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Housing hygiene conditions impact adult stem cell populations in adipose and muscle tissues of pigs

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In pigs, the lean mass/fat mass ratio determines production efficiency and is strongly influenced by the number and size of cells in the tissues. During growth, the increase in the number of cells results from the recruitment of different populations of multipotent adult stem cells residing in the tissues. We hypothesized that the impact of a hygiene challenge on the proportions of adult stem cells in adipose tissue and skeletal muscle may differ between pigs with different residual feed intake (RFI), a measure of feed efficiency. At the age of 11 weeks, Large White pigs from two lines divergently selected for low and high RFI were placed in two contrasting housing hygiene conditions (good vs poor). After six weeks of challenge, pigs were slaughtered ($n = 6/\text{group}$). Samples of subcutaneous adipose tissue and longissimus muscle were removed, and cells from the stromal vascular fraction (SVF), which includes adult stem cells, were isolated for each tissue. Adipose and muscle cell populations from the SVF were phenotyped by flow cytometry using antibodies that targeted different cell-surface markers (CD45 to identify hematopoietic cells; CD34, CD38, CD56 and CD140a to identify cells with adipogenic and/or myogenic potential). Adipose tissue and muscle shared some common cell populations with differences in their proportions. For example, CD45-CD56+ cells were abundant in both tissues, with an average proportion of 74% in muscle and 40% in adipose tissue. Among the cell populations identified in adipose tissue, the proportion of CD45-CD56-CD34- cells were higher ($P < 0.05$) in pigs housed in poor hygiene than in good hygiene conditions whatever the RFI line. In skeletal muscle, preliminary analyses indicate there was an increase ($P < 0.05$) in the proportion of CD45+ cells in pigs of both RFI lines housed in poor hygiene conditions compared with those housed in good conditions. Other cell populations are poorly affected by hygiene of housing. This study shows that hygiene of housing conditions has an impact on some populations of adult stem cells in adipose and muscle tissue, without any difference between the two pig lines. The animal experimentation was funded by the EU FP7 PROHEALTH project (no. 613574).

Dear Dr Louveau,

Thank you for submitting your abstract, we have received your contribution for EAAP Annual Meeting 2021, Davos, Switzerland in good order.

Abstract no.: 35966

Abstract title: Housing hygiene conditions impact adult stem cell populations in adipose and muscle tissues of pigs

Author: Quéméner, A., Dessauge, F., Perruchot, M.H., Le Floc'h, N., Louveau, I.

Preferred presentation: Theatre

Preferred session: 71: Nutrient competition between production and animal health - crosstalk between nutrition, immunity, and microbiota win-win strategies between growth and maintenance functions (including health and welfare)

Abstract text:

In pigs, the lean mass/fat mass ratio determines production efficiency and is strongly influenced by the number and size of cells in the tissues. During growth, the increase in the number of cells results from the recruitment of different populations of multipotent adult stem cells residing in the tissues. We hypothesized that the impact of a hygiene challenge on the proportions of adult stem cells in adipose tissue and skeletal muscle may differ between pigs with different residual feed intake (RFI), a measure of feed efficiency. At the age of 11 weeks, Large White pigs from two lines divergently selected for low and high RFI were placed in two contrasting housing hygiene conditions (good vs poor). After six weeks of challenge, pigs were slaughtered (n = 6/group). Samples of subcutaneous adipose tissue and longissimus muscle were removed, and cells from the stromal vascular fraction (SVF), which includes adult stem cells, were isolated for each tissue. Adipose and muscle cell populations from the SVF were phenotyped by flow cytometry using antibodies that targeted different cell-surface markers (CD45 to identify hematopoietic cells; CD34, CD38, CD56 and CD140a to identify cells with adipogenic and/or myogenic potential). Adipose tissue and muscle shared some common cell populations with differences in their proportions. For example, CD45-CD56+ cells were abundant in both tissues, with an average proportion of 74% in muscle and 40% in adipose tissue. Among the cell populations identified in adipose tissue, the proportion of CD45-CD56-CD34- cells were higher ($P < 0.05$) in pigs housed in poor hygiene than in good hygiene conditions whatever the RFI line. In skeletal muscle, preliminary analyses indicate there was an increase ($P < 0.05$) in the proportion of CD45+ cells in pigs of both RFI lines housed in poor hygiene conditions compared with those housed in good conditions. Other cell

populations are poorly affected by hygiene of housing. This study shows that hygiene of housing conditions has an impact on some populations of adult stem cells in adipose and muscle tissue, without any difference between the two pig lines. The animal experimentation was funded by the EU FP7 PROHEALTH project (no. 613574).