

Effects of Geometric Shape and Serving Temperature on Quality Characteristics of Irradiated Bologna and Frankfurters

A.S. Leaflet R2391

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Summary and Implications

The effects of irradiation (1.1 kGy, and 2.2 kGy) on bologna and frankfurters were measured to determine if variations in geometric size create differences in quality of irradiated ready-to-eat meats. Irradiation up to 2.2 kGy had no effect on color, TBARS values, pH, or texture of vacuum packaged bologna and frankfurters. Irradiation significantly ($P < 0.05$) lowered aroma and flavor scores while increasing off-aroma and off-flavor scores in product served cold, but was not significant when the product was served hot. Geometric size did not create differences in quality of irradiated bologna and frankfurters but serving temperature did. New information on the effects of processing variables and product differences would provide opportunities to improve control of potential quality changes from irradiation of Ready-to-Eat (RTE) meat products.

Introduction

Listeria monocytogenes, the organism responsible for listeriosis, is a significant threat to ready-to-eat meat products because of its ubiquitous nature, resistance to salt, and its ability to grow at refrigerated temperature. Thermal processing effectively controls and kills *L. monocytogenes*, however, food recalls of RTE meat products contaminated with the pathogen continue to occur. Since RTE meats are often consumed without reheating prior to consumption, consumers could be at risk. One procedure that can be used to eliminate *L. monocytogenes* after packaging is irradiation. Irradiation has been proven to be an effective method for controlling *L. monocytogenes* in RTE meats but questions still arise on the quality changes associated with irradiated meats such as off-flavors and off-odors. These detrimental effects from irradiation are not consistent across all studies suggesting other factors may be involved in the development of off-odors and off-flavors in RTE meat products. One such factor may be the difference in the physical shape of a product. Since RTE products often exist in a variety of shapes and sizes, the potential for quality differences may exist in the product after irradiation. Therefore, the objective of this research was to determine

the effect of physical shape and size on quality characteristics of common RTE meats following irradiation.

Materials and Methods

Frankfurters and bologna were manufactured on the same day from the same formulation and cooked to an internal temperature of 74°C. Bologna was then sliced and stacked equaling the same thickness as a frankfurter link. Products were then vacuum packaged and irradiated at 0, 1.1, and 2.2 kGy. For each of three replications, oxidation (TBARS values), pH, and proximate analysis were measured in duplicate; color (CIE L*, a*, b*) and texture were measured in triplicate. Trained sensory panel was completed on bologna and frankfurters for aroma, off-aroma, cured color, flavor, off-flavor, and firmness for bologna and frankfurters served cold (0°) and hot (71°C).

Results and Discussion

Our results show that irradiation up to 2.2 kGy has no effect on color, oxidation, pH, or texture of vacuum packaged bologna and frankfurters. Sensory results show that aroma/off-aroma and flavor/off-flavor are negatively affected by irradiation regardless of dose. When served hot, irradiation had no effect on aroma, off-aroma, flavor, and off-flavor scores of bologna or frankfurters. When served cold, there were no product differences between bologna and frankfurters, however, irradiation decreased aroma and flavor scores while increasing off-aroma and off-flavor scores. These results suggest that irradiation induced quality changes are not affected by the geometric shape but rather by serving temperature of the product. Irradiation does not affect flavor, off-flavor or off-aroma of products when served hot. This could be explained by aroma and flavors existing as volatiles. When products are heated volatiles are flashed off and are no longer contained in the product.

Table 1. Combined data for the effect of irradiation on the Least Square Means (\pm SE) of sensory traits of both bologna and frankfurters served cold (0°) and hot (71°C).

Item	Irradiation (kGy)			SEM
	0	1.1	2.2	
Sensory				
Aroma	9.33 ^a	8.63 ^b	8.50 ^b	0.19
Off-Aroma	0.88 ^a	1.67 ^b	1.94 ^b	0.24
Cured Color	9.29 ^a	9.08 ^a	8.82 ^b	0.07
Flavor	9.31 ^a	8.65 ^b	8.70 ^b	0.16
Off-Flavor	0.54 ^a	0.96 ^b	1.23 ^b	0.12
Firmness	8.81 ^a	8.24 ^b	8.20 ^b	0.11

^{a,b} Means within a row with different letters are significantly different at P<0.05