EFFECT OF COOKING METHOD ON SENSORY AND TEXTURE ATTRIBUTES OF LOW FAT BEEFBURGERS

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BACKGROUND

Since the quality of low fat beefburgers is reduced relative to burgers with higher amounts of fat the development of novel ingredients and processes is necessary to improve quality. The choice of cooking method has vastly improved quality over other cooking methods in various studies (Janicki and Appledorf, 1974; Dagerskog and Sorenfors, 1978; Cross *et al.* 1980 and Berry and Leddy, 1984). Berry and Leddy, 1984, compared electric broiling, broiling, charbroiling, conventional oven roasting, convection oven roasting, electric grill frying and microwave cooking and found electric grill frying, equivalent to grilling in the present study, to improve flavour characteristics while microwave cooking produced low sensory panel ratings. Microwaving has also been found to give significant lower sensory scores for appearance, flavour and general acceptability (Cremer, 1982). The variety of methods studied with beefburgers has been vast. Various frying methods - deep fat, contact, long wave irradiation and convection frying - were compared in a study by Gros *et al.*, 1986, while Janicki and Appledorf, 1974, compared broiling, grill frying and microwave cooking. The present paper reports a study of some of the more common cooking methods available.

OBJECTIVE

The aim was to compare the texture and sensory attributes of low fat beefburgers cooked by various methods - grilling, frying, deep fat frying, griddling and roasting.

METHODS

A batch of low fat beefburgers (8% fat, 8% water, 0.5% salt) was prepared using flank lean and fat. Burgers were blast frozen at - 30°C prior to cooking. Burgers were cooked to an internal temperature of 72°C. The average times to reach this temperature were 15min 25sec, 9min 40sec, 3min 40sec, 7min 40sec and 23min 15sec for grilling, frying, deep fat frying, griddling and roasting respectively. For the grilling, frying and griddling methods burgers were turned every two minutes during cooking. Sensory analysis (hedonic scaling) of the cooked burgers was repeated four times with a panel of eight judges. Measurements on an Instron using the Warner Bratzler blade, the Kramer shear method and Texture Profile Analysis were made on two burgers per cooking method. The experiment was repeated four times.

RESULTS AND DISCUSSION

The cooking method significantly affected the sensory characteristics fattiness ($p < 0.05$), overall appearance, moistness/juiciness, overall texture, overall acceptability ($p < 0.01$), tenderness, meaty flavour and overall flavour ($p < 0.001$) as shown in Table 1. Griddled low fat beefburgers gave the highest scores for moistness/juiciness, meaty flavour, overall flavour, overall texture and overall acceptability. Grilled burgers had the highest scores for overall appearance while roasted burgers had the highest scores for tenderness and crumbliness. Burgers which were deep fat fried had the lowest scores for tenderness, crumbliness, moistness/juiciness, meaty flavour, fattiness, overall texture, amount of residual connective tissue and overall acceptability. The range in sensory score was small. For example for the characteristic overall acceptability the range was only 0.65 of a unit.
Texture parameters peak force, cohesiveness ($p < 0.05$) and peak energy ($p < 0.01$) were significantly affected by cooking method at the 5% level while energy, hardness, springiness, gumminess and chewiness were significantly affected by cooking method at the 10% level (see Table 2). Roasted burgers had the lowest values for peak force while grilled burgers had the lowest values for peak energy, load, hardness, springiness, gumminess and chewiness. Griddled burgers had the lowest values for cohesiveness. Low fat burgers which were deep fat fried had the highest values for peak force, peak energy, energy, springiness and cohesiveness.

CONCLUSION

Although the absolute differences in acceptability scores were relatively small the cooking method was found to affect most of the sensory and texture attributes examined. Griddling was found to be the most acceptable cooking method due mainly to superior flavour while deep fat frying was the least acceptable.

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Table 1 Mean scores for sensory characteristics for each cooking method

Sensory characteristic	p value	Cooking method					Standard error
		Grilling	Frying	Deep fat frying	Griddling	Roasting	
Overall appearance	0.001	4.211	3.641	3.969	4.055	3.523	0.096
Tenderness	0.000	5.125	5.398	4.164	5.203	5.602	0.153
Crumbliness	0.125	4.594	4.531	4.328	4.555	4.672	0.087
Moistness/juiciness	0.004	4.641	5.094	4.203	5.102	4.906	0.152
Meaty flavour	0.000	5.000	4.984	4.781	5.594	4.828	0.068
Fattiness	0.022	2.211	2.344	2.055	2.094	2.188	0.057
Overall flavour	0.000	3.555	3.383	3.438	3.797	3.281	0.061
Overall texture	0.002	3.484	3.531	3.117	3.656	3.539	0.078
Amount of residual connective tissue	0.230	5.578	5.586	5.273	5.656	5.523	0.117
Overall acceptability	0.001	3.625	3.555	3.219	3.867	3.438	0.082

where p value = probability value from a one-way ANOVA

Table 2 Mean values for textural parameters for each cooking method

Texture parameter	p value	Cooking method					Standard error
		Grilling	Frying	Deep fat frying	Griddling	Roasting	
Peak force N	0.034	13.86	16.42	19.03	17.11	13.42	1.26
Peak energy J	0.001	1.408	1.755	1.845	1.584	1.453	0.067
Load N/Kg	0.413	$5.0x10^4$	$5.5x10^4$	$5.8x10^4$	$5.8x10^4$	$5.2x10^4$	$0.3x10^4$
Energy J/Kg	0.057	$2.64x10^2$	$3.07x10^2$	$3.21x10^2$	$2.93x10^2$	$2.36x10^2$	$0.20x10^2$
Hardness N	0.060	72.18	75.94	104.79	121.69	86.47	12.26
Springiness m	0.075	$5x10^{-3}$	$5.16x10^{-3}$	$5.38x10^{-3}$	$5.2x10^{-3}$	$5.15x10^{-3}$	$0.083x10^{-3}$
Cohesiveness	0.018	0.594	0.599	0.611	0.578	0.586	0.006
Gumminess N	0.060	42.59	45.21	63.60	69.57	50.17	6.96
Chewiness J	0.052	212.33	234.97	342.3	363.34	258.52	38.44

where p value = probability value from a one-way ANOVA