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# Combined Effects of Freezing Rate and Thawing/Cooking Methods on Physicochemical and Textural Properties of Pork Patties

J.-H. Kim[1,2]*, H.-W. Kim[1], and Y. H. B. Kim[1]

[1]Department of Animal Sciences, Purdue University, West Lafayette, IN, USA;
[2]Department of Food Science & Biotechnology of Animal Resources, Konkuk University, Seoul, Republic of Korea

## Objectives

Quality defects associated with frozen/thawed patties have been well documented. Freezing rate is known to affect water-holding capacity (WHC), texture and possibly oxidative stability of frozen/thawed patties. In addition, different thawing/cooking conditions could influence the quality attributes of frozen/thawed meat. However, there has been little to no available information on the effects of initial freezing temperature coupled with different thawing/cooking methods on quality and physicochemical attributes of frozen/thawed patties. Therefore, the objective of this study was to evaluate the combined effects of different freezing rates with various thawing/cooking methods on physicochemical and textural properties of cooked pork patties.

## Materials and Methods

At 2 d postmortem, pork ham muscles (*M. biceps femoris*) from 1 side of 6 carcasses were removed and ground (2 carcasses per each batch). A total of 72 patties (80 g and 10.5 cm in diameter) was manufactured in each batch using the ground pork only. The patties (24 patties per each freezing temperature) were randomly assigned into slow freezing (–20°C in a conventional freezer), fast freezing (–50°C in a liquid nitrogen chamber) and ultra-fast freezing (–80°C in the same chamber), vacuum-packaged, and stored at –20°C for 3 wk. The frozen patties were thawed/cooked at 3 different conditions; immediately cooking without thawing, slow thawing (2°C in a refrigerator) and fast thawing (25°C in a water bath). Cooking process was conducted on an electric grill 150°C to reach at 72°C of core temperature. The pH, color (CIE L*, a* and b*), WHC (freezing, thawing, cooking, and total losses), textural properties and lipid oxidation (2-thiobarbituric acid

reactive substances, TBARS) of pork patties were evaluated. Experimental design was a completely randomized design with 3 independent batches (*n* = 3). All data were analyzed using the PROC MIXED procedure of SPSS, and Tukey's multiple range test (*P* < 0.05) was used to separate differences between treatment means.

## Results

No interactions between freezing temperature and thawing/cooking method on pH, color, WHC, textural properties (hardness, springiness and cohesiveness) and TBARS were found (*P* > 0.05). Fast and ultra-fast frozen pork patties had significantly lower total losses (the sum of freezing/thawing/cooking losses) compared to the slow frozen pork patties. In addition, direct cooking without thawing reduced cooking and total losses of patties compared to other treatments (*P* < 0.05). Freezing rate had no impacts on textural properties (*P* > 0.05), except for hardness. However, fast thawing resulted in lower hardness, springiness, cohesiveness, gumminess and chewiness compared to slow thawing (*P* < 0.05). Fast thawing slightly reduced TBARS value of pork patties compared to the others thawing/cooking methods (*P* < 0.05).

## Conclusion

The results of this current study indicate that fast freezing could be an effective way to reduce weight losses associated with freezing/thawing/cooking process. We also found that different thawing/cooking methods had greater impacts on textural properties and lipid oxidation of pork patties, rather than initial freezing rate. This study suggests that fast freezing coupled with fast thawing would be the most effective way to minimize quality defects associated with freezing/thawing/cooking of pork patties.