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Transcription regulation of global gene expression profiling reveals lactoferrin intervention influences neurodevelopment and cognition

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Background/Aims: To test the hypothesis that Lf may induce gene expression profiling and function to improve neurodevelopment and cognition in postnatal piglets, an animal model for human infants.

Methods: 3-day-old male piglets were randomly allocated to 2 groups. Group 1 were fed milk replacer supplemented with Lf at dose level of 0.6g/L (n=17) and Group 2, 0.06 g/L (n= 16; control). RNA was isolated from the hippocampus of 10 piglets/group and subjected to transcript profiling using a Porcine Affymetrix GeneChips representing 20,201genes from S. scrofa. A TaqMan® Gene expression assay based real-time PCR was used to validate the microarray findings. Results were analyzed using Partek Genomics Suite 6.5 software and Ingenuity System (Ingenuity® System, Redwood City, CA, USA).

Results: A total of 1,187 genes were differentially expressed between the control and Lf groups, based on our filter criteria (fold change: 1.15 and $p<0.05$). A positive global effect of Lf on neurodevelopment and cognition was observed, as evidenced by the modulation of a wide range of neuronal processes including an increase in cellular protrusions, microtubule dynamics, formation and organization of neurite outgrowth, cytoskeleton formation, and a decrease in anxiety. Microarray results were validated using TaqMan® gene expression assays which showed that Lf up-regulated the BDNF gene and signaling pathway known to influence early neurodevelopment and cognition in postnatal mammals.

Conclusions: Lf supplementation up-regulated several canonical signaling pathways associated with neurodevelopment and cognition, the principal one being BDNF.

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