

## ESTIMATION OF CORRECTNESS OF MEAT PREPARATION AT HOME ON THE EXAMPLE OF A SELECTED GROUP OF PEOPLE

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The aim of the research was to identify methods of meat preparation in the conditions of home environment and to estimate the correctness of the preparation process according to the rules of the catering technology. The directly interview with 360 randomly chosen adults was conducted. The questionnaire included questions concerning on preparation of meat dishes and the kinds of products used: raw meat products, ready-to-cook, and ready-to-heat products. The respondents were questioned about methods and conditions under which the preliminary and heat treatments of meat were conducted. In addition, they were also asked how they stored meat dishes.

The respondents usually used raw and frozen meat (including ground meat) to prepare dishes at home. Ready-to-cook and ready-to-heat meat products were used sporadically. The majority of respondents (about 90%) thawed meat in the correct way, but many of them did that in room temperature. Generally, the respondents prepared meat chops using single or double coat (bread-crumbs and eggs or flour, eggs and bred-crumbs). The coating was done in the right way – immediately before frying. Usually the respondents used sunflower oil to fry on pan. Only some consumers (12.5%) used deep fat frying process for prepare meat. Many of them always disposed of used oil after frying. The frying process began with warming up of the oil, which is the right way to do. The respondents recognized the end of the roasting process by the color of meat or by measuring the time of the process. It does not guarantee the proper quality of roasted meat and it is not correct from the technological point of view. The respondents who prepared meat on barbecue, cooked it to either medium or well-done. Meat dishes were stored in fridge for 1-2 days, but some of the consumers indicated longer time of storage, up to 7 days.

Conclusions: on the basis of the conducted research it can be stated that meet preparation at home follows the rules of the catering technology. Only some respondents conducted this process in an inappropriate way. Irregularities included coating chops too early before frying, thawing meat in improper conditions, using unsuitable oil for frying and storing used oil for future use, and too long storage meat dishes.

### INTRODUCTION

The observance of proper parameters of the preparation process and correct technological processing is critical to the production of wholesome quality meals. Irregularities on every stage of food handling (preliminary preparation, heat processing, storage after cooking) may result in obtaining products of inappropriate or even hazardous quality as far as consumer's health is concerned. Results of numerous research [Williamson *et al.*, 1992; Klontz *et al.*, 1995; Redmon & Griffith, 2002] shows that over 50% of food poisoning cases is caused by incorrect food handling in the home, that is incorrect heat processing, using bad quality raw material, especially that of animal origin, and lack of hygiene during meal preparation. Similar facts are shown by Kendal *et al.* [2003] who suggest that food poisoning may be prevented if food handling in the home is done in compliance with hygiene rules, meat is cooked properly, cross-over contamination is avoided, and food is kept in correct thermal conditions. Many authors [Medeiros *et al.*, 2001; Li-Cohen & Bruhn, 2002; Finch & Daniel, 2005; Unusan, 2007] have stressed the necessity of consumer education that would explain the rules of the technological process in order to ensure

the correct quality of meals, and especially the microbiological food safety.

The aim of the research was to investigate the methods of meat preparation in the home and to estimate the correctness of food handling process in accordance to the rules of catering technology.

### MATERIAL AND METHODS

The survey was conducted in the form of direct interview among randomly chosen 360 adults, with their consent. The questionnaire was composed of two sections. The first part included 12 questions concerning the following: the type of products used for home meal preparation, *i.e.* raw meat produce, ready-to-cook and ready-to-heat meat products; the methods of preliminary treatments (thawing, coating); heat processing (type of fat used for frying and the frequency with which it is exchanged, the methods of determining the beginning and end of frying or roasting process, the ways of preparing grilled meat); as well as storing food after preparation. The questionnaire comprised mostly of closed-type questions and the respondents could choose more than one answer. Three questions were open and the subjects could give their own

TABLE 1. The characteristics of the group of respondents.

Group characteristics	Group	Number of respondents	Percentage of respondents
Total	---	360	100
Sex	women	247	68.6
	men	104	28.9
	no answer	9	2.5
Age	under 25 years	89	24.7
	25 – 40 years	132	36.7
	41 – 60 years	111	30.8
	over 60 years	19	5.3
	no answer	9	2.5
Education	elementary school	11	3.1
	technical school	52	14.4
	secondary school	136	37.8
	higher education	151	41.9
	no answer	10	2.8
Occupation	public sector	94	26.1
	private sector	170	47.2
	freelance	15	4.2
	farmer	5	1.4
	unemployed	5	1.4
	student	34	9.45
	pensioner	25	6.95
	no answer	12	3.3
Number of people in the household	1	40	11.1
	2	80	22.2
	3	86	23.9
	4	104	28.9
	5	26	7.2
	6	6	1.7
	8	1	0.3
	no answer	17	4.7
Income	to 500 PLN	21	5.8
	501 – 1000 PLN	96	26.7
	1001 – 1500 PLN	62	17.2
	1501 – 2000 PLN	97	27
	over 2001 PLN	63	17.5
no answer	21	5.8	

answer. The second part of the survey concerned the characteristics of the respondents: sex, age, education level, occupation, number of people in the household, income level.

The majority of the respondents said to have high school (37.8%) or higher education (41.9%), work in the private sector (47.2%) or public sector (26.1%) and run household of 1 to 4 people of various net income per person (Table 1). Most of the respondents (68.6%) were women.

The statistical analysis of the results was performed using the statistical software Statistica PL for Windows 5.5. The Chi<sup>2</sup> test with Yates correction was used. Significance of differences between the values was determined at a significance level of  $p < 0.05$ .

## RESULTS AND DISCUSSION

The study demonstrated that 96.4% of the respondents claimed to prepare their own meals at home, while 3.6% to eat out or have meals cooked for them by someone else.

### Type of meat products used: raw, ready-to-cook, ready-to-heat

The majority of the respondents utilizes fresh meat produce for home cooking (42% claim to use it a few times a week), (Table 2). Ground or frozen meat is used less frequently, a few times a month. Ready-to-cook meat products, frozen meat dishes, hamburgers, meat dumplings and ravioli, as well as ready coated chops are sporadically used. Some respondents buy grilled chicken, goulash meat in a jar or ready-made meals (beans, stuffed cabbage, bigos, poultry tripe, lasagna, spaghetti, croquettes, pancakes with meat filling). Buying ready – made meat or semi-meat meals shows no correlation to the respondents' income. It was found that big families (over 4 members) rarely buy ready meals, especially dumplings or chops.

Babicz-Zielińska *et al.* [1998], who investigated the preferences of university students about convenience foods, have found that three quarters of respondents very rarely ate frozen and microwaveable meat products or even did not eat them at all.

### Preliminary meat preparation

It was found, that most respondents thaw meat in the correct way: in cold storage (about 40%), in microwave oven (13.6%) or directly during heat processing (11.4%), (Figure 1). According to Anderson *et al.* [2004] the most popular methods of meat thawing used in domestic conditions are: defrosting in the microwave oven (about 50%) and in the fridge. The present research shows that a remarkable number of respondents (about 23%) thaw meat in the incorrect way, *i.e.* by leaving it on the kitchen counter at room temperature or by putting wrapped meat in hot water (5%). These methods do not guarantee good quality of produce for meal preparation, and thawing at room temperature may lead to multiplying pathogenic microbes in meat.

TABLE 2. Raw, ready-to-cook and ready-to-heat meat products used to prepare meals for home cooking.

Type	Frequency of use (% of answers)							No answer
	every day	a few times a week	once a week	a few times a month	once a month	sporadically	never	
Meat culinary elements	8.6	41.4	12.2	15.3	2.8	6.9	9.2	
Ground meat	0.6	8.3	18.6	32.5	13.1	14.2	9.2	
Spiced up meat	3.3	18.1	10.8	14.4	3.6	20.6	26.1	
Frozen meat	1.1	14.4	10.6	20.8	6.1	24.7	18.6	
Frozen hamburgers	0	1.1	2.2	4.2	5.0	43.6	40.3	3.6
Dumplings, ravioli	0	2.2	4.4	19.2	14.2	35.3	21.1	
Ready-to-heat chops	0	2.2	3.3	6.7	4.7	37.5	41.9	
Other	0	0.3	0.8	1.7	1.1	1.7	90.8	

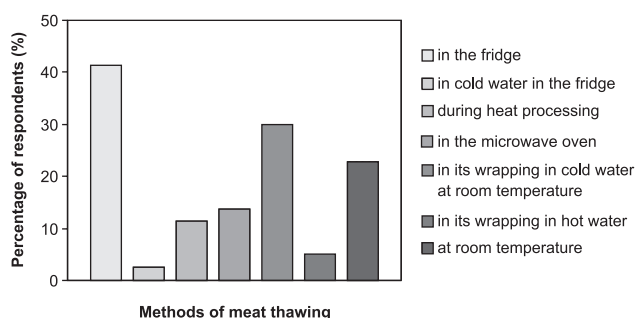


FIGURE 1. Methods of meat thawing used by the respondents (n=360).

The respondents usually coat meat using single layer coating: egg and bread crumbs (54.4%) or double layer: flour, egg, bread crumbs (43.3%), (Figure 2). Coating process is done just before frying (about 83%), which is the correct practice. However, some respondents (10.5%) coat chops some time before frying and put them in the fridge for 0.5–1 h. Such behaviour reduces the quality of chops, as coated meat produces remarkable amount of juices while stored, which then evaporate during heat processing, causing the coating to break and come off. Few respondents (0.6%) prepare coated chops one day before frying, which can result in microbiological hazard as the coating is made of raw egg.

**Heat processing of meat**

The respondents claim, that they determine the end of the roasting process visually (52.8%) or by measuring the time (49.7%), which does not guarantee proper heat processing and acceptable quality of the roast (too dry or too rare meat). Although special thermometers to measure the temperature inside meat are available on the market, only 7.5% of respondents use them. According to Anderson *et al.* [2004], consumers often excessively prolong the heat processing, as few of them use thermometers to establish the end of the process. It should be stressed that temperature control inside the roast guarantees correct quality of the meat, *i.e.* proper juiciness and microbiological safety. It is not, however, a popular method, as can be seen from the survey results.

As indicated Postolski & Gruda [1999], heating in the flowing air range (roasting) should last till the geometrical centre of the product reaches the temperature of 65-70°C for beef, 75°C – for pork and 79-82°C for mutton. Kiper & Street [2005] state that roast processing should aim at the follow-

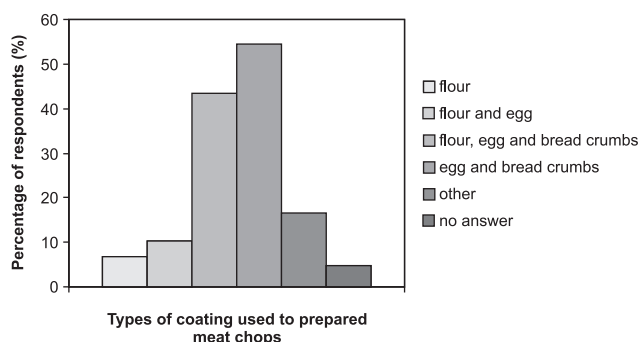


FIGURE 2. Types of coating used by the respondents to prepare meat chops.

ing temperature levels inside the roast: 71°C – for beef, lamb, pork and veal, and at least 74°C – for poultry. Reaching that levels of temperature inside roasted meat guarantees microbiological safety of the meal and its proper sensory values.

It has been shown, that for frying process the respondents use mainly oil (80.3%), olive oil (34.4%) and lard (22.5%). A statistically important influence of income on the type of fat used, was observed (p=0.0002). Some respondents (17.2%) declare, that they use butter for frying poultry, which is not acceptable as far as their health is concerned. The respondents list the following fat types: sunflower oil, soy oil, rape oil, universal oil, or mixtures of olive oil with other oils, *e.g.* Oliwier. Some respondents (12.5%) claim to rarely deep fat frying meat, and if they do, they use oil. The statistical analysis shows that men use animal fat more often than women: lard (p<0.05), butter (p<0.05), which is probably because they care less for the health values of the consumed fat.

The respondents state that the beginning of the frying process is established using domestic methods of measuring the temperature of fat: they would use a drop of water (37.5%) or a piece of raw potato (22.8%). They rarely have modern thermometers to measure temperature at the bottom of a frying pan or a deep fryer (9.4%). It has been shown that men use thermometers more often than women (p=0.00407), and that the method of determining the beginning of the frying process depends more on individual knowledge and experience of the respondents than on their sex, age or education.

About 7% of the respondents begin to fry meat in cold fat. Such technological practice prolongs the frying process and is very inappropriate from the health point of view, as meat absorbs more fat. It may also reduce the meal's efficiency. Some respondents (18.9%) claim that they begin frying when oil steams in the pan. This may result in a lower quality of the product, as the coating will get burned and the meat inside will be still raw.

The quality of the fried meat depends also on the frequency with which fat used for frying is exchanged. Most respondents (84.2%) dispose of the fat each time after frying. Some leave it for future use, keeping it in the fridge (4.2%), (Figure 3). But 10% of the respondents store the fat at room temperature: in the pan, in a kitchen cupboard or in the deep fryer. The oxidization and hydrolytic processes triggered in fat during frying process (thermic polymerization) continue to intensify

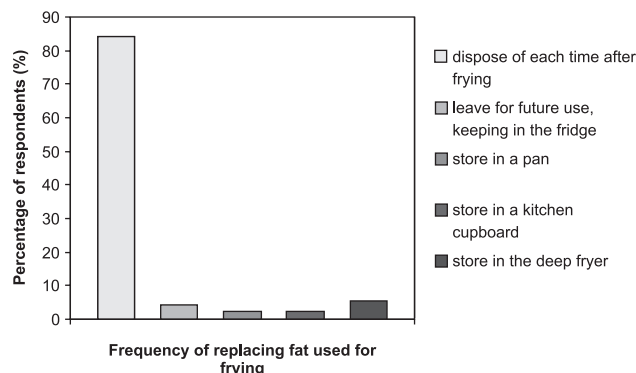


FIGURE 3. The storage conditions and the frequency with which the frying fat is exchanged by the respondents (n=360).

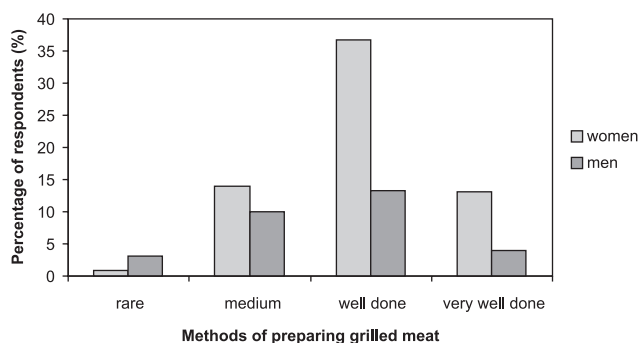


FIGURE 4. Method of preparing grilled meat by the respondents (n=360).

while the fat is stored and used for the second time. The result is bad quality fat (characterized by hydrolytic rancidity, when more difficult to digest polymers of mutagenic properties and hydrogen peroxides come to exist, while fat dissolvable vitamins become destroyed, *etc.*). The product has reduced sensory and health quality, as some of the fat (about 20%) is absorbed by the meat.

The respondents claim that when preparing grilled meat they prefer it well done (50.8%), (Figure 4). Fewer of them like it medium (24.4%) and very well done (17.2%). Rare steaks are the choice of only 4.2% of the respondents. The statistical analysis shows that men prefer rare meat ( $p=0.00024$ ) and medium ( $p=0.01071$ ) more than women.

These preferences are also dependent on age, as respondents under the age of 40 pointed to them more often. Grilled meat is prepared quite rarely, usually on garden barbecue (78.9%). Only 20.6% of respondents use contact grill or microwave oven with infra-red radiation.

#### Storage of meat dishes after cooking

As claimed by the respondents, meat dishes are usually stored in the fridge (75.3%), and 55.3% of the subjects say to store meat for 3 days. It is disturbing to find that some of them (3.6%) store dishes for more than 3 days, even up to 7 days. Over 20% of the respondents freeze meals and keep them frozen for a few up to 30 days at maximum. Only 2% admit to keep meat dishes at room temperature (in a pan, on the kitchen counter or in a cupboard). Incorrect thermal conditions while storing food may lead to the development of pathogenic microflora, which is the cause of food poisoning. Coleman & Griffith [1998] state that the reasons behind food poisoning, caused by consuming home-made meals, may include preparation of excessive amounts of food (9.9-57.1%) and its incorrect storage (21.1-38.5%).

## CONCLUSIONS

On the basis of the conducted research it may be stated that meat preparation in the home follows the rules of the catering technology. Few irregularities have been shown, which concern mainly: coating chops long before frying, thawing meat in incorrect thermal conditions, using bad quality fat for frying, and storing used fat for further use, as well as keeping to incorrect time parameters when safe keeping meat dishes.

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## **OCENA PRAWIDŁOWOŚCI PRZYGOTOWANIA POSIŁKÓW Z MIĘSA W WARUNKACH DOMOWYCH NA PRZYKŁADZIE WYBRANEJ GRUPY OSÓB**

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Celem badań była ocena sposobów przygotowania mięsa w warunkach domowych i ich prawidłowości biorąc pod uwagę zasady technologii gastronomicznej. Badania przeprowadzono metodą wywiadu bezpośredniego wśród losowo wybranych 360 dorosłych osób. Kwestionariusz ankiety zawierał pytania dotyczące przygotowywania posiłków z mięsa: rodzaju wykorzystywanych surowców, półproduktów oraz gotowych dań, sposobu i warunków prowadzenia obróbki wstępnej i ciepłej oraz przechowywania gotowych potraw.

Do przygotowywania posiłków z mięsa w domu respondenci zwykle wykorzystują mięso świeże lub mrożone (w tym mielone), sporadycznie stosując półprodukty lub gotowe wyroby. Rozmrażanie mięsa jest przeprowadzane przez większość respondentów (90%) w sposób prawidłowy, chociaż wielu z nich rozmraża mięso w temperaturze pokojowej. Do przygotowywania kotletów badani zazwyczaj stosują panierunek pojedynczy lub podwójny wykonując panierowanie prawidłowo, bezpośrednio przed smażeniem. Do smażenia na patelni najczęściej wykorzystywany jest olej słonecznikowy. Smażenie zanurzeniowe mięsa jest prowadzone przez nieliczne osoby (12,5%). Tłuszcz, większość z badanych wymienia każdorazowo po smażeniu. Smażenie badani rozpoczynają prawidłowo na rozgrzanym tłuszczu. Koniec procesu pieczenia mięsa oceniany jest wizualnie lub po określonym czasie, co nie gwarantuje dobrej jakości pieczeni i nie jest prawidłowe z technologicznego punktu widzenia. Mięso grillowane respondenci przygotowują przy wykorzystaniu grilla ogrodowego, jako średnio lub dobrze wysmażone. Posiłki z mięsa są przechowywane przez większość w lodówce przez okres 1-2 dni, nieliczne osoby wskazują na dłuższy czas, nawet do 7 dni.

Na podstawie przeprowadzonych badań stwierdzono, że posiłki z mięsa są przygotowywane w warunkach domowych z technologicznego punktu widzenia prawidłowo. Nieliczni ankietowani prowadzą ten proces nieprawidłowo. Nieprawidłowości dotyczą głównie panierowania kotletów na długo przed procesem smażenia, niewłaściwego rozmrażania mięsa, stosowania nieodpowiedniego tłuszczu do smażenia czy przechowywania go po użyciu w niewłaściwych warunkach do dalszego stosowania, a także zbyt długiego czasu przechowywania posiłków z mięsa.