End-point temperature and cooking loss of neck loin prepared in institutional cater

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Introduction

It has been estimated that almost one third of all medical and surgical patients suffer from malnutrion (Hessov & Ovesen, 1992; Tuc Miguel, 1996). Focusing on the nutritional composition of food will not necessarily improve this situation. It is a well known fact, that only serves a nutritional purpose when it is eaten. It is therefore important that the preparation and presentation of the food is optim patients to feel like eating it.
According to interviews carried out at 20 hospitals and nursing homes, meat is the single component of meals which is most often criti and also the component that kitchens have most difficulty handling (not published).

The effect of various end-point core temperatures on tenderness and juiciness has been described (Davey & Gilbert, 1974; Martens e 1982). When cooking whole joints of meat it is most advantageous to aim for an end-point core temperature that is suitable for the ty cut of meat. One of the main goals of a Danish project known as FOKUS (see the project abstract) is to determine the optimal end-poin temperature of various cuts of pork and beef, destined for groups of elderly or hospital patients. However, first of all it has been nece to assess whether institutional kitchens are able to control the temperature when preparing joints according to normal procedures. Thi been the motivation for this study. Furthermore, the aim has been to estimate the significance of the initial weight of the joint on the end- core temperature. From these and other project results, specifications have to be drawn up for use in institutional catering.

Materials and Methods

Pork neck loin was produced in an institutional kitchen in two different ovens. Cooking was carried out in two different ways accordi the normal procedures of the kitchen *(Oven type, oven temperature and cooking time*: *Trial 1*: HOUNØ, CONMATIC Line C (combioven), 200°C for 15 minutes follow by 130°C for 125 minutes, + steam, + ventilation *Trial 2*: JUNO, 250°C for 20 minutes fo by 200°C for 55 minutes ÷ steam, ÷ ventilation). Trial 1 were carried out with 15 joints in the oven (4 joints in 3 tray, and 3 joints in 1 t All of the joints were included in temperature studies. Trial 2 were carried out with 40 joints in the oven (4 joints in each tray, 10 shel 16 out of the 40 joints were included in temperature studies, as shown in figure 1. The temperature was measured in the core of the jo just after they had been removed from the ovens. This was done by three trained laboratory technicians. All measurements were completed within a 2 minute time span.
The thermometer was a thermocouple type K, with a 1,5 mm in diameter needle probe, calibrated against a reference thermometer. In the specified temperature span the accuracy was +/- 1°C.
The joints were ordered according to the normal quality specifications for neck loin, and were delivered by the customary supplier. They were random by position in the oven. The joints were weighed before and after cooking.

Figure 1 Trial ... position in ov... the 16 out of... joints where... temperature w... measured.

Results and Discussion

The end-point core temperature variation of the joints was suprisingly large. The first round of measurements showed minimum and maximum end-point temperatures of 75°C and 89°C respectively. When the core temperatures measured during the second production the temperatures ranged between 68°C and 97°C. In other words, deviations in temperatures of 14°C and 29°C were found in joints cooked in the same oven, see table 1. As part of the same project, similar deviations in temperature have been found when measuring joints prepared in other institutional kitchens (not published).

Table 1 illustrates the minimum, maximum and average weight of the raw meat joints. There are large deviations in the initial weight of joints. Figure 2 shows the raw weight as a function of the end-point core temperature of the joints. This shows a correlation between the weight and the end-point core temperature of the cooked joints of meat, with correlation coefficients of R^2=0.51, P<0,05 (trial 1) and R^2=0 P<0,01 (trial 2). However, the weight of the raw joint is not the only factor that influences the end-point temperature. The position of joint in the oven is probably also of significance. Schafheitle & Light (1989) and Shead & Roger (1995) have examined the variation in distribution in institutional ovens. They found that the cooking time had to be varied considerably, to achieve an uniform product end te perature. The project also included trials that indicated that the heat distribution within ovens in institutional kitchens can vary consider (not published).
Figure 3 shows cooking loss as a function of the end-point core temperature. As expected this also shows a correlation between cooking and final temperature, correlation coefficients R^2=0.51, P<0,05 (trial 1) and R^2=0.47, P<0,10 (trial 2). As there is a variation in the biolo material used for these trials, the cooking loss is also influenced by variation in the raw materials used. Furthermore measuring temperature in the core of a joint of meat can be difficult to do correctly, as there is a large temperature gradient from the outside and through the joint. If the temperature is not measured precisely in the centre, then the deviation from the true centre temperature wil relatively large. In these trials it was not possible to determine whether the temperature was in fact measured in the centre of the joint.

The variation in the final temperature of the meat joints was large. This means that the quality of the meat served in institutional cater will vary likewise as illustraded by the cooking loss. In addition, lack of control over temperature variation can lead to hygienic proble It is important to solve these problems. When cooking large portions of food it is not practically possible to moniter the temperature of the joints of meat in the oven and then to stop the cooking when the required end-point temperature is attained. For practical reasons usually necessary to take all the joints (usually between 16-40) out of the oven at the same time. The problem can probably be solved by specifying the size of the joints of meat delivered, and by changing the cooking methods, so that the final temperatures in the joints are as uniform as possible. Preliminary results indicate that cooking at lower temperatures can solve some of the problems of variations in end point temperatures. In addition it can be necessary to optimise oven heat distribution.

Table 1: Cooking loss, end-point core temperature and raw weight of two productions of neck loin (position of joints measured in nr. 2 trial is shown in figure 1), Std = standard deviation.

		Cooking loss				End-point core temperature				Raw weight			
Cooking procedure	**n**	**Min.**	**Max.**	**X̄**	**Std**	**Min.**	**Max.**	**X̄**	**Std**	**Min.**	**Max.**	**X̄**	**Std**
1: 200°C for 15 min. and 130°C for 125 min. + steam, + ventilation	15	27 %	37 %	32 %	3,4	75°C	89°C	80°C	4,0	1269	2047	1603	239
2: 250°C for 20 min. and 200°C for 55 min. ÷ steam, ÷ ventilation	16	28 %	42 %	35 %	3,8	68°C	97°C	80°C	8,5	990	2135	1605	325

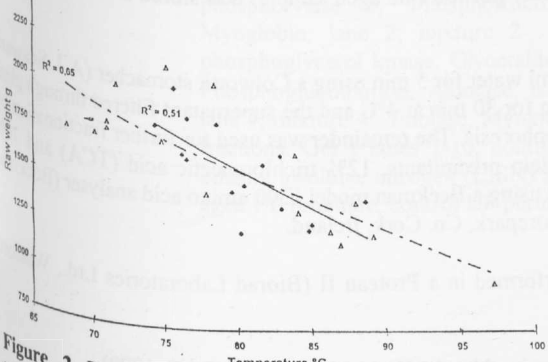

Figure 2 Raw weight as a function of end-point core temperature when cooking neck loin. (—— trial 1, - - - trial 2).

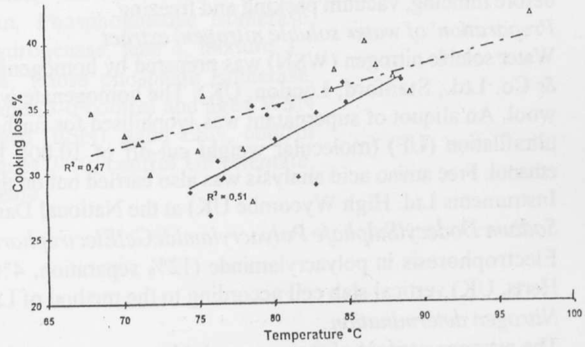

Figure 3 Cooking loss as a function of end point core temperature for neck loin. (—— trial 1, - - - trial 2).

Conclusion

Cooking of joints of meat in institutional catering can lead to large variations in the final temperature of the meat, which in turn leads to variation in the quality of the cooked meat. There is a significant correlation between the final temperatre of the cooked meat, and the initial weight of the raw joints. However, the problem of varying end point core temperature will not be solved entirely by specifying a more uniform joint size. It is also necessary to optimise cooking methods.

Litterature:

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Project abstract:

Project FOKUS is financed by Ministry of Business. Carried out by The Danish Catering Centre, Greater Copenhagen Hospital Purchasing Department, Danish Meat Research Institute, Danish Crown, catering departments at 3 institutions (Amtssygehuset i Glostrup, Sundby Hospital, De Gamles By), a catering company (Centralkøkkenet A/S), and catering equipment and packaging suppliers (Oluf Broennum & Co., W.R Grace A/S).

The scope of the project is to describe in detail the specifications for meat cuts used in public catering. This is done by testing common meat recipes used in catering kitchens. The recipes resulting in the highest quality are then selected for futher testing. In addition, the scope is to test new preparation techniques such as sous vide and low temperature cooking. The project will result in the production of a handbook which can be used by the catering managers, purchasers and meatpackers.