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The sensory quality of meat, game, poultry, seafood and meat products as affected by intense light pulses: A systematic review

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Abstract

The effect of intense light pulses (ILP) on sensory quality of 16 different varieties of meat, meat products, game, poultry and seafood are reviewed. Changes induced by ILP are animal species, type of meat product and fluences applied dependent. ILP significantly deteriorates sensory quality of cooked meat products. It causes less change in the sensory properties of dry cured than cooked meat products while fermented sausage is least affected. The higher fluence applied significantly changes the instrumental color values of meat, poultry, game and meat products. The use of ILP on seafood regarding its influence on sensory quality is promising.

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Keywords: intense light pulses; sensory quality; red meat; meat products; game; poultry; seafood

1. Introduction

A number of thermal and non-thermal decontamination and preservation methods have been, and continue to be developed in order to sustain meat safety and quality. The fact that not only the shelf life but also the quality of food

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is important to consumers gave birth to the concept of preserving foods using non-thermal methods. Non-thermal methods of food preservation are being developed to eliminate or at least minimize the quality degradation of foods that results from thermal processing. They are expected to induce only minimum quality degradation of food. It is therefore necessary to evaluate changes in sensory attributes of foods[1].

Intense light pulses (ILP), also known as pulsed light[2], pulsed white light[3] and pulsed UV light[4] are included among the emerging technologies that are intensely investigated as an alternative to thermal treatment for killing pathogenic and spoilage microorganisms. Most of the literature concerning the application of ILP for the preservation of foods mainly deals with microbiological inactivation and few data are reported on sensory analysis[5]. Therefore, the aim of this review was to systematically present the effects of ILP on sensory quality of 16 different varieties of meat, meat products, game, poultry and seafood. Since meat purchasing decisions are influenced by color more than any other quality factor, special attention was paid to the effect of ILP on this.

2. Materials and methods

Samples preparation, ILP equipment used and treatments applied, five-point-scale scoring sensory method sensory evaluation by a professional panel, instrumental color measurements and statistical analysis performed were all explained in previous publications[6,7,8,9].

3. Results and discussion

3.1. Five-point-scale scoring method

ILP treatment did not significantly change appearance and total score values of the beef samples[8]. The color score also remained unchanged regardless of the level of fluence applied, which is in contrast of the findings of Hierro et al.[10] where the color of beef was assessed by panel members as slightly lighter after the treatment of 11.9 J/cm2. The application of 1-pulse (3.4 J/cm^2) in our investigation[8] significantly decreased the score for beef odor while the same happened only after 8.4 J/cm^2 when applied to beef *carpaccio* in the experiments of Hierro et al.[10]. The beef odor was assessed as acceptable in both studies even after the highest fluency rate was applied. According to our results, the odor of beef meat is a bit more sensitive to the ILP then the odor of pork meat. For the poultry, the only sensory attribute affected by the ILP treatment was odor but not to such extent that it could also affect the pondered average values of the total sensory quality for the chicken and turkey meat[8]. A similar finding was published by Paskeviciute et al.[11] where UV light dose higher than 6 J/cm^2 had only some moderate effect on odor of chicken. The odor scores significantly decreased in all game meat samples after the 17 J/cm^2 treatment but they were most easily observable in deer meat, and essentially contributed to the significant change of its pondered average value of total sensory quality. The effect of the treatment on odor was least pronounced in kangaroo meat[8].

The 17 J/cm^2 treatment resulted in significant quality degradation in both ready-to-eat cooked meat products evaluated. The sensory quality of Parisian sausage and cooked ham deteriorated after the 17 J/cm^2 treatment to such an extent that they were assessed as unacceptable products, with unpleasant odor similar to the one found in scalding facilities in slaughterhouses, terrible taste even regardless of smell, untypical yellowish and brownish color, strong aftertaste and poor texture[7]. Our findings are quite the opposite of what was previously reported by E. Hierro et al.[5] where the test panelists did not find significant differences in any of the parameters evaluated among pulsed and non-pulsed ham slices.

Dry-cured meat product, Parma ham and bacon, showed a greater resistance to the effects of ILP than the cooked meat products examined. There were no statistically significant differences in any of the attributes evaluated between 1-pulse treated and untreated samples of Parma ham[7]. In the case of bacon, the same treatment caused significant difference only in odor, although assessors noted that the odor of both, treated and control bacon samples, was not so pronounced. When the higher fluence of 17 J/cm^2 was applied to Parma ham and bacon their odor and taste significantly decreased to the level of neither good nor poor, as assessed by the panelists. However,