Editorial

The Regulation of Innate Immunity by Nutritional Factors

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Recent years have witnessed growing interest in the biochemistry and physiology of nutrients for mammals, such as amino acids, fatty acids, polyphenols, and oligosaccharide. Notably, dietary nutrients have critical importance on immune function, especially in the pathogenesis of many immune related diseases including autoimmune diseases, inflammatory bowel disease (IBD), and cancer. These studies propose the way to manipulate immune associated diseases with a nutritional aspect.

This special issue provides us with a better understanding of the role of nutrition on immunity at the molecular, cellular, and organ level, which suggests possible implications in nutritional manipulations.

Mingxin Li et al. explored the effect of dietary methionine restriction on bone density and function of natural killer cells in mice. The results revealed that methionine-restricted diet decreases the bone mass and reduces the cytotoxicity of NK cells. Vitamin D has profound implications for animal and human health. However, the influence of the vitamin D signaling pathway on immunity and how it is regulated is only partially known which limits efforts to support immunity through the vitamin D pathway. R. Lin reviewed the recent knowledge on how immune signals regulate vitamin D metabolism and how innate immune responses are modulated by ligand-bound vitamin D receptor. Although osteopontin (OPN) is associated with the pathogenesis of osteoarthritis (OA), the underlying mechanism of OPN in the biology of OA remains to be known. Y. Li et al. demonstrated that OPN enhances the production of matrix metalloproteinase 13 (MMP13) and activates the NF-κB pathway, while inactivation of NF-κB pathway reduces the production of MMP13. Y. Zhou et al. found that Fetuin-A may improve the excessive activation of hepatic stellate cells by inhibiting the expression of Smad2 and Smad3 genes but upregulating the Smad7 gene expression.

The gastrointestinal tract is particularly responsive to stressors and inflammatory mediators. Oregano essential oil (OEO) has long been used to improve the health of animals and is widely known for its antimicrobial and anti-inflammatory effects. Y. Zou et al. investigated the effects of OEO in the intestine of pigs and they found that OEO promotes intestinal barrier integrity. Mechanically, this modulation is probably through regulating intestinal bacteria and immune status in pigs. Weaning is known to compromise the digestive, absorptive, and secretory capacity of the small intestine, which can cause morphological and histological changes of the small intestine. M. C. B. Tossou et al. showed that tryptophan (Trp) affects the tight junction barrier and intestinal health in weaned pigs. They found that 0.15% Trp supplementation did not affect pig performance, while 0.75% Trp supplementation negatively affects intestinal morphology and tight junction proteins in weaned pigs.
Chitosan is an attractive additive for animal feed because of its inherent antimicrobial and anti-inflammatory properties. G. Guan et al. explored relationships between low dose dietary supplementation of chitosan and body weight, feed intake, intestinal barrier function, and permeability in mice. They used the mouse model and demonstrated that 30 mg/kg dose of chitosan supplementation did not influence growth performance but compromised intestinal barrier integrity. M. Iser et al. also found that Agave fourcroydes powder can be used as a dietary supplement which had beneficial effects on increasing the growth performance and serum concentration of IgG, as well as improving the gut morphology without affecting the hematology parameters in broiler rabbits. L. Cheng et al. purified and characterized thermostable β-Mannanase from Bacillus subtilis BE-91 which will have potential applications as a dietary supplement in treatment of inflammatory diseases.

The research article by M. Brianza-Padilla et al. showed that chronic ingestion of sucrose in rats induces the upregulation of inflammation related microRNAs (miR-21 and miR-223) in plasma and extracellular vesicles. H. Ni et al. reported that isoquinoline alkaloids, derived from Macleaya cordata extract, are beneficial to swine and poultry growth by increasing feed consumption, body mass, and weight, as well as the concentration of serum amino acids. Isoquinoline alkaloid also boosts the innate immune system by regulating the concentration levels of haptoglobin and serum amyloid A. X. Chen et al. found that miR-166a is the most highly enriched exogenous plant miRNAs in the blood of mice fed with rapeseed bee pollen. The study also suggested that food-derived exogenous miRNAs from rapeseed bee pollen could be absorbed in mice and the abundance of exogenous miRNAs in mouse blood is dependent on their original levels in the rapeseed bee pollen.

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