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Do immune organ weights indicate immunomodulation of polyunsaturated fatty acids?

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Introduction: The main immune organs in poultry are the thymus, spleen and bursa of Fabricius. During an immune response, mature lymphocytes and other immune cells interact with antigens in these tissues. Consequently, the mass of these organs can in some cases indicate immune status. Wang et al. (2000) observed that feeding laying chickens on diets rich in PUFA, especially n-3 PUFA, promoted the growth of the thymus, spleen and bursa up to 4 weeks of age. From the age of 4 weeks onwards, the immune tissue weight started to be suppressed and the bursa was degenerated in the course of 4 to 8 weeks of age. However, the authors observed that these changes in the immune tissues did not correlate with the immune function of thymus and spleen cells. Interestingly, the same phenomenon was observed in mice. For example, subcutaneous injection of 3.6 mg/day of pure linoleic, linolenic, or arachidonic acid into male C57Bl/6 mice daily for 10 days resulted in up to a two- to threefold increase in spleen weight. In another study, the authors fed *Listeria monocytogenes* infected or non-infected mice on 20% fat diet rich in either n-3 PUFA, linoleic oleic, or saturated fatty acids for 6 weeks. Results showed that spleens were 12-22% heavier in the infected mice fed the n-3 PUFA diets than in those fed the saturated diets.

Results: Results showed that dietary supplementation with flaxseed did not affect the weights of the spleens of broiler chickens. However, it significantly lowered bursa weights ($p < 0.01$), compared to the control diet. In addition, the bursae were thinner in appearance compared with bursae from chickens fed the control diets.

Discussion & conclusion: Dietary supplementation with flaxseed did not affect the growth of the spleen of the chickens. Conversely, it was reported in some studies that feeding PUFA to chickens and mice results in increased spleen weights. However, chickens fed a diet containing flaxseed had smaller and thinner bursae than chickens fed the control diets ($P = 0.001$). This modulation in the weight of immune organs may indicate immunomodulation effect of fatty acids in flaxseed. More investigation studies need to be applied to shed light on the mechanism behind this immunomodulation.

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