70th Annual Meeting of the European Federation of Animal Science

NO.31161

Effects of creep feed copper level on the health and ionomic profiles of suckling piglets

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Objectives

This study aims to assessed the safety and necessity of high-level copper in antibiotic free creep feed.

Introduction

Using high-level copper as the alternate of antibiotic growth promoters in animal production, which in order to control the emergence and propagation of antibiotic resistance have encountered limited success. High-level of copper in diet might further enhance the co-selection toward antibiotic resistant bacteria. In China swine industry, copper was generally supplemented above the National Research Council (NRC, 2012) requirement, and the antibiotic in swine production was not banned until now, so it is concerned that whether this excess supplementation of Cu in feed is necessary.

Methods

172 piglets from 18 multiparous Suhuai sows (inseminated twice) were blocked by their anticipated farrowing dates and assigned to 2 rooms (9 litters/room, 10 piglets per litter), copper supplementation from Cu sulfate ($CuSO_4$), (i) a low-copper (LC, 6 $mg \cdot kg^{-1}$) diet containing no supplemental Cu; (ii) a control (CON, 20 $mg \cdot kg^{-1}$) diet; or (iii) a high-copper (HC, 300 $mg \cdot kg^{-1}$) diet. The piglets were allowed free access to feed and water during the 26-day (14-40 days of age) animal trial. Before weaning, 3 litters were chosen within each treatment. Hair, feces and blood samples were harvested on 4 piglets/litter (half male and female). Thirteen elements including macro (Ca, Mg, Na, K, P), micro (Fe, Cu, Mn, Zn, Cr) and toxic (Pb, Al, Ni) elements in hair, serum, and feces were measured.

Results and Conclusions

Dietary 300 $mg \cdot kg^{-1}$ copper promoted growth in the short term, but lack of a significantly growth response over the entire experimental period. Dietary 6 $mg \cdot kg^{-1}$ Cu seems unable to meet the nutritional needs of suckling piglets. Dietary 20 $mg \cdot kg^{-1}$ Cu could effectively improve the antioxidant ability, protect tissues from oxidative damage, and maintained the homeostasis due to keep the interaction between macro and micro elements, which seems suitable to meet the needs and maintain the health of Suhuai suckling piglets.

Acknowledgement

This research was supported by the earmarked fund for Jiangsu Agricultural Industry Technology System (JATS[2018]287), the National Natural Science Foundation of China (31372321).

Fig 1. Effect of dietary copper on the growth performance of suckling piglets

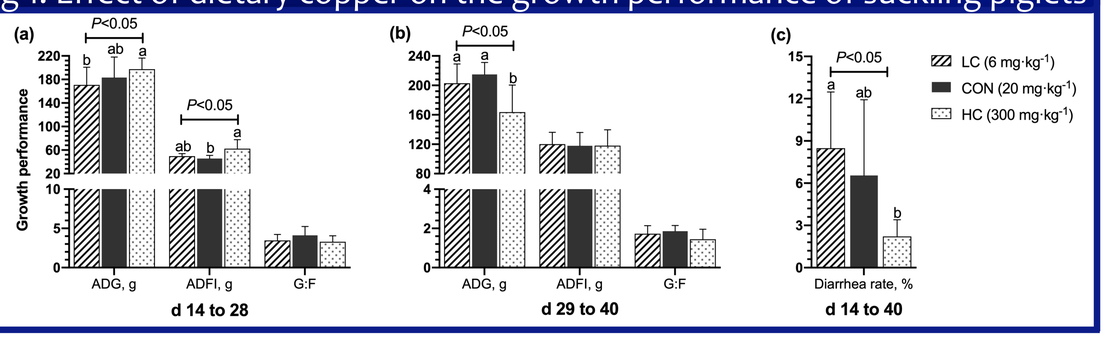


Fig 2. Effect of dietary copper on serum biochemical parameters of suckling piglets

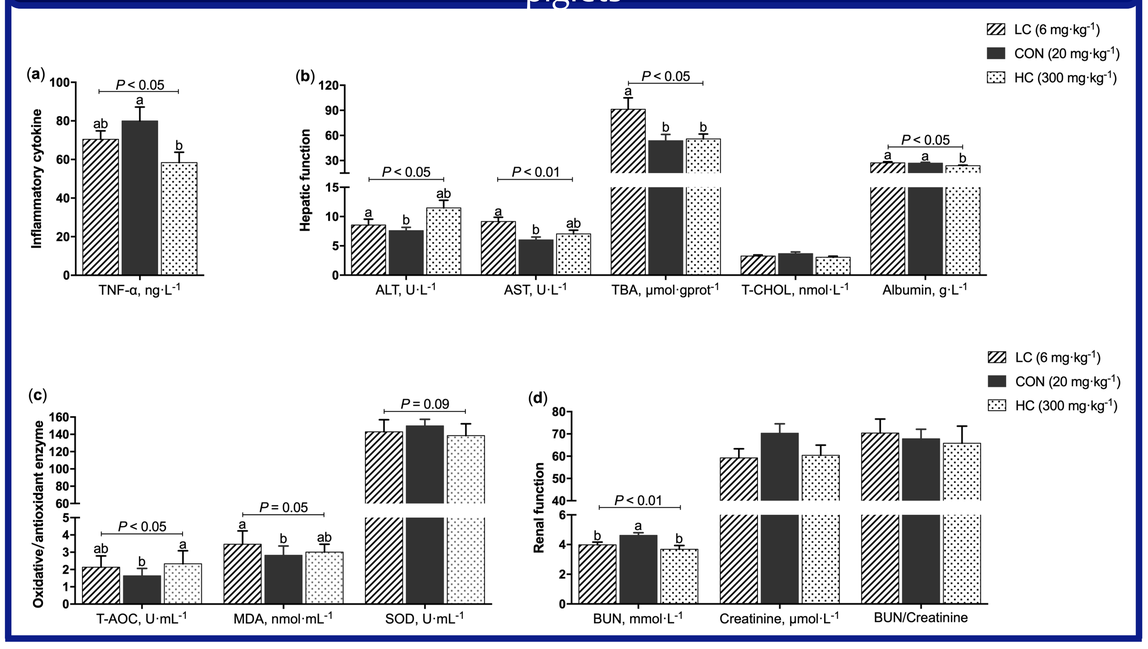


Fig 3. Effect of dietary copper level on hair, serum and fecal ion concentrations of suckling piglets

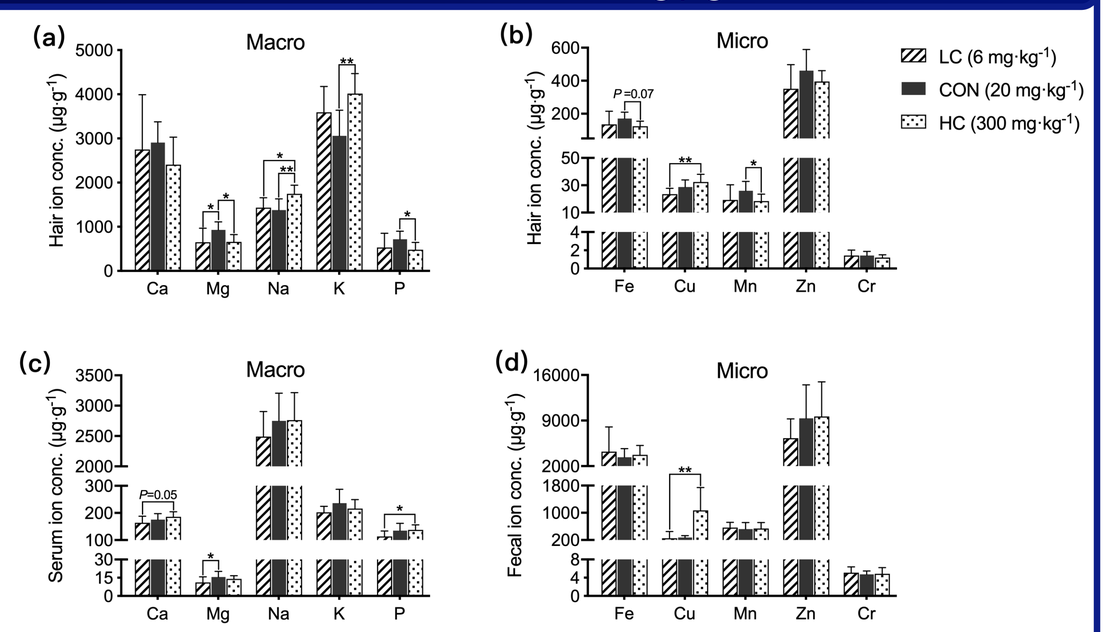
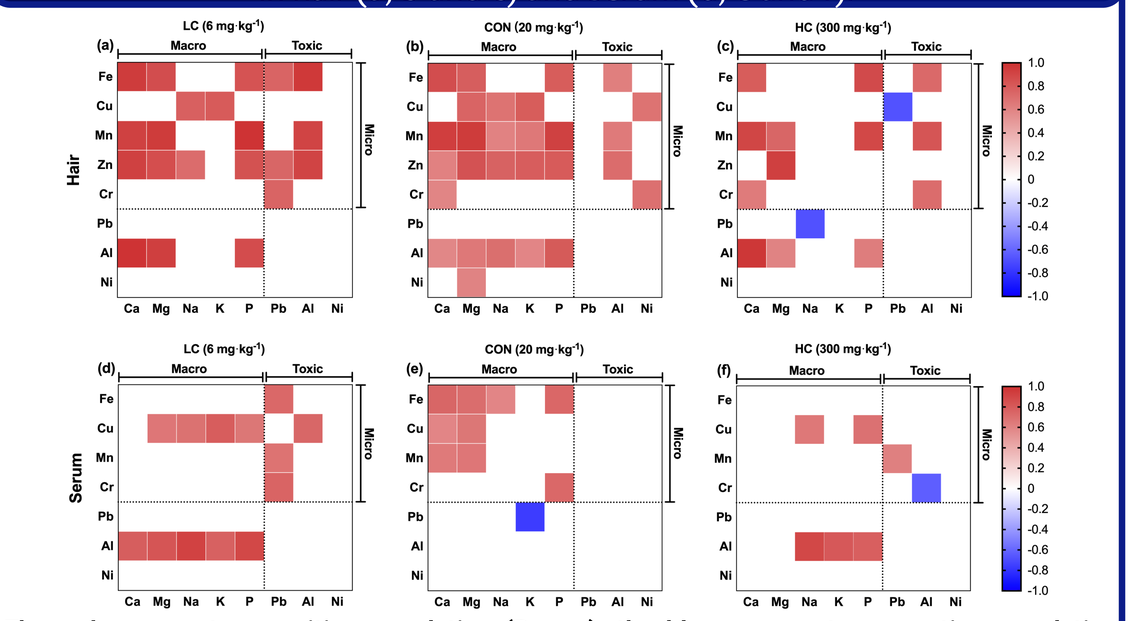


Fig 4. The macro-micro, macro-toxic and micro-toxic correlation pattern were presented with different dietary copper level (6, 20 and 300 mg·kg-1) in hair (a, b and c) and serum (d, e and f).



The red represents a positive correlation (P<0.05), the blue represents a negative correlation (P<0.05), and the white shows that the correlation was not significant (P>0.05).

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