

EFFECT OF RESTING TIME ON LOSS OF MEAT JUICEIna Clausen¹ and Jens Christian Christensen²¹Danish Veterinary and Food Administration, Institute of Food Safety and Nutrition²Frederiksberg School of Domestic Science**Background**

Many cookery books recommend that roasts are allowed to rest for 20 minutes before slicing. It is contended that the meat preserves its juiciness better by this advance, since slicing up roasts immediately after cooking will result in increased losses of meat juice (Botorp *et al.*, 1999; Sarlin, 1996; Willan, 1992). As far as we know, the statement has not been scientifically challenged.

Objectives

The purpose of the present study was to examine whether roasts retained meat juice better if resting for 20 minutes after cooking compared to roasts sliced immediately after cooking. The experiments were undertaken with 3 different cuts, different oven temperatures, and the roasts were cooked to different temperatures.

Methods

Meat samples: Pork loin, pork neck and roast beef were selected for analysis. Two uniform joints from the same carcass (right and left side for pork and from the same muscle for beef) were divided into a total of 4 uniform roasts. Each roast underwent one of the four different cooking methods (see table 1). 4 repetitions were carried out.

Cooking methods: Cooking was carried out in a preheated combioven (Rational ClimaPlus Compi model CPC101, Internal size 77 x 65 x 50 cm; oven temperatures were as indicated in table 1) and maintained until the desired internal meat temperatures were reached (see table 1). Roasts that were cooked at high oven temperature (140°C) and cut into slices immediately after cooking were cooked to about 2°C higher internal temperature than roasts resting for 20 minutes (due to temperature rise immediately following resting). Roasts were sliced into 1 cm thick slices (7-14 slices pr. roast).

Weight registration: Roasts were weighed before and after cooking, and slices were weighed immediately after slicing and 30 minutes after cooking.

Calculation: Percent cooking loss: $100 \text{ (raw meat weight - cooked meat weight) / raw meat weight}$.

Percent meat juice lost: $100 \text{ (cooked meat weight - sliced meat weight) / cooked meat weight}$

Statistical analysis: Analysis of variance (ANOVA) (SAS Systems for windows, version 8). P-values <0.05 were considered statistically significant.

Results and discussion

Cooking conditions, cooking losses, losses of meat juice in the period from cooking to cutting and losses of juice from cooking to 30 minutes resting are shown in table 1. Earlier studies have shown a positive correlation between cooking loss and final internal temperature – a rule of thumb says that cooking loss will increase about 1% point for each 1°C temperature increase (Martens *et al.* 1982, Seuss *et al.* 1986, Clausen and Ovesen 2001). There can be a large variation in cooking losses within uniform cuts from different animals cooked to the same internal temperature. In this study the roast treated by the different cooking methods came from the same animal. Difference in weight loss after cooking is therefore probably due to different internal temperature and perhaps the cooking conditions.

Meat juice lost from cooking to cutting out in slices: Meat juice lost (all cuts) tended to be less when slicing was performed immediately after cooking (5.8 %) compared to slicing after 20 minutes resting (6.8; $P=0.0635$). The higher quantity of meat juice lost after 20 minutes resting is probably due to losses during the resting period and losses in connection with slicing the meat may be lower than without rest. A study has shown a 2 % weight loss during 20 minutes rest (before slicing) for pork neck cooked in oven (180 °C) to an internal temperature of about 80°C (Clausen, 2002). With respect to loss of meat juice these results indicate that it is not an advantage to allow roasts to rest 20 minutes before slicing.

High and low oven temperature: Roasts (pork loin and roast beef) cooked in oven at low temperature (80°C) lost less meat juice with cutting (with and without a resting period) (4.3 %) than roasts cooked at high temperatures (140°C) (7.2 %; $P<0.0001$). Cooking loss was also higher for roasts cooked at high oven temperature (19.8 %) than at low temperature (14.9 %; $P<0.001$). However, other experiments could not demonstrate differences between high and low temperature when cooking was performed to the same internal meat temperature (Clausen and Wilquin, 1999; Lassen *et al.* 2000). The difference in cooking loss in this study can be due to differences in final internal temperature.

High and low internal temperature: Pork neck cooked to 80°C lost more meat juice from cooking to cutting (both with and without rest) (8.7 %) than pork neck cooked to 90°C (6.2 %; $P=0.0002$). On the other hand pork loin cooked to 60°C lost 6.9 % in the same period. If there is a negative relation between internal meat temperatures and meat juice losses from cooking to after slicing it is not possible to apply the relation between different roasts.

Species: There were no significant differences between pork leg and roast beef (same cooking condition) with respect to meat juice lost from cooking to after slicing.

Meat juice lost from cooking to 30 minutes later: Meat juice lost from cooking to 30 minutes after cooking did not differ within time of cutting out in slices.

Appearance: Roast beef sliced immediately after cooking looked more brown in the carve surface than roast beef sliced after 20 minutes rest, whereas there was no difference to observe on pork roasts.

Conclusions

Cutting roasts out into slices immediately after cooking instead of after an 20 minutes' resting period resulted in increased retention of meat juice, about 1% point, however small compared to total cooking loss (from cooking to after slicing). 30 minutes after cooking there

was no differences in meat juice lost from cooking to cutting despite slicing time. Thus there is no clear advantage, with respect to loss of meat juice, to allow roasts to rest before slicing.

Pertinent literature

- Botorp O., Jensen L., Dan F., Hansen F., Andersen J., Løvgreen K., Rickelsen B. (1999). Kokkebogen. Erhvervsskolernes Forlag. Odense.
- Clausen I., Ovesen L. (2001). Proximate Contents, Losses and Gains of Fat, Protein and Water Comparing raw, Hospital- and Household- Cooked Pork Cuts. *Journal of Food Composition and Analysis*. 14, 491-503.
- Clausen I., Wilquin K. (1999). Effect of oven temperature and steam on international temperature variation, pasteurising value and cooking loss of pork joints. International Congress. Improved traditional foods for the next century, Spain, Valencia, 28-29 October 1999. 473-477.
- Clausen I. (2002). Not published data. Danish Veterinary and Food Administration, Institute of Food Safety and Nutrition.
- Lassen A., Kall M., Hansen K. (2000). Effect of different cooking conditions on cooking yield and retention of vitamin B1 in pork neck. Proceeding of the Eight International Congress on Engineering and Food. Mexico 2000. 297-305.
- Martens H., Stabursvik E., Martens M. (1982). Texture and color changes in meat during cooking related to thermal denaturation of muscle proteins. *Journal of the American Oil Chemists' Society*. 13. 291-309.
- Sarlin J. A., Porter D. (1996). *The new Meat Lover's Cookbook*. A Simon & Schuster Macmillan Company, New York.
- Seus I., Pospiech E., Honikel K. O. (1986). Causes of cooking loss on heating of meat. 32nd Eur Meeting of Meat Research Workers, Ghent. 143-146.
- Willan A. (1992). *Look & Cook, Meat Classics*. Dorling Kindersley Limited, London.

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Table 1. Calculated cooking loss, loss from cooking to cutting out into slices and loss from cooking to 30 minutes after cooking for pork loin, pork neck filet and roast beef cooked in oven to different internal temperatures. (n=4)

Cut	Resting time before slicing (minutes)	Oven temperature (°C)	Internal temperature in meat (°C)	Weight raw meat (g)	Cooking loss (%)	Loss from cooking to cutting out into slices (%)		Loss from cooking to 30 minutes after cooking (%)
						Sliced immediately	Sliced after 20 resting	
Pork loin	0	140	60	605	23.1 (19.2-26.5)	6.8 (3.3-8.8)		10.8 (8.5-12.8)
	20	140	-	625	21.7 (17.9-23.7)		7.0 (5.2-8.6)	9.0 (6.9-10.5)
	0	80	-	611	16.3 (14.1-17.6)	4.3 (2.7-6.2)		8.2 (6.0-10.4)
	20	80	-	590	17.1 (13.5-20.4)		5.0 (2.6-6.7)	7.1 (4.2-9.0)
Pork neck filet	0	140	80	802	35.2 (30.8-39.3)	7.1 (6.1-7.9)		11.4 (9.6-12.2)
	20	140	-	797	32.2 (29.0-34.4)		10.3 (9.1-11.1)	12.2 (11.3-12.8)
	0	140	90	811	38.5 (31.0-47.3)	5.4 (3.9-6.9)		9.0 (6.3-11.2)
	20	140	-	841	38.2 (32.9-43.4)		6.9 (6.3-7.7)	8.8 (8.2-9.4)
Roast beef	0	140	60	627	18.3* (18.1-18.7)	8.1* (7.1-9.6)		11.5* (10.4-12.9)
	20	140	-	637	16.2 (15.2-16.8)		7.0 (6.2-8.2)	8.8 (8.1-9.9)
	0	80	-	602	15.3 (12.9-16.8)	3.2 (2.0-4.4)		6.1 (4.7-8.0)
	20	80	-	621	10.9 (7.9-13.4)		4.6 (4.2-5.1)	6.6 (5.9-7.5)

* n=3 because a weight registration was extreme, and therefore excluded