STRESS, MAST CELLS AND INTESTINAL BARRIER FUNCTION IN PRE-WEANING AND POST-WEANING PIGLETS.

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INTRODUCTION AND OBJECTIVE.

The intestinal mucosa is a physical and immunological barrier. The intestinal barrier function is the ability of the epithelium to form a selectively permeable barrier made up of tight binding proteins, mucus and sub-epithelial immune cells.

Stress causes in piglets the release of corticotropin-releasing hormone (CRH), that acts on the mast cells, causing their degranulation. This degranulation releases mediators that alter the intestinal barrier function.

This work is part of a study that aimed to see if enrichment reduced stress and improved the intestinal barrier. The hypothesis was based on the assumption that stress increases the concentration of mast cells and goblet cells at the intestinal level. Therefore, a decrease of this concentration indicates a reduction of stress and an improvement of the intestinal barrier.

RESULTS AND DISCUSSION.

The increase in the number of mast cells after weaning was possibly because the animals stopped receiving milk immunomodulatory factors (Pohl et al. 2015).

Lower counts of goblet cells and mast cells in pre-weaning animals may be due to reduced stress caused by enrichment (da Silva et al. 2014; Pohl et al. 2017).

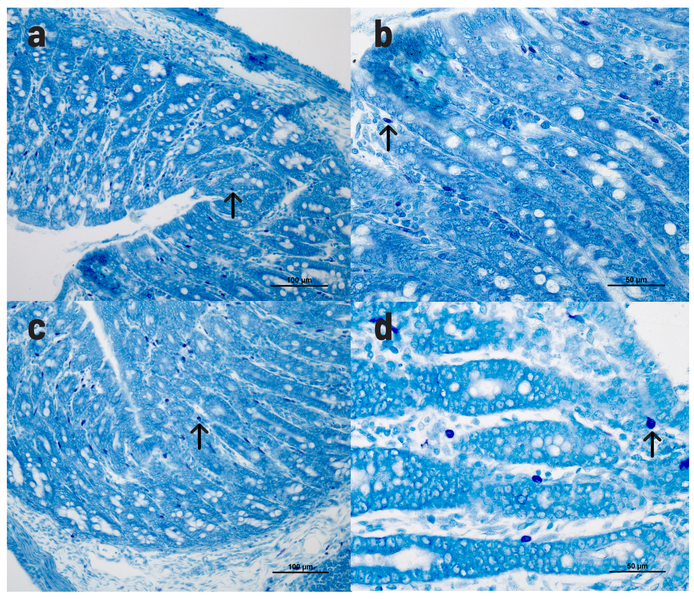

Figure 2. ***Mast cells in the intestinal mucosa of treated pre-weaning piglets (a and b) and control (c and d) on the number of mast cells in mucosa and submucosa of the colon.*** Segments of colon were fixed with Carnoy, sectioned, and stained with toluidine blue to show the mast cells. Arrows indicate mast cells with positive toluidine blue.

CONCLUSIONS.

Stress in early life is an important factor in the dysfunction of intestinal barrier function in piglets. This work shows that weaning causes an increase in the number of intestinal mast cells. In addition, this number, like that of goblet cells, can be reduced by reducing stress in pre-weaning animals by providing them with toys and allowing them to interact with animals from different sows.

The management change proposed in this work can be a new strategy to reduce stress and improve animal welfare, thus improving their health and decreasing their susceptibility to diseases, especially intestinal.

EXPERIMENTAL DESIGN.

The treated animals were given toys and allowed to interact with animals of different sows.

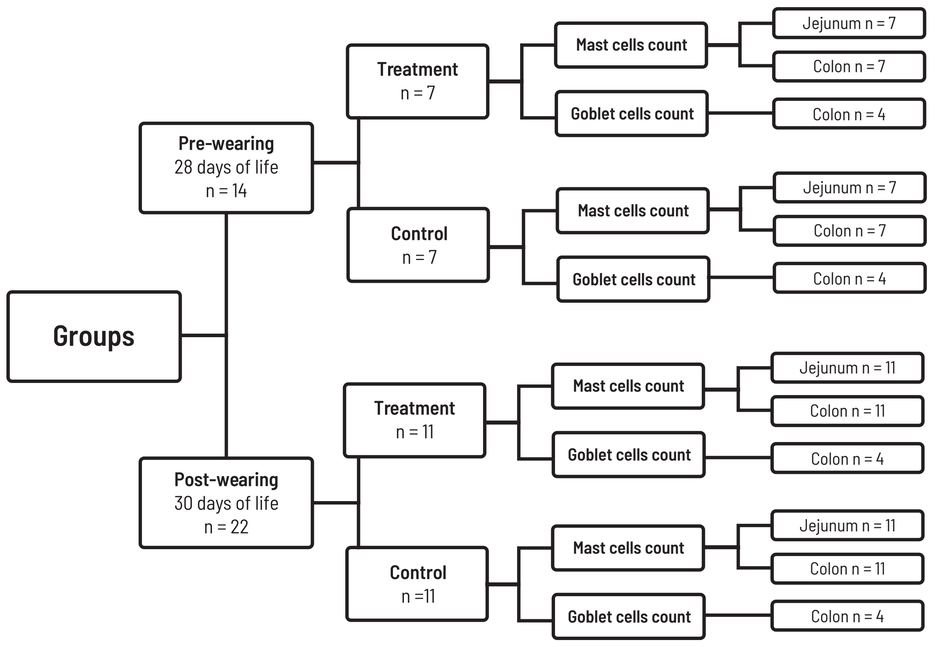

Figure 1. ***The experimental design.***

All counts were made at 400 magnifications.
Mast cells: were counted in 20 random fields of mucosa, 20 of submucosa, 20 of muscle and 20 of serosa.
Goblet cells: were counted in 5 random fields of mucosa.

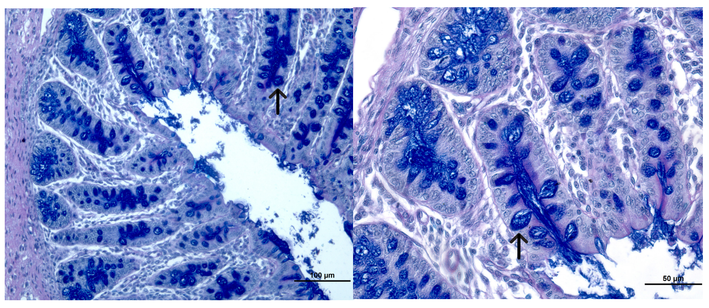

Figure 3. ***Goblet cells in the intestinal mucosa in the colon of piglets.*** Colon segments were fixed with Carnoy, sectioned, and stained with PAS (Periodic Acid-Schiff) to show the goblet cells. Arrows indicate the goblet cells with a blue-purple coloration.

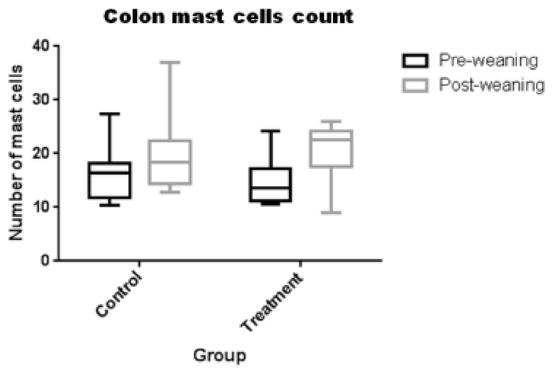

Figure 5. ***Number of mast cells in the mucosa and submucosa of colon stained with toluidine blue.*** Although the results were not significant, mast cell counts in the pre-weaning group were significantly lower than in the weaned animals. In addition, the counts were lower in treated and unweaned animals than in their control group. A trend towards a higher mast cell count was also observed in the post-weaning treated group compared to their control group.

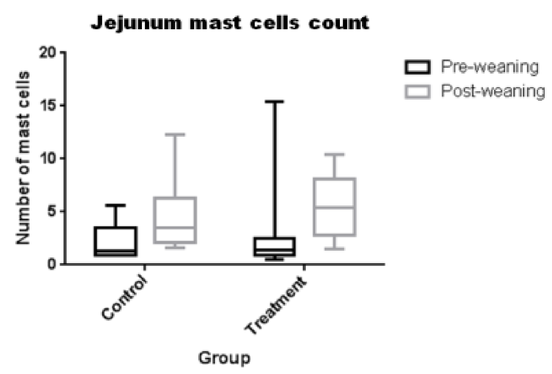

Figure 4. ***Number of mast cells in the jejunum mucosa and submucosa stained with toluidine blue.*** Although the results were not significant, it was observed that there was a lower mast cell count in treated animals without weaning compared to the other groups. There was also a tendency for treated animals, after weaning, to have more mast cells compared to their control group.

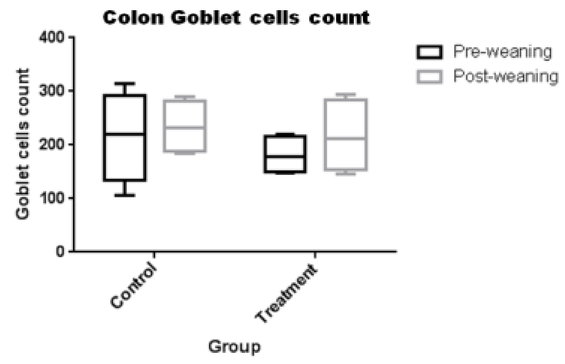

Figure 6. ***Number of goblet cells in the colon mucosa of weaned and unweaned animals, stained with PAS (Periodic Acid-Schiff) staining.*** Although the differences were not significant, a lower goblet cell count was observed in the treated group compared to their control group in the pre-weaning animals.

BIBLIOGRAPHY

Pohl CS, Medland JE, Moeser AJ. 2015. Early-life stress origins of gastrointestinal disease: animal models, intestinal pathophysiology, and translational implications. Am. J. Physiol. - Gastrointest. Liver Physiol. 309:G927–G941.

Pohl CS, Medland JE, Mackey E, Edwards LL, Bagley KD, DeWilde MP, Williams KJ, Moeser AJ. 2017. Early weaning stress induces chronic functional diarrhea, intestinal barrier defects, and increased mast cell activity in a porcine model of early life adversity. Neurogastroenterol. Motil. 29:1–13.

da Silva EZM, Jamur MC, Oliver C. 2014. Mast Cell Function: A New Vision of an Old Cell. J. Histochem. Cytochem. 62:698–738.