
Elucidation of the mechanism of atmospheric pressure plasma-induced green discoloration of myoglobin

Hae In Yong ¹, Sang Hui Lee ¹, Ki Ho Baek ¹, Wonho Choe ², and Cheorun Jo ¹

¹*Seoul National University, Korea, Republic of*

²*Korea Advanced Institute of Science and Technology, Korea, Republic of*

To date, antimicrobial effect of atmospheric pressure plasma (APP) on raw meat has been demonstrated. However, some studies reported that APP treatment may cause minor deterioration in meat quality such as slight green discoloration. Meat color is an important factor that influences product acceptability by consumers, and which is highly responsible by myoglobin. Thus, the objective of present study was to elucidate the mechanism of APP-induced green discoloration of myoglobin. Generally, it is known that green-colored pigments derived from myoglobin are in the forms of sulfmyoglobin, choleglobin, verdoheme, nitrihemin or nitrimyoglobin. We hypothesized that the green discoloration of myoglobin by APP treatment is caused by one or more of the above-mentioned green pigments. When myoglobin dissolved in phosphate buffer was exposed to APP for 20 min, a^* -value (+redness/-greenness) was significantly decreased. In the UV absorption spectrum, APP-treated myoglobin showed absorption peak at 503 and 630 nm, which is not a spectrum of sulfmyoglobin or choleglobin. We also excluded the possibility of the form of verdoheme or nitrihemin in APP-treated myoglobin solution because the secondary structure and molecular weight of myoglobin were not changed by APP treatment. On the other hand, nitrite concentration was increased in myoglobin solution by APP treatment. In meat and meat products, high concentration of nitrite provides an environment that nitrimyoglobin could be formed. With the evidences, it could be concluded that occurrence of green color in APP-treated myoglobin is due to nitrimyoglobin formation.

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