

# Effect of carbon dioxide gas stunning on discoloration and quality trait of chicken breast muscle and small intestine in factory

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Consumer's interests in animal welfare for the meat production process, such as rearing, transportation, and slaughtering are increasing (Kim *et al.*, 2018). European legislation includes the laws describing the prevention of the animal from unnecessary suffering with the obligatory stunning of animal pre-slaughter to ensure unconsciousness (Gerritzen *et al.*, 2013). The carbon dioxide (CO<sub>2</sub>) gas stunning method has received a positive evaluation for the application to slaughterhouses in terms of animal welfare because it causes less pain and stress to animals compared to the electrical method (Gerritzen *et al.*, 2013; Salwani *et al.*, 2016). It has been reported that meat to which CO<sub>2</sub> stunning method has been applied causes discoloration and a soft texture (Xu *et al.*, 2018). In particular, the discoloration of small intestine is a problem in the distribution stage as it lowers the preference of distributors. Therefore, this study was conducted to investigate the effect of carbon dioxide (CO<sub>2</sub>) gas during slaughter on the quality characteristics of chicken breast meat and small intestine. A total of 80 birds of broilers stunned and slaughtered using the electrical or CO<sub>2</sub> gas stunning methods were collected from slaughterhouses. After transporting to the Lab., breast muscle (*m. pectoralis major*) and small intestine of broilers were separated and used as samples. The measuring of pH, color, cooking loss and shear force were performed. And, the thickness was measured additionally for small intestines. The data analyses were conducted using Student's t-test with the SAS enterprise ver. 7.1 system. It was considered to have a significant difference when  $p < 0.05$ . In chicken breast muscle, the CO<sub>2</sub> treatment showed a higher pH and lower redness, yellowness, and chroma value than the electrical treatment ( $p < 0.001$ ). There was no significant difference in lightness and shear force between electrical and CO<sub>2</sub> treatment. Compared with the electrical treatment, the CO<sub>2</sub> treatment resulted in higher pH, redness, Hue-angle and lower lightness and yellowness of the fresh small intestine ( $p < 0.001$ ). The color of the small intestine after cooking showed similar results to that fresh sample, additionally, the chroma value of the CO<sub>2</sub> treatment was significantly lower than that of the electrical treatment. The thickness of the fresh and cooked small intestine was lower in the CO<sub>2</sub> treatment than in the electrical treatment ( $p < 0.001$ ). The shear force of the fresh small intestine was significantly lower in the CO<sub>2</sub> treatment (1.11 kg/f) than in the electrical treatment (1.51 kg/f). Furthermore, the shear force of the cooked small intestine with CO<sub>2</sub> (0.11 kg/f) was less than half that of electrical treatment (0.11 kg/f;  $p < 0.001$ ). These results indicate that the shear force is thought to be affected by the thickness. In conclusion, the discoloration of chicken breast and small intestine is induced by CO<sub>2</sub> gas stunning. Furthermore, the tissues of the small intestine stunned with CO<sub>2</sub> tended to show weaker texture than those of the electrical stunning.

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