Duodenal ferroportin expression in nursing piglets is unresponsive to dietary iron excess

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Nicole Doan, Yining Wang, Eric Nonnecke, Bo Lönnerdal, and Peng Ji*
Department of Nutrition, University of California Davis (penji@ucdavis.edu)

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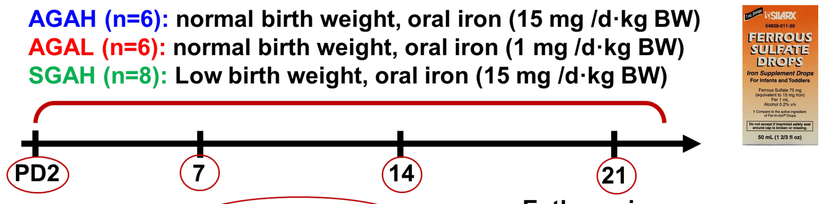
INTRODUCTION & HYPOTHESIS

- In the US, prophylactic iron supplementation is commonly practiced at 4 – 6 months of age without screening test of iron status of the infants.
- Preterm infants and infants born small for gestational age receive iron therapy shortly after birth to compensate for low iron store during gestation.
- The optimal dose of iron supplement or therapeutic iron is unclear, and there is an emerging concern over the potential adverse effects of iron over-supplementation during infancy. (Hare et al., *Lancet Child Adolesc Health*, 2018)
- We used a nursing piglet model to assess the effects of dietary iron excess on iron metabolism and systemic iron homeostasis.

MATERIALS & METHODS

- EXPERIMENTAL DESIGN:
  - ✓ Twelve piglets with normal birth weight (BW = 2.06 kg on PD2) were randomly assigned to high (AGAH) or low iron (AGAL) treatment on PD2. Eight piglets with low birth weight (BW = 1.18 kg on PD2) were assigned to high iron treatment (SGAH) on PD2.
  - ✓ Iron (ferrous sulfate drops) were give by oral gavage daily.

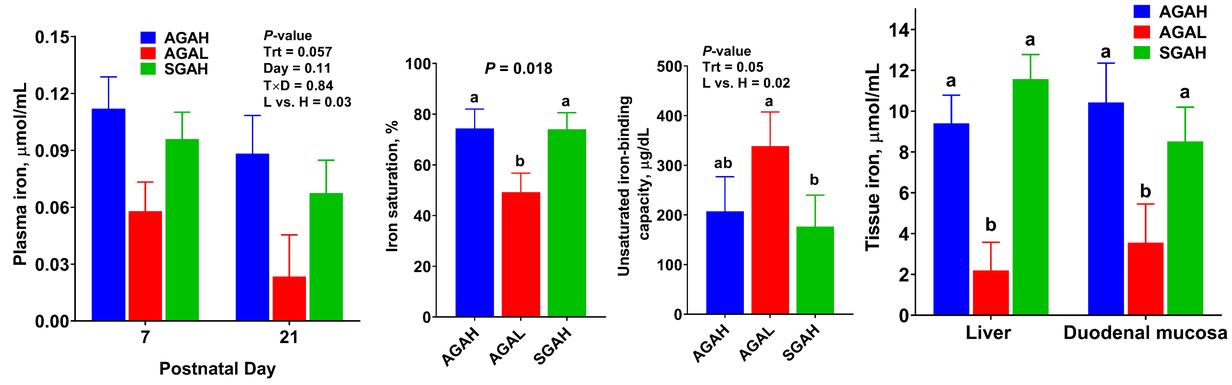
AGAH (n=6): normal birth weight, oral iron (15 mg /d·kg BW)
AGAL (n=6): normal birth weight, oral iron (1 mg /d·kg BW)
SGAH (n=8): Low birth weight, oral iron (15 mg /d·kg BW)

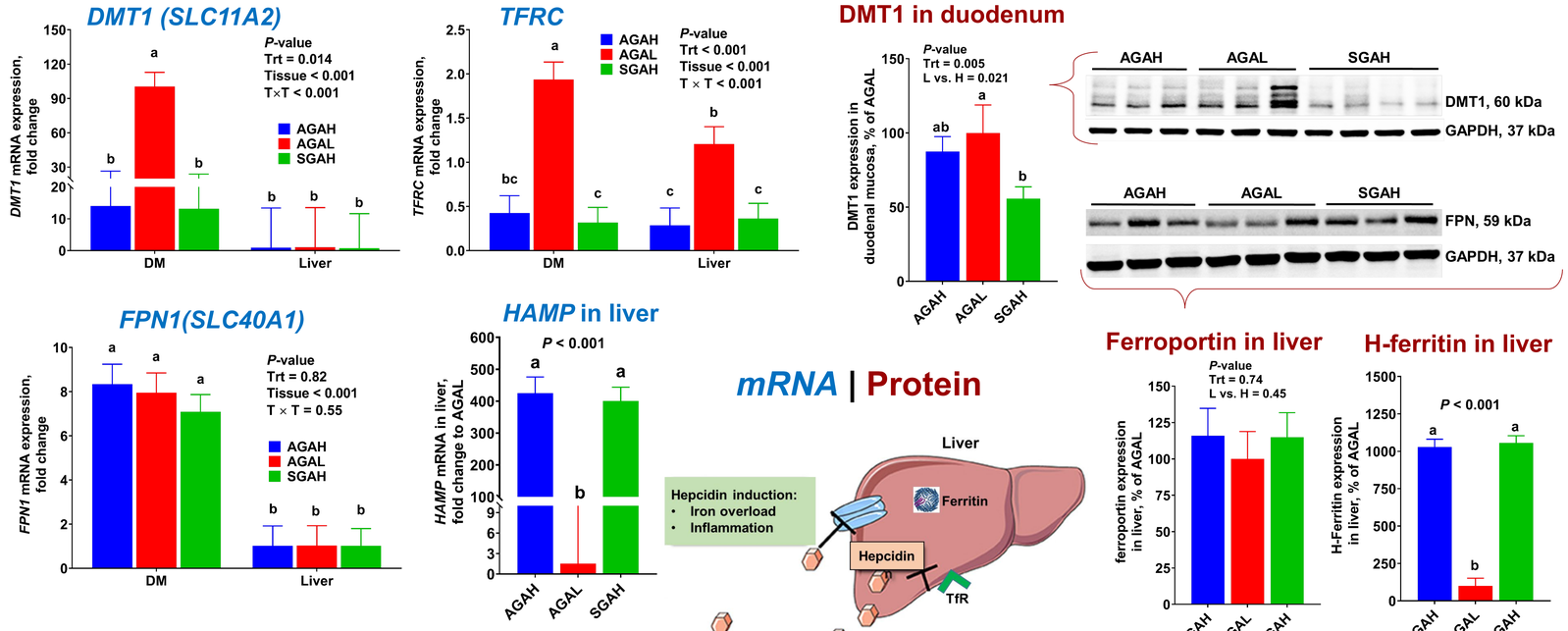


- ANALYSES
  - ✓ Tissue and plasma iron: Atomic absorption spectrometry
  - ✓ Transferrin saturation: TIBC kit (Pointe Scientific)
  - ✓ Gene and protein expression: RT-qPCR and western blot
  - ✓ Primary Ab: Ferroportin & DMT1 (Novus Biologicals); H-ferritin (Abcam)

RESULTS

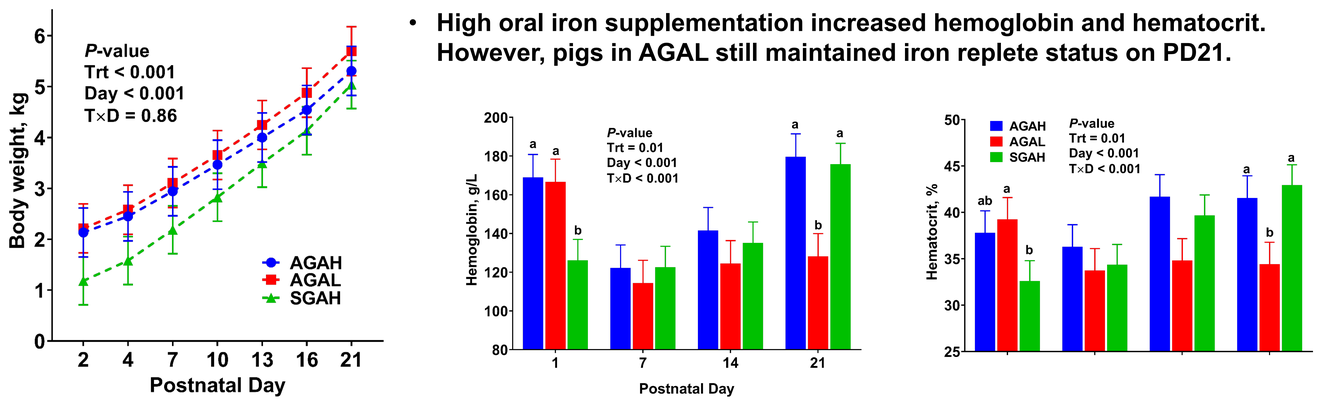
- High iron supplement resulted in iron overload in liver and duodenum, and increased Tf saturation and plasma iron on PD21





RESULTS

- High oral iron supplementation increased hemoglobin and hematocrit. However, pigs in AGAL still maintained iron replete status on PD21.



CONCLUSIONS

- Dietary iron excess resulted in hepatic iron overload, high transferrin saturation and increased plasma iron concentration in nursing piglets.
- Despite drastic induction of the mRNA expression of hepcidin in the liver, protein expression of ferroportin in the duodenal mucosa was not reduced, but increased by iron over-supplementation.
- The unresponsiveness of ferroprotin to hepcidin-induced degradation may contribute to iron efflux to blood circulation. increase of Tf saturation and liver iron overload in nursing piglets