

Title Controlling off-flavor and color changes due to irradiation in meat and meat products
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Abstract

Off-odor production and color changes are two most important quality parameters that influence consumer acceptance of irradiated meat and meat products. Irradiation off-odors are mainly produced by S-containing compounds. These compounds are generated by the radiolytic degradation of sulfur amino acids. Although packaging conditions at the time of irradiation and during storage play important roles on the color of irradiated meat, brown or gray color formation is a problem for red meats while pinking is for light meats. The pigment responsible for pinking in irradiated light meats is carbon monoxide-myoglobin (COMb) and the change of oxidation-reduction potential (ORP) by irradiation plays an important role in the formation of COMb. In red meat, the formation of strong oxidizing agents from the reactions of oxygen with aqueous electrons and hydrogen radicals is the key to the brown color formation. This is especially important for irradiated beef color because the content of heme pigments in beef is about 10-fold that of light meats and the proportion of COMb to total heme pigments is small. Thus, overall beef color is mainly determined by the status of heme pigments, which is determined by reducing potential of red meats. The sulfur volatiles responsible for irradiation off-odor are highly volatile and can be eliminated by storing the irradiated meat under aerobic conditions. Exposing irradiated meats to aerobic conditions also increases ORP and CO vs O₂ competition, which reduces the chances for COMb ligand formation and decrease pink color intensity in light meat. However, aerobic conditions accelerate lipid oxidation in meat. Vacuum packaging prevents lipid oxidation in irradiated meat during storage, but maintains reduced conditions of meat and keeps off-odor volatiles inside the bag. Appropriate combinations of vacuum/aerobic packaging and antioxidants, therefore, can be effective in controlling color, off-odor volatiles, and lipid oxidation of irradiated light meat.