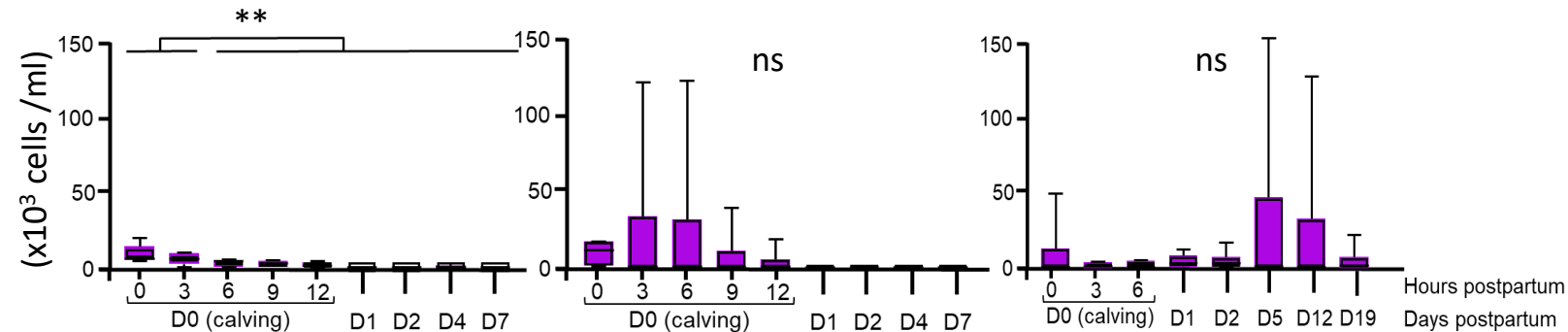
Concentration in thousand of cells related to viable cells per mL (\pm SEM)



Epithelial stem-like cells
($CD49^{f+} CD24^{+}$)



Mesenchymal Stem-like cells
($CD34^{-} CD90^{+}$
 $CD105^{+} CD29^{+}$)



Hematopoietic Stem-like cells
($CD45^{-} C34^{+} CD117^{+} CD90^{+}$)

0.01% (\pm 0.01)

0.00% (\pm 0.001)

0.06% (\pm 0.02)

> 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

To contact me: laurence.finot@inrae.fr



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International scientific meeting on colostrum / 2022