Opinion

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Resveratrol Play as Anti-Heat Stressor

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ABSTRACT

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A natural botanical polyphenolic compound, resveratrol (3,5,4'-trihydroxy-trans- stilbene) was reported to have anti-oxidation, anti-tumor, anti-inflammatory, neuro-protection and cardiovascular protection effects [1] Numerous studies have shown that resveratrol effectively eliminated reactive oxygen species (ROS), reduced DNA fragmentation, and enhanced the regulatory effects on growth factors and anti-inflammatory cytokines [1]. Resveratrol was considered to be important bioactive compound in monomers, and it has shown strong antioxidant capacity including scavenging free oxygen and lipid radicals [2]. Resveratrol is able to inhibit the formation of glutathione disulfide and keep glutathione in a reduced state, thereby inhibiting free radicals [3]. It has also been shown that resveratrol and its derivatives have activities of antimicrobial (bacterial), and anti-proliferation of cancer cells [4]. In recent study, resveratrol was shown to protect DNA damage against oxidative damage [5].

It has been reported that some plant polyphenols can also be used as anti-stress additives of livestock and poultry to alleviate tissue damage caused by heat stress [6,7]. Heat stress causes an imbalance in physiological status, a general reduction of the antioxidant system, and a reduction in the immunological function of chickens [8]. The research team leading by Dr. Jianhua He conducted a series of trial with broiler chicken to verify the anti-heat stress effect of resveratrol [1,9,10]. The resveratrol (≥98% purity) they used to be extracted from *Polygonum cuspidatum* at Hunan Engineering and Technology Center for Natural Products. He [9] reported that Resveratrol supplementation improved average daily gain ($p = 0.001$) and decreased ($p < 0.05$) rectal temperature from d 3 when compared with heat-stressed (maintain room temperature at 34°C for 8h from 9:00 to 17:00) birds fed diet without resveratrol. In addition, supplementation with resveratrol at 350 or 500 mg/kg lowered ($p < 0.05$) the contents of corticosterone, adrenocorticotropic hormone (which are highly related to heat stress); it also decreased the content of triglycerides, uric acid, malonaldehyde, and activities of aspartate aminotransferase, alanine aminotransferase, and lactate dehydrogenase, increased ($p < 0.05$) the levels of triiodothyronine, the ratio of triiodothyronine to thyroxine, total protein, glutathione, and activities of alkaline phosphatase, total superoxide dismutase, catalase, and glutathione peroxidase, the above results suggested that dietary resveratrol supplementation could improve the growth performance by positively regulating serum metabolic parameters and alleviating tissue oxidant damage of broilers under heat stress. The results provided by Liu [10] also showed that dietary supplemented with resveratrol improved growth performance, feed intake and body weight gain of black-boned chickens during heat stress period, while feed conversion ratio was decreased. And it reduced oxidative stress in heat-stressed black-boned chickens by increasing serum growth hormone concentrations and modulating the genes expression of heat shock protein in organs of the immune system. She also found that dietary supplementation with 400mg/kg of resveratrol improved the villus morphology, increased the numbers of goblet cells and lymphocytes, attenuated the mRNA overexpression of HSP70, HSP90 and NF-κB on the 6th, 10th and 15th days of heat stress (maintain room temperature at 34°C for 8h from 9:00 to 17:00)($P < 0.05$), activated the expression of EGF ($P < 0.05$) in the jejunal mucosa.

Resveratrol reduced protein expression of HSP70, HSP90 and NF-κB in the jejunal villus after 15-days heat stress, increased EGF expression from the lamina propria toward the epithelial cells of the villus. These results suggest that dietary resveratrol offers a potential nutritional strategy to improve intestinal morphology and alleviate jejunum mucosa injuries by modulating the mRNA and

protein expression of HSPs, epithelial growth factor and transcription factor in black-boned chickens subjected to circular heat stress. Liu [1] found that Resveratrol attenuated the heat stress-induced overexpression of Hsp27, Hsp70, and Hsp90 mRNA in the bursa of Fabricius and spleen and increased the low expression of Hsp27 and Hsp90 mRNA in thymus upon heat stress. Preliminary studies also have indicated some benefits of resveratrol supplementation to alleviate negative effect of heat stress, and increased SOD, GSH-Px and CAT enzyme activities in mice [11], quail [7] during heat stress exposure. Das [11] also observed that resveratrol is able to resist the body organ dysfunction induced by heat stress. Sahin [7] reported that resveratrol can inhibit the high-levels of HSP70/90, NF-κB proteins in quail liver during heat stress. In conclusion, dietary supplementation of resveratrol could alleviate the heat-stress effect of broiler by reduced oxidative stress and its recovery effect of intestinal damage caused by heat stress. It was suggested that eat resveratrol containing herbs or food may play benefit effect for Human in tropic area.

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