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THE KNOWLEDGE OF PRINCIPLES OF GOOD CATERING PRACTICE (GCP) BY THE STAFF OF KINDERGARTEN CANTEENS®

Znajomość zasad dobrej praktyki gastronomicznej (GCP) przez personel stołówek przedszkolnych®

The aim of the study was to determine the knowledge of the correct production operations during preparation of meals for children in Warsaw's kindergartens. A survey was conducted among 220 people preparing meals in kindergarten canteens. It was stated, that respondents don't understand GCP principles, despite declaring proper technological practices. The correctness of pretreatment of potatoes and vegetables, as well as meat was confirmed, respectively by about 60% and 78–92% of respondents. Technological incorrectness declared by respondents were related to skipping vegetable washing after peeling, long soaking of peeled potatoes, not used proper rules when meat thawing and chops coating. A significant percentage of respondents (over 60%) declared cooking potatoes starting with cold water, which contributes to the loss of vitamin C, as well as the cooking of green vegetables in a small amount of water, which effects in lower sensory quality. Estimation of the end of the meat roasting process by temperature measuring was used by a small percentage of respondents (33%). Identified the lack of technological knowledge and non-application of HACCP rules in practice, which indicates the need to educate canteen personnel.

Key words: technological process, canteens in kindergarten, GCP, personnel.

Celem pracy przedstawionej w artykule jest określenie wiedzy na temat prawidłowego postępowania technologicznego podczas przygotowywania posiłków dla dzieci w warszawskich przedszkolach. Przeprowadzono badania ankietowe wśród 220 osób przygotowujących posiłki w stołówkach przedszkolnych. Stwierdzono, że respondenci nie w pełni rozumieją zasady GCP, mimo iż deklarują właściwe wykonywanie wielu procesów technologicznych. Prawidłowe prowadzenie obróbki wstępnej ziemniaków i warzyw deklarowało około 60% ankietowanych, natomiast mięsa 78–92%. Błędy technologiczne wskazane przez respondentów dotyczyły nie stosowania mycia warzyw po obieraniu, długiego moczenia obranych ziemniaków, nieprawidłowego rozmrażania mięsa i panierowania kotletów. Znaczny odsetek (ponad 60% osób) deklarował rozpoczynanie procesu gotowania ziemniaków od zimnej wody, co przyczynia się do strat witaminy C oraz gotowanie warzyw zielonych w małej ilości wody co ma wpływ na ich jakość sensoryczną. Koniec procesu pieczenia mięsa poprzez pomiar temperatury stosowało niewiele osób (33%). Stwierdzone braki wiedzy technologicznej i niestosowanie zasad HACCP w praktyce, wskazują na konieczność edukacji personelu stołówek.

Słowa kluczowe: proces technologiczny, stołówki w przedszkolu, dobra praktyka gastronomiczna, personel.

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INTRODUCTION

Institutional children's nutrition requires special responsibility in terms of providing high nutritional and sensory quality meals and their food safety. Ensuring the proper quality of prepared dishes in mass catering establishments is possible only within the implementation of Good Hygienic Practice (GHP) and Good Manufacturing Practice (GMP)' principles referred as Good Catering Practice (GCP), as well as HACCP rules [26].

The quality of food offered by catering establishments is closely related to proper food preparation in accordance with technological rules. It includes both the correct selection of foodstuffs, processes, and operations to be used in the production of dishes, as well as physicochemical and biological changes that occur in the raw materials during processing [11].

According to authors [10] personnel in Polish catering establishments still uses inappropriate technological and hygienic practices in food production.

In 2018, there were 408 canteens in Warsaw, which constituted approximately 15.2% of the total number of catering establishments in Warsaw [39]. They were under the supervision of the State Sanitary Inspection in the capital city of Warsaw among a group of 2,563 mass catering establishments. In 2016, in a group of 15 controlled establishments, poor sanitary and hygienic conditions that posed a threat to food safety were found. During the inspection, the sale of out-of-date products, digestive system ailments after eating meals delivered from catering establishments to schools and kindergartens, food storage at incorrect temperatures, lack of hygiene, and other issues were noted. Assessment of the catering services provided in school and kindergarten canteens showed a number of incorrectness in menus planning, including an insufficient variety of meals and too small proportion of fruit and vegetables in relation to consumed fats [36, 41]. In other research [44, 50], analysis of food safety compliance in 55 Warsaw nurseries demonstrated conformity with the GMP/ GHP and HACCP standards. However, the level of compliance with the standards to the documentation of the food safety system was higher than their use in practice [44].

Most of the published studies on canteens concern an assessment of food safety and hygienic behavior of staff, while only a small number explores technological practices (GMP) of the staff [5, 9, 22, 29, 44, 47]. It should be emphasized that improper technological behavior may lead to providing end products of poor quality [25]. The shaping of the technological process is closely related to health safety aspects. From the consumer's health point of view, it is important to obtain a microbiologically, chemically, and physically safe product, which could be achieved by the implementation and application of food safety systems [4, 15, 26]. Importantly, the catering industry can be a potential source of food poisoning for a big group of people. In the European Union, the percentage of noted food poisoning outbreaks after eating meals in catering establishments is over 60%, and in the USA it is nearly 80%, while the number of food poisonings caused by improper preparation of dishes at home is 21–30% [19, 20, 49].

The aim of the study was to determine the knowledge of catering practices during the preparation of meals for children by people responsible for the nutrition in Warsaw educational institutions on the basis of their declarations.

MATERIAL AND METHODS

Research on the implementation of GMP in kindergarten canteens was carried out using the direct interview method with staff responsible for nutrition in educational institutions.

The research was conducted among 220 people working in Warsaw kindergartens. Most of the respondents were women (92.7%). Three-quarters of the group (72.3%) were between 41 and 60 years old, 16.8% were 25–40 years old, and 10.9% of the respondents were under the age of 25. Almost half of the respondents (48.2%) had secondary education, 26.8% – vocational education, 2.7% – primary education, and 10% – higher education. The rest of the group did not declare their degree of education. More than half of the respondents were employed as a cook (50.5%) or as a kitchen manager (16.4%); 19.1% as manciples, the rest worked in different positions. They were mainly people who prepared meals directly.

The research tool was an original, validated questionnaire used in previous research [12, 31, 45]. The survey consisted of 16 questions about good catering practice during meal preparation and 4 questions about the characteristics of the respondents (gender, age, education, job position). The questions were closed-ended and related to the good manufacturing practices (GMP) during pre-treatment and thermal processing of plant and animal origin ingredients.

Statistical package STATISTICA v.13.0 was used to perform the statistical analysis. The comparison of the given qualitative features was performed using the one-way analysis of variance (ANOVA), which showed no statistically significant differences between catering practices in dependence of gender, age, and education of respondents.

RESULTS AND DISCUSSION

Manufacturing practices during pre-treatment of vegetables and potatoes

Operations related to the preparation of raw materials for heat treatment of vegetables and potatoes have a significant impact on the quality of the dishes obtained from them [11], therefore, the respondents were asked about the procedure during pre-treatment (Table 1). To eliminate physical, chemical and microbiological contaminants from the vegetable surface, proper pre-treatment procedure is recommended, i.e. root vegetables and potatoes should be washed, peeled, and then rinsed.

Most of the respondents (62.7%) declared the correct pre-treatment procedure (Table 1). Some respondents declared making mistakes by skipping the rinsing (16.8%) and soaking [root] vegetables in cold water for a long time before cooking (10.5%). There is a noticeable greater variation in declared handling methods of potatoes. The largest number of respondents (31.8%) declared, they soak the potatoes in cold water maximally <0.5h before cooking. Some (28.6% of surveyed workers) cook potatoes immediately after pre-treatment. Every fifth person (20%) conducted this process

incorrectly, and 23.3% of the group too long soaked the potatoes after peeling.

Table 1. Methods of vegetables and potatoes pre-treatment declared by canteens personnel (n=220)

Tabela 1. Metody obróbki wstępnej warzyw i ziemniaków deklarowane przez obsługę stołówek (n=220)

Pre-treatment method		Percentage of responses (%)	
		Root vegetables	Potatoes
wash, peel with a knife (for vegetable or chef's) and rinse		62.7	28.6
peel it with a knife and rinse it		16.8	20.0
wash, peel, rinse and soak in cold water (<0.5h)		17.3	31.8
wash, peel, rinse, soak in cold water until cooking (about 0.5-1h)		10.0	17.3
wash, peel, rinse, soak in cold water (for a few hours or more)		0.5	5.0
Peeling methods			
Manual		66.4	
Mechanical		47.3	
mechanical and manual		13.7	
The method of soaking the seeds of legumes			
„cold"	12 h at room temperature	38.2	
	12h at low temperature <10°C	44.1	
„hot"	12 h, pouring boiling water	4.1	
	3-4h, pouring boiling water	13.6	

Source: The own study

Źródło: Badania własne

Undesirable changes in color can influence consumer acceptability of the product. Enzymatic browning is an indicator of the quality deterioration of many fresh and processed fruits and vegetables such as banana and potato [2]. The chemical substances (e.g. sulfide) use, heat treatment, cold storage, and other advanced techniques are the methods that inhibit the browning.

Correct pre-treatment of root vegetables and potatoes allows for a short subsequent soaking in cold water after peeling to prevent their color darkening, which is caused by the browning reaction. The process is caused by the oxidation of phenolic compounds (mainly tyrosine) induced by endogenous polyphenol oxidase (o-diphenol oxidase, EC 1.10.3.1) in the presence of oxygen, to a brown compound called o-Quinones, which then polymerize to produce deep dark polymers (melanin) [2, 11]. Short-term soaking of the peeled vegetables in cold water or in weak salt solution are the methods commonly used in food service. Indeed, they reduce the activity of enzymes responsible for browning reactions (salt) and reduces the access of oxygen (water), but the too-long process may lead to minerals and vitamin C loss [28], as well as deterioration of sensory quality due to the leaching of flavor compounds [11, 46].

The surveyed workers declared (61%), that they usually peel the vegetable mechanically using a washer-peeler or combine mechanical with manual peeling (Table 1). Interestingly, many canteen workers (66.4% of respondents), declared manual peeling which in the case of preparing a large number of meals may have an impact on the quality of the produced dishes. Commercially pre-peeled vegetables (both potatoes and root ones) were not used by respondents in their canteens. Mechanical peeling is recommended to shorten the time of contact of the freshly cut vegetable' surface with oxygen or water (during soaking in water), thus reducing the nutrients lixiviation and cross-contamination possibility, as well as due to the smaller amount of food waste, and increased yield of the process [11]. Meal preparation personnel is becoming the most important factor influencing the generation of food waste in schools [7].

The nutritional recommendations indicate the need to include legume dishes in the menu. However, flatulence caused by oligosaccharides (RFO) deters consumers from eating more legumes [21]. A properly carried out culinary treatment includes soaking in water, which is usually applied prior to cooking to soften texture, significantly reduce the cooking time, and remove natural anti-nutritional substances (raffinose family of oligosaccharides - RFOs) [16]. Legume seeds can be soaked: cold (in refrigerated conditions) for about 10 hours or hot (by pouring boiling water over them) for 2-3 hours. "Hot" soaking is a more advantageous method in terms of greater removing the flatulence substances, better retention of nutrients and food safety, as higher temperature reduces initial microbial load (2-3 hours) and limits the time of staying in a dangerous temperature zone [1, 5, 16]. In our study, the majority of surveyed staff declared the use of the 'cold' method (82.3%), wherein a significant share (38.2%) improperly stores the soaked seeds at room temperature, which poses a microbiological hazard. The results of other authors also found improper food processing by the kitchen staff. In 16% of catering establishments, vegetables were processed at the same stand as other raw materials [23].

Manufacturing practices during the thawing and preparing cutlets for heat treatment

Thawing is one of the most important processes of a pre-treatment regarding meat. It should be carried out in a way allowing to minimize the risk of multiplication of pathogenic microorganisms. It is recommended to thaw the meat under refrigerated conditions and use a leak-proof package or plastic bag to isolate food from the surrounding environment. Once thawed the food cannot be re-frozen and must be cooked immediately [26].

The majority of the respondents (Table 2) declared that they thaw meat in accordance with the recommendations, i.e. thawing in cold temperature (76.4%) or directly cooking without thawing (1.8%). Some respondents (Table 2) used the cold-water thawing method at room temperature (13.2%) or under refrigerated conditions (3.6%). A small percentage of participants (3.2%) thawed meat at room temperature [37].

Table 2. Methods of pre-treatment and heat treatment of meat used by canteens personnel (n=220)

Tabela 2. Metody obróbki wstępnej i cieplnej mięsa stosowane przez personel stołówek (n=220)

Meat processing	Percentage of responses (%)
The ways to thawing meat	
in refrigerator	76.4
in cold water (packed) at room temperature	13.2
in cold water (packed) under refrigerated conditions	3.6
in hot water (packed)	0.5
directly during the heat treatment process	1.8
in a microwave oven	0.0
in the air without packaging at room temperature	3.2
Preparation cutlets to the heat treatment	
breading for cutlets immediately before pan-frying	91.8
breading for cutlets beforehand to save time and stored them after	4.1
breading for an hour in a refrigerator	1.4
breading for cutlets beforehand to save time and stored them after	0.9
breading and frying day before	0.9
Fat change after meat frying	
after each use	96.4
after use pouring fat into a jar and stores it for the next frying	2.6
the lack of answer	1.0
The end of the meat roasting process determining	
based on the processing time	34.1
assessing visually	22.3
the probe reading use	32.7
the lack of answer	10.9

Source: The own study

Źródło: Badania własne

A similar percentage of people declaring thawing the meat under refrigerated conditions was noted among staff responsible for mass catering in Ireland (63%) [6], Brazil (78.1%) [38], and Jordan (66.7%) [34]. In other Polish catering establishments, employees often do not follow the principles of GMP regarding meat and egg preparation, which can be a source of *Salmonella* sp. [26].

The surveyed workers were also tasked to indicate how long they make a breading for cutlets before pan-frying (Table 2). Most of the participants (91.8%) declared that this process was carried out, i.e. immediately before pan-frying. The rest of the group did this beforehand to save time and stored them after breading for an hour or a night in a refrigerator. Such a procedure leads to a product of low quality, and the breadcrumbs soaked with the juice of the meat may fall off during frying and burn [11].

Practices of respondents regarding the heat treatment of potatoes and vegetables

Almost all respondents boiled potatoes traditionally in a pot (Table 3), wherein most of them (64.5%) process them incorrectly, starting with cold water. This leads to increased vitamin C loss of up to 60%, whereas boiling water use reduces the loss to 41%. This is due to the inactivation of the ascorbinase enzyme at higher temperatures [11]. The recommended parameters of cooking vary depending on vegetable type, therefore the respondents answered a separate question about the thermal processing of green and other vegetables (Table 3), as well as the question about cooking vegetable stock.

Table 3. Methods of vegetables & potatoes heat treatment used by canteens personnel (n=220)

Tabela 3. Metody obróbki cieplnej warzyw i ziemniaków stosowane przez personel stołówek (n=220)

Thermal treatment methods	Percentage of responses (%)			
	potatoes	green vegetables	carrot	other
in a pot with plenty of water:				
- when starting the process with cold water	64.5	-	-	43.0
- when starting the process with boiling water	35.5	-	5.9	50.0
- without cover	-	7.7	-	-
- under cover	-	9.5	-	-
in a pot in a little water:				
- without cover	-	20.0	35.5	0
- under cover	-	40.9	45.2	0
- with the addition of fat	-	-	16.4	-
in the microwave oven:				
- in a little water	0.0	0.0	-	0.0
- in plenty of water	0.9	0.0	-	0.0
in a pressure cooker:				
- in a little water	0.5	0.0	-	2.0
- in plenty of water	0.0	0.9	-	0.0
in a pot (with perforated insert) steaming	0.0	10.9	-	5,0
in the combi steamer (steaming)	0.0	15.0	-	0.0

Source: The own study

Źródło: Badania własne

The greatest number of respondents (Table 3) declared that they usually cook green vegetables traditionally in a pot (78.1%), steam them in a pot (10.9%), and cook in a combi steamer (15%). Among kitchen workers who use traditional boiling, only 7.7% of them follow the culinary recommendations (GMP). It was found that most people cook green vegetables in a small amount of water, covered (40.9%), or without a cover (20%).

Green vegetables, that are rich in chlorophyll pigments, should be cooked as short as possible, and the process should be started with boiling water. A properly conducted cooking process is carried out in a large amount of water with a neutral

pH (dilution of organic acids), possibly with the addition of milk (neutralization of some acids), without a cover in the initial stage of heat treatment (to evaporate volatile organic acids) and without the use of increased pressure [11, 18].

A large diversification of responses was observed in the methods of carrot cooking (Table 3). Most of the respondents (97.1%) declared that they cook this vegetable in a small amount of water. Carrots are often prepared as stewed vegetables. Most consumers boil them under cover (45.2%), starting the process with both cold and hot water (22.6% each). A small percentage of surveyed (5.9%) indicated traditional boiling in a pot with a large amount of hot water as a beneficial method of processing carrots. This allows for obtaining a product with good sensory quality, good retention of carotenoid compounds, and significant removal of chemical contaminants [44]. Vegetables low contaminated with chemical residues should be cooked in a little water, which reduces the leakage of nutrients. On the other hand, vegetables that tend to accumulate chemical contaminants should be boiled in large amounts of water and with prolonged process time to remove them [13] Only 16.4% of examined workers declared fat as an additive to stewing carrots, which is used to preserve beta-carotene (Table 3).

In the case of other vegetables (Table 3), the respondents declared traditional boiling in water (93%). Half of the respondents (50%) cook vegetables correctly, starting with hot water, but a significant share (43%) boil it with a 'cold start' (Table 3). A significant percentage of the surveyed staff correctly depended boiling with „cold or hot start" on the culinary intention (stock or vegetable portion). More than half of the surveyed group (52% of indications) indicated that the vegetable stock should be cooked with a cold start, and only 20% of workers pointed out that cooked vegetable portion should be boiled with a 'hot start'. Few of the respondents declared cooking in a steam pot (5%) and in a pressure cooker (2%).

The beetroot borscht (red beet soup) is a typical national Polish dish eaten mainly in Central and Eastern Europe [48]. In Russia, Lithuania, Belarus, Ukraine, and Poland, the main ingredient is beet, which gives the soup a vivid red color [32]. Betalains, the beetroot pigments, are sensitive to high temperatures and the presence of oxygen. In gastronomic practice, to obtain the desired red color of beetroot, they should be boiled or baked in its peal, and then grated and acidified to fix the color. Boiling beets of a high degree of fragmentation (rubbing on the grater) results in obtaining unacceptable sensory experience of soup [11, 46].

In this study, almost all of kitchen staff (98.7%) declared preparation of beetroot borscht on their own, and a small percentage (1.4%) uses canned or instant soup (Figure 1).

The largest percentage of the respondents (36.4%) comminuted beets before heat treatment, rubbing them on a grater, which contributes to a significant deterioration of the color. Nearly 30% of respondents diced beetroots into cubes or slices before heat processing. Only every third respondent (34.5%) declared following the recommended procedure to maintain the desired color of borscht, i.e. roasting the beets in their peel, then shredding them and cooking them briefly to elute the dyes (Figure 1).

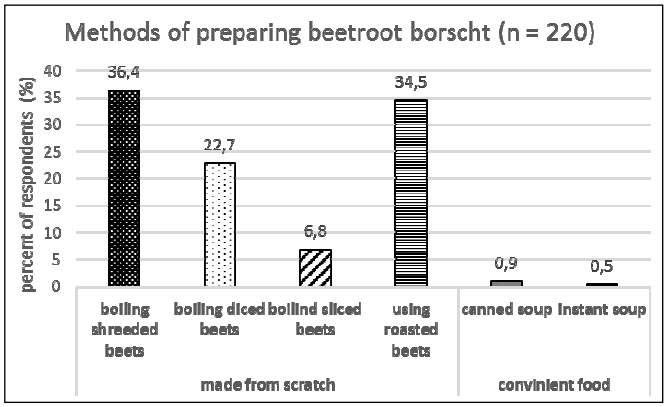

Fig. 1. Methods of beetroot soup preparation in group of canteens personnel (n=220).

Rys. 1. Sposoby przygotowywania barszczu czerwonego przez personel stołówek (n=220).

Source: The own study

Źródło: Badania własne

The process of heat treatment of meat

Frying is a heat treatment method that involves food and hot oil or fat. Hence, the quality of the frying medium, process conditions, and utensils or fryers used are critical elements in the frying process. The frying fats most frequently used by the respondents were vegetable oil (94.6%), olive oil (6.4%), and butter (2.3%). Lard and other fats were used by less than 1% of responders. The majority of participants in the study (96.4%) declared that the frying fat was changed after each use, one of those surveyed poured it into a jar and stored it for the next frying, the others did not answer this question.

The respondents (n = 220) determined the moment of oil readiness for frying in various ways. This was mainly done by the "raw potato" test (35.5%), the "water drop" test (31.4%), or used by a thermometer (24.5%). A small percentage of the respondents (5.5%) declared that they start frying when they notice the burning and smoking of fat or start the process immediately after pouring the cold fat into the pan (1.4%). Too low temperature of fat and the use of old frying fat are factors to increase its absorption into a product, which is a disadvantageous phenomenon from the technological and nutritional point of view [11].

One of the important elements in ensuring food safety is reaching the right temperature in the geometric center of the product. Meat processing temperature is a critical control point (CCP) and should be monitored and recorded [11]. Respondents were asked how they determined the end of the roasting process (Table 2). Most surveyed workers (34.1%) declared that the end of the process was determined based on the processing time or assessed visually (22.3%). The probe reading as a method of estimation was used only by 32.7% of the respondents. A similar share of kitchen workers (31.3-37.5%), who declared indication of the end of the roasting process based on temperature measurement were obtained in Brazilian study [39] and higher share (40-57%) in the Irish study [22].

The time and temperature of the heat treatment should be sufficient to inactivate pathogenic non-sporulating microorganisms. It is assumed that the temperature of beef

should be min. 63°C, pork at least 74°C (72° C for 2 minutes), and in the case of whole poultry carcasses temperature of up to 85°C. Visual assessment of the degree of doneness is not enough to accurately determine the temperature inside the meat. Determining the end of the process visually or by measuring the cooking time may lead to a reduction in the juiciness of the meat [12]. Controlling the temperature and time of the process reduces the formation of unfavorable compounds (heterocyclic aromatic amines and acrylamide) and the loss of some amino acids and minerals [9].

Food provided by catering establishments can be a significant source of many food poisonings [35]. It may be affected by improperly conducted culinary treatment, which lead to cross-contamination between ready food and the raw material; inappropriate storage conditions; incorrect cleaning procedures; lack of personnel hygiene ; use of contaminated dishes and equipment, and insufficient heat treatment [3, 24, 33]. In the past, these food safety noncompliances resulted in food poisoning caused by the presence of *Listeria monocytogenes* in food – in school catering in Italy, 2009-2012 [30]; and in school and university canteens in Greece, 2001-2004 [27]; *Bacillus cereus* in kindergarten in Belgium [14]; *Salmonella Sp.* - in Podgorica, Montenegro, where about 23,000 food poisonings were found in 2004-2015 [4]. It is worth emphasizing that young students represent a high-risk group for *L. monocytogenes* due to lower immunity, especially among children with weakened immune systems [8, 35, 43].

The performed statistical analysis did not show the influence of sociodemographic features on the technological behavior of canteen employees. This may be due to the homogeneity of the group, as most of the people delegated to the workshops were female, aged 41-60 and employed as a cook or kitchen assistant.

Summing up, digestion of nutrients, bioactive compounds bioavailability, development of changes in food, and above all, food safety may be influenced by its thermal processing and application of appropriate technological procedures [17, 40, 42]. Proper manufacturing practices, which include pretreatment and heat treatment besides ensuring food safety (e.g. internal temperature measurement, removing food contaminants) should also provide food of attractive appeal and other sensory traits (e.g. color of green vegetable, the juiciness of meats, intense flavor of vegetables), and protect nutritional value (against leaching and destruction of nutrients, absorption of undesired fat). Gaps in kitchen workers' knowledge resulting from no culinary education, as well as underinvestment of equipment in kindergarten, may reflect on a lower quality of served dishes. Further study should develop this preliminary research and be focused on hygienic aspects including the kitchen premises audits.

CONCLUSIONS

1. The staff of kindergarten canteens participating in the study does not fully know and implement the principles of good catering practice (GCP).
2. Although reaching the right temperature in the geometric center of a dish is crucial for food safety and sensory quality, only about 33% of respondents declared that the end of heat treatment of meat is determined by measuring temperature. This indicates irregularities in the hygiene of food preparation in kindergartens and in the functioning of the HACCP system.
3. About 60% of the respondents declared that the pretreatment of potatoes and vegetables was performed correctly. The rinsing of vegetables after peeling and soaking of peeled for too long was mentioned among the irregularities. Proper pre-treatment of meat was declared by the majority of respondents, e.g. defrosting the meat in accordance with the recommendations (78%) coating the cutlets immediately before frying (92%).
4. Surveyed staff declared that potatoes were improperly boiled with a cold start (64.5%), which contributes to large losses of vitamin C. Additionally, 60.9% of staff was stated as cooking green vegetables in a small amount of water, which effect reduces the products sensory quality.
5. Our findings show the need to educate people responsible for preparing meals in preschool institutions. Irregularities in the field of technological conduct can affect sensory quality, nutritional value, and food safety.

PODSUMOWANIE

1. Personel stołówek przedszkolnych, biorący udział w badaniu nie w pełni zna i realizuje zasady dobrej praktyki gastronomicznej (GCP).
2. Mimo, iż osiągnięcie odpowiedniej temperatury w geometrycznym centrum potrawy jest kluczowe dla bezpieczeństwa żywności i jakości sensorycznej, jedynie około 33% osób deklarowało, że koniec obróbki termicznej mięsa określa mierząc temperaturę. Wskazuje to na nieprawidłowości w higienie przygotowania posiłków w przedszkolach i w zakresie funkcjonowania systemu HACCP.
3. Prawidłowe wykonywanie obróbki wstępnej ziemniaków i warzyw deklarowało około 60% badanych. Wśród nieprawidłowości stwierdzono pomijanie procesu mycia warzyw po obraniu, a obrane ziemniaki były zbyt długo moczone. Poprawne prowadzenie obróbki wstępnej mięsa deklarowała większość respondentów, np. rozmrażając mięso zgodnie z zaleceniami (78%) czy panierując kotlety bezpośrednio przed smażeniem (92%).
4. W przypadku procesu obróbki termicznej, ankietowany personel deklarował nieprawidłowe gotowanie ziemniaków od zimnej wody (64.5%) co przyczynia się do dużych strat witaminy C oraz gotowanie warzyw zielonych w małej ilości wody (60.9%), co obniża ich jakość sensoryczną.
5. Na podstawie przeprowadzonych badań stwierdzono potrzebę edukacji osób odpowiedzialnych za przygotowanie posiłków w placówkach przedszkolnych. Nieprawidłowości w zakresie postępowania technologicznego mogą bowiem wpływać na jakość sensoryczną, wartość odżywczą i bezpieczeństwo żywności.

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