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THE DEVELOPMENT OF NEW MEAT PRODUCTS FOR THE ELDERLY

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INTRODUCTION

One of the most significant social and economic problems of the coming century in Europe, North America, Japan and Australia is the problem of aging. It is expected that this demographic shift will lead to new problems in the field of healthcare, long-term care for the elderly, and an increase in social spending on maintaining the health and well-being of an increasingly large elderly population. A significant number of elderly people face negative and often irreversible health problems due to protein malnutrition. Meat of ruminants, in particular beef, veal and lamb, together with other sources of animal protein, such as dairy products, fish and eggs, are important sources of essential nutrients[1]. Adequate protein intake is necessary to prevent protein malnutrition and for healthy aging.

There is a difficult question of how to increase the protein intake of older people in order to prevent protein malnutrition. The potential for increasing protein intake by older people remains largely unexplored[2]. Short-term metabolic studies show that older people require protein intake at a higher level than younger people in order to maximize muscle protein synthesis[3]. A higher level of protein intake is associated with a smaller decrease in muscle mass and physical performance among the elderly, ensuring the preservation of overall health and quality of life in old age.

The purpose of the study is to consider the current state and prospects for the development of meat products of elderly nutrition. In this article, a research attempt is made to describe potential ways to develop nutritionally balanced meat products of elderly nutrition aimed at helping older people to maintain an active and healthy aging process. Of great importance is the

[1] Lee, S., Choi, Y.-S., Jo, K., Yong, H. I., Jeong, H. G., Jung, S. 2021. Improvement of meat protein digestibility in infants and the elderly. *Food Chemistry*, 356, 1–12. URL: https://pubmed.ncbi.nlm.nih.gov/33873143/

[2] Mena, B., Ashman, H., Dunshea, F. R., Hutchings, S., Ha, M., Warner, R. D. 2020. Exploring meal and snacking behaviour of older adults in Australia and China. *Foods*, 9 (426), 1–24. URL: https://www.mdpi.com/2304-8158/9/4/426.

[3] Iammarino, M et al. 2020. Dye use in fresh meat preparations and meat products: A survey by a validated method based on HPLC-UV-diode array detection as a contribution to risk assessment. *Int. J. of food science & technology*, 55 (3), 1126–1135. URL: https://www.researchgate.net/publication/334228940

production of meat products of elderly nutrition with a high content of nutrients, which are characterized by easy accessibility and such chemosensory characteristics as attractive appearance, size, color, taste, texture and consistency[4]. It is important that meat products intended for the elderly solve the problem of nutrient deficiency, improve health, have a pleasant taste and realistically meet the existing conditions of consumption at home or in a hospital[5]. In the process of developing new meat products of elderly nutrition, various factors should be taken into account, such as chemosensory attractiveness, packaging solutions and enrichment with micronutrients.

The object of the study is age-related changes in the consumption of meat products. Age undoubtedly affects the thresholds for recognizing basic tastes, especially sweet and salty. In particular, higher thresholds for sucrose and sodium chloride were found among the elderly, compared with young people[6]. Higher thresholds of taste recognition cause a natural need to add sugar and salt to food[7]. Older people are also less sensitive to odors. Changes in taste and smell require some sensory modification of functional foods for the elderly[8]. Such flavor enhancers as spices and herbs, especially natural ones, masking any extraneous notes of taste and smell, as well as ingredients that improve texture, should be included in the composition of meat products of elderly nutrition to enhance their sensory properties.

The relevance of the presented research on the development of meat products of elderly nutrition is due to the fact that the relative preferences provided by older people to various sources of protein, including such sources of animal protein as red meat and poultry, as well as alternative sources of vegetable protein, have not yet been identified. The choice of

[4] Botinestean, et al. 2020. Optimization of textural and technological parameters using response surface methodology for the development of beef products for older consumers. *Journal of Texture Studies*, 51 (2), 263–275. URL: https://pubmed.ncbi.nlm.nih.gov/31292959/

[5] Siegrist, M. 2020. Consumer acceptance of novel food technologies. *Nature Food*, 1, 343–350. URL: https://www.nature.com/articles/s43016-020-0094-x

[6] Shi, H. et. al. 2021. Techniques for postmortem tenderisation in meat processing: Effectiveness, application and possible mechanisms. *Food Production, Processing and Nutrition*, 3 (21), 1–26. URL: https://fppn.biomedcentral.com/articles/10.1186/s43014-021-00062-0

[7] Vliet, S. et. al. 2020. A metabolomics comparison of plant-based meat and grass-fed meat indicates large nutritional differences despite comparable Nutrition Facts panels. *Scientific Reports*, 11, 1–13. URL: https://pubmed.ncbi.nlm.nih.gov/34226581/

[8] Gómez, I. et. al. 2020. The effects of processing and preservation technologies on meat quality: Sensory and nutritional aspects. *Foods*, 9 (10), 1–30. URL: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7601710

food by elderly people has not been studied[9], their preferences and willingness to pay for various carbon labels depending on the protein source have not been studied. The novelty of the presented research consists in the fact that the problems of the production of meat products of elderly nutrition are considered based on the possible chemical interaction[10], not only between nutrients, but also between conventional medicines and biologically active additives and various food products that are now included in the composition of functional foods.

1. Materials and methods

In order to identify new empirical studies in the field of the production of meat products of elderly nutrition, citation tracking was carried out in Google Scholar. It was assumed that it is possible, although unlikely, there may be studies of the production of meat products of elderly nutrition, in which the scientific literature presented in Google Scholar on the production of meat products of elderly nutrition is not cited, in this case, such studies will be skipped when using the named method. Using the same search query allowed us to discover 417 unique citations in Google Scholar. Filtering of these 417 publications allowed us to identify 26 studies related to the study of the production of meat products of elderly nutrition, namely, the growing volume of experimental and interventional studies aimed at identifying ways to increase the acceptability of meat products of elderly nutrition, conducting comparisons of cultured meat with alternative proteins in the production of meat products of elderly nutrition, identifying countries and demographic groups, the most open for the production of meat products of elderly nutrition, the supposed advantages in the aspects of preserving the health of the elderly and ensuring the safety of meat products of elderly nutrition, key barriers to the distribution of meat products of elderly nutrition associated with aversion, food neophobia, economic anxiety and ethical problems, including two key variables that greatly affect the consumer perception of meat products of elderly nutrition in the long term, specifically speaking of price and taste.

[9] Bloom, I., Pilgrim, A., Jameson, K. A., Dennison, E. M., Sayer, A. A., Roberts, H. C., Cooper, C., Ward, K. A., Robinson, S. M. 2021. The relationship of nutritional risk with diet quality and health outcomes in community-dwelling older adults. *Aging Clinical and Experimental Research*, 17 (7), 1–10. URL: https:// pubmed.ncbi.nlm.nih.gov/ 34255296/

[10] Chriki, S., Hocquette, J.-F. 2020. The myth of cultured meat: A review. *Frontiers in Nutrition*, 7 (7), 1–9. URL: https://www.frontiersin.org/articles/10.3389/ fnut.2020.00007/full

The texts of research publications collected thanks to Google Scholar were inductively analyzed using qualitative content analysis. Qualitative content analysis is carried out on two levels. Explicit content analysis focuses on the content of texts from a superficial point of view based on the written word. Hidden content analysis delves into the content and interprets the deep meaning embedded in the text. In the presented study of the production of meat products of elderly nutrition, qualitative content analysis is mainly based on the analysis of the explicit content of publications. Qualitative content analysis of the collected material was carried out in several stages. At the first stage, the texts of publications devoted to the production of meat products of elderly nutrition were read and re-read entirely, that is, the so-called naive reading was carried out[11]. Then, reflections on the integrity and on the important elements of the publications read were recorded, arising on the basis of impressions aroused under the influence of naive reading. Further, all parts of publications related to the purpose of the study of meat products of elderly nutrition were divided into approximately the same semantic units[12].

Qualitative content analysis included grouping of meat products of elderly nutrition by identifying common characteristics between them, in accordance with production processes and ingredients[13]. At the subsequent stage, semantic units were codified, a number of categories with subcategories emerged. Finally, after all the texts of the publications were read, the texts were compared with the results of the content analysis undertaken, which made it possible to verify the reality of the coverage of the selected categories and subcategories of the content of the texts of publications and codes in full.

The final data of qualitative content analysis were reviewed and analyzed by two researchers independently of each other, using thematic analysis aimed at identifying individual topics. All collected materials and personal data related to respondents were treated confidentially. The study

[11] Jędrusek-Golińska, A. et al. 2020. Recent progress in the use of functional foods for older adults: A narrative review. *Comprehensive Reviews in Food Science and Food Safety*, 19, 835–856. URL: https://pubmed.ncbi.nlm.nih.gov/33325174/

[12] Grasso, A. C., Hung, Y., Olthof, M. R., Brouwer, I. A., Verbeke, W. 2021. Understanding meat consumption in later life: A segmentation of older consumers in the EU. *Food Quality and Preference*, 93, 1–14. URL: https://www.sciencedirect.com/science/article/pii/S0950329321001257

[13] Broeckhoven, I., Verbeke, W., Tur-Cardona, J., Speelman, S., Hung, Y. 2021. Consumer valuation of carbon labeled protein-enriched burgers in European older adults. *Food Quality and Preference*, 89, 1–11. URL: https://www.sciencedirect.com/science/article/pii/S0950329320303839

was conducted in accordance with the Helsinki Declaration of Ethical Principles.

2. Results

Aging people are more susceptible to weight loss and loss of muscle mass, so it is important that meat products for elderly nutrition provide sufficient nutrients in terms of functional preservation and strengthening of immunity, bone health and cognitive functions. Poor appetite leads to a decrease in the consumption of meat products, which entails difficulties in achieving the recommended level of consumption of macronutrients, such as protein, and many trace elements, especially vitamin D, which is fraught with a decrease in body weight and muscle mass.

The consumption of protein by the elderly is important for the healing of the skin, maintaining the integrity of the immune system and restoring the body after diseases. Increasing protein intake is useful to meet the physiological needs of the elderly, especially those suffering from chronic diseases[14].

In addition to an additional protein allowance, it is recommended to take calcium and vitamin D to prevent bone loss and maintain existing bone density, thereby reducing the risk of traumatic injuries in falls and fractures.

An adequate diet in old age plays an important role in maintaining the health and well-being of older people. In the elderly subgroup of the population, energy costs often exceed energy consumption, which leads to weight loss, muscle exhaustion and increased weakness of the body. Consequently, a decrease in muscle mass and metabolic rate develops, which affects appetite, physical activity, functional abilities and health status. Consumption of meat products may decrease. Physical obstacles, such as limited mobility, limited access to shops, functional restrictions on the preparation and consumption of meat products, as well as other social and medical reasons are factors influencing the choice of meat products by older people[15]. Meat food prices also have an impact on the consumption of meat products by older people. Elderly people often lack food for reasons of isolation, dental problems, depression or chronic diseases, as well as difficulty swallowing and loss of taste.

[14] Beniwal, A, S. et. Al. *Comprehensive Reviews in Food Science and Food Safety*, 20 (2), 1221–1249. URL: https://www.researchgate.net/publication/349377814_Meat_analogs_Protein_restructuring_during_thermomechanical_processing

[15] Bryant, C., Barnett, J. 2020. Consumer acceptance of cultured meat: An updated review (2018–2020). *Applied Sciences*, 10, 1–25. URL: https://www.mdpi.com/2076-3417/10/15/5201

The chemosensory problem, coupled with difficulties in chewing and swallowing food, contribute to poor nutritional status and decreased appetite among the elderly. Older people are much more concerned about the texture of food, compared with young people, because older people usually have difficulty eating meat products that have a hard, crunchy, dry or stringy texture[16]. Therefore, the consumption of such important sources of protein and micronutrients as red meat by the elderly may decrease. Patients with Alzheimer's disease often suffer from loss of sensitivity and from a decrease in the acuity of taste and smell, which can cause a lack of interest in eating. Many chronic diseases, as well as the lack of visual appeal of high-quality food, can negatively affect appetite. In addition, medications prescribed to elderly people can cause unpleasant side effects, including not only drowsiness, forgetfulness, but also nausea, and changes in taste perception, as well as affect the digestive tract and, consequently, the diet. Along with the noted problems, older people are characterized by a decrease in appetite, which is why they consume smaller portions of meat products, so it becomes more difficult for them to meet their needs for micronutrients[17]. Early onset of satiety and physiological loss of appetite are common among the elderly and entail a decrease in the consumption of meat products.

A decrease in the level of consumption of meat products negatively affects the ability of an elderly organism to digest food, since, ultimately, the physiological processes of absorption, transportation and metabolism slow down, leading to insufficient intake of nutrients into the body. Low consumption of meat products by elderly people leads to a shortage of energy, protein and trace elements, to specific nutritional deficiencies associated with vitamins B, C, D, E and K, as well as zinc, iron, potassium and selenium. Insufficient protein intake leads to a decrease in muscle mass, restriction of muscle protein synthesis and an increase in oxidative damage to muscle tissue.

Future approaches to the development and production of meat products for elderly nutrition should focus on the development of new means to meet the special nutritional needs of older people, taking into account the

[16] Fraeye, I., Kratka, M., Vandenburgh, H., Thorrez, L. 2020. Sensorial and nutritional aspects of cultured meat in comparison to traditional meat: Much to be inferred. *Frontiers in Nutrition*, 7 (35), 1–7. URL: https://www.frontiersin.org/articles/10.3389/fnut.2020.00035/full

[17] Holman, B. W.B., Fowler, S. M., Hopkins, D. L. 2020. Red meat (beef and sheep) products for an ageing population: A review. *Int .J. of food science & technology*, 55 (3), 919–934. URL: https://researchoutput.csu.edu.au/en/publications/red-meat-beef-and-sheep-products-for-an-ageing-population-a-revie

decrease in olfactory function, changes in sensory perception of food and preferences in the elderly socio-age group. Here there is a serious problem of developing nutritionally balanced meat products for elderly nutrition that can help the elderly cohort maintain an active and healthy aging process. It is important that meat products intended for elderly nutrition eliminate nutrient deficiencies, stimulate the functional abilities of the body, improve taste and, ultimately, consumption, taking into account factors such as differences in sensory perception, realistic consumption conditions, as well as physical health. Elderly people face the problem of loss of chemosensory acuity, as a rule, more pronounced in adults over the age of seventy. Food preferences and consumption of meat products for elderly nutrition are influenced by age-related diseases and medications. In addition, the decrease in sensory function is often influenced by habits, traditions, mobility and social environment. The characteristics of meat products for elderly nutrition, such as packaging, consistency, temperature and visual appeal, as well as the motives for choosing meat products for elderly nutrition, such as cost and convenience, also play an important role in choosing meat products. The relationship between aging and taste perception increases simultaneously with age, affecting appetite and the consumption of meat products by older people. When a large concentration of stimulus is required, older people are characterized by an increased sensitivity threshold before the stimulus can be felt. The threshold values of the main taste qualities in older people, for example, sweeteners, salt, acids and bitter compounds, are four to five times higher compared to younger adults. This decrease in the ability of older people to recognize flavors in food can lead to a preference for meat products with more intense flavors containing higher levels of sugar or salt, which are not always useful. However, a number of studies have shown[18] that the loss of taste sensitivity in older people does not necessarily lead to a preference for products with improved taste. Strategies for solving the problem of reducing chemosensory in the elderly include measures aimed at improving the taste and aroma of meat products, enhancing taste sensations and stimulating appetite. Additives such as monosodium glutamate or artificial flavors, such as roast beef or bacon, spices such as rosemary, garlic, paprika and onion, can stimulate the consumption of meat products for elderly nutrition.

[18] Payne, L., Harris, P., Ghio, D., Slodkowska-Barabasz, J., Sutcliffe, M., Kelly, J., Stroud, M., Little, P., Yardley, L., Morrison, L. 2020. Beliefs about inevitable decline among home-living older adults at risk of malnutrition: A qualitative study. *Journal of Human Nutrition and Dietetics*, 33 (6), 841–851. URL: https:// pubmed.ncbi.nlm.nih.gov/32840942/

Poor chewing ability caused by decreased muscle strength, dental problems and difficulty swallowing can affect the consumption of meat products for elderly nutrition. The need for the elderly to apply increased efforts when chewing meat products for elderly nutrition is accompanied by a feeling of fatigue. Creaminess, smoothness, crispness and elasticity of the texture of meat products for elderly nutrition are important attributes that determine the general perception of meat products for elderly nutrition. Elderly people prefer such meat products for elderly nutrition, which can be consumed without much effort. Manipulating the textural characteristics of meat products for elderly nutrition is beneficial from the point of view of improving nutritional properties and reducing chewing efforts, while simultaneously providing a natural increase in the consumption of meat products for elderly nutrition by elderly people.

3. Discussion

Due to the increase in life expectancy in recent decades, the elderly is becoming the most numerous segments of the population suffering from limited physical and cognitive functioning. To ensure that older people not only live longer, but also lead a healthy lifestyle, it is necessary to thoroughly investigate the determinants of physical functioning, primarily those that include chronic diseases, oxidative stress, waist circumference.

A prospective study of the consumption of processed meat, red meat and poultry in combination with self-esteem and lower limb functions among persons representing the non-institutionalized elderly population allows researchers to obtain detailed information related to the consumption of meat products of elderly nutrition. On the one hand, the reduction in the consumption of meat products by the elderly population is caused by a reduction in the energy needs of the elderly body. On the other hand, it is provoked by information received in the media or from the Internet. In particular, the complete refusal of elderly people, the so-called vegetarians or vegans of ovo-lactic[19], from eating red meat of lamb, pork, beef, veal and horse meat, as well as poultry or meat products in the form of boiled and raw sausages, boiled, dried and raw meat products, or eating them eating only occasionally, that is, less than once a week, is mainly due to concern about the high content of cholesterol, fat and salt in meat products. Meat products usually contain more salt and fat than fresh meat. It should also be mentioned the antibiotics, hormones and dioxins contained in meat products. The problem is multifaceted and difficult to control. Grouping of

[19] Spence, C., Youssef, J. 2021. Aging and the (chemical) senses: Implications for food behaviour amongst elderly consumers. *Foods*, 10 (168), 1–16. URL: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7830801/

different types of meat contributes to the identification of three mutually exclusive categories of meat products of elderly nutrition, firstly, processed meat, including bacon, salami and sausages, secondly, red meat, including beef, lamb and pork, and, thirdly, several varieties of poultry and rabbits. A high level of consumption of processed meat products with elderly nutrition is fraught with an increased risk of impaired mobility and functions of the lower extremities. In addition, replacing processed meat with fish, legumes, dairy products or nuts entails a reduction in the risk of functional disorders.

Red meat is closely associated with increased mortality. Replacing processed meat with poultry reduces the risk of lower limb dysfunction. A high level of consumption of red meat and poultry during elderly nutrition is associated with higher muscle mass, especially among women[20]. In groups of people who eat large amounts of red meat and chicken, there was no association with muscle mass or muscle strength. There are several potential mechanisms of communication between processed meat and functional disorders. Protein is an important component of meat, however, meat, and especially processed meat, also contains a significant amount of saturated fats and trans fats. These types of fats are quite capable of subsequently leading to a decrease in the level of physical functioning. In addition, compared with red meat and poultry, the sodium and nitrite content in processed meat is significantly higher. Sodium and nitrites are fraught with an increased risk of cardiovascular diseases due to increased blood pressure and endothelial dysfunction. This suggests that, with elderly nutrition, the beneficial effect of high-quality protein in meat can be balanced by a high content of saturated fats and trans fats, sodium and nitrites in processed meat.

This idea is confirmed by the fact that the risk of impaired physical functions is reduced when processed meat is replaced with other sources of protein during elderly nutrition. Fish is a common substitute for meat and is an important source of omega-3 fatty acids with an anti-inflammatory effect. It is likely that the detrimental effect on the health of the elderly from eating processed meat is caused by insufficient consumption of fish. It is widely believed that beef has the best taste and is the safest of the three types of meat. The taste of pork meat is less attractive, pork is recognized as a more fatty and less digestible type of meat. Poultry is lean, easy to prepare, better digestible, compared to other types of meat. Factors of fat

[20] Struijk, E., Fung, T., Hu, F., Willett, W., Rodriguez-Artalejo, F., Lopez-Garcia, E. 2021. Red meat consumption and risk of frailty in older women. *Current Developments in Nutrition*, 5 (2), 52. URL: https://pubmed.ncbi.nlm.nih.gov/34755477/

content, digestibility, cooking efforts, as well as education and how important a healthy diet is for older people do not really predict the frequency of eating meat products of elderly nutrition. It was found that the same factors predict the frequency of consumption of pork and poultry, moreover, they are difficult to compare, since the categories of meat are not the same. Meat is an important source of high-quality protein, because it contains a large amount of essential amino acids. Thus, among the elderly, the consumption of animal protein is directly related to the improvement of physical functioning, especially with muscle strength, as opposed to muscle weakness. Malnutrition due to aging is a condition resulting from insufficient assimilation or consumption of food, leading to a change in body composition, to a decrease in body weight without fat and to a decrease in body cell mass, resulting in a decrease in physical and mental functions, deterioration of the clinical condition. In addition to protein, meat contains other nutrients, such as B vitamins, which are also beneficial for physical functioning. On the other hand, meat is characterized by a relatively high content of saturated and trans-fatty acids. Reducing the consumption of saturated and trans fatty acids, replacing them with unsaturated fats reduces the incidence of cardiovascular diseases. In addition, eating red meat appears to be associated with an increase in overall, cardiovascular and oncological mortality. Therefore, understanding the impact of meat consumption on the health of the elderly is of great interest, given the high prevalence of not only cardiometabolic risk factors, but also malnutrition, which leads to loss of muscle mass and disability. Studies of the links between the consumption of red and white meat with physical functions allow us to identify the phenomenon[21] that a higher level of consumption of red meat or poultry and fish is characterized by a lower risk of developing functional disorders, although this relationship seems significant only in people with a high level of physical activity.

Oral food intake during the day promotes good health, and also relieves an elderly person from many sufferings associated with chronic diseases. There is a link between the disorder of chewing and swallowing, on the one hand, and the nutritional status of older people, on the other hand. Fear of suffocation can lead to an unwillingness to eat, and, as a result, to insufficient intake of nutrients. Other reasons that negatively affect the motivation to eat in old age, and therefore are possible causes of

[21] Szejda, K., Urbanovich, T., Wilks, M. 2020. *Accelerating consumer adoption of plant-based meat: An evidence-based guide for effective practice*. Washington: The Good Food Institute. URL: https://gfi.org/wp-content/uploads/2021/01/NO-HYPER LINKED-REFERENCES-FINAL-COMBINED-accelerating-consumer-adoption-of-plant-based-meat.pdf

malnutrition among the elderly, are, firstly, psychological aspects, such as depression, moving to a nursing home, loss of relatives and friends and, accordingly, social interaction. Secondly, physiological factors, such as the inability to cook food on their own, dependence on caregivers, violation of physiological functions, in particular, restriction of sensory abilities. Thirdly, pathological causes associated, for example, with taking medications. In this context, more and more attention being paid to the systems of recommendations for the development of meat products of elderly nutrition, aimed at helping older people learn healthy eating habits. It is mainly about offering the right foods based on individual preferences and the health status of the elderly. Nevertheless, serious problems remain unresolved related to monitoring the eating habits of older people and providing appropriate recommendations. Older people should be aware of what their eating habits represent, in terms of diversity and regularity of the diet. Instead of focusing on the amount of food and nutritional value, one should strive for a variety of diets for each elderly person.

Elderly people are vulnerable to the effects of microorganisms and products of their metabolism, due to the weakness of their own immune system. In order to avoid exposure to microorganisms and their metabolic products, the storage time of meat ingredients for elderly nutrition should be minimized[22]. In this regard, in conditions of a relatively limited number of ingredients, a real opportunity opens up to provide a diverse number of opportunities for eating, while maintaining the attractiveness of the general menu and not creating a feeling of satiety. As an example, we can name ham for breakfast on bread, pasta sauce for lunch and fried egg for dinner. Thanks to the described approach, minimal formation of food waste can actually be achieved, and the risk of microbiological spoilage of meat products for elderly nutrition is minimized. Drawing up a regular description of the nutrition of older people for a certain period allows you to assess the quality of nutrition, determine the products that should be consumed in smaller quantities, and also explain why and what such products are recommended to be replaced. Individual solutions adapted for the elderly[23] are a psychological tool for changing behavior with the help of such personal aspects as self-control, personalized visual feedback, goal

[22] Li, H., Sun, X., Liao, X., Gänzle, M. 2020. Control of pathogenic and spoilage bacteria in meat and meat products by high pressure: Challenges and future perspectives. *Comprehensive Reviews in Food Science and Food Safety,* 19 (6), 3476–3500. URL: https://ift.onlinelibrary.wiley.com/DOI/10.1111/1541-4337.12617

[23] Rusu, A., Randriambelonoro, M., Perrin, C., Valk, C., Álvarez, B., Schwarze, A.-K. 2020. Aspects influencing food intake and approaches towards personalising nutrition in the elderly. *Population Ageing,* 13, 239–256. DOI: 10.1007/s12062-019-09259-1

setting, self-awareness and personalized learning. Self-monitoring allows you to track your diet and learn the optimal portion size. The personalized visual feedback between variety and regularity of nutrition is illustrated directly on the plate, showing the consumed ratio of proteins, carbohydrates and vegetables in comparison with the optimal ratio. Visual observation of meal times by older people is designed to encourage introspection of their eating regularity. Training in the analysis of eating habits, allows you to set personal goals, such as three meals a day, and determine the timing of achieving your goals. Self-awareness increases awareness of real physical hunger by comparing how you feel before and after each meal. Personalized training ensures the constant availability of answers to questions that arise in older people in the process of psychological changes[24].

In addition, almost none of the researchers consider the development of meat products for elderly nutrition, using a modified texture adapted to the needs of elderly people with chewing and swallowing problems. The use of 3D printing in the production of products with a modified texture complements the classic procedure based on molding. 3D printing technology represents the first step towards the future automation of systems for the production of meat products of elderly nutrition with a modified texture. The most commonly used 3D printing technology for meat products of elderly nutrition with a modified texture is the modeling of fused deposition. In the process of implementing the technology of modeling fused deposition, the extruder creates the selected shape by squeezing a certain amount of puree in a certain place, layer by layer. It should be noted that a number of studies face the uncertainty of information provided by older people, as older people tend to forget what they ate. This complicates the task of developing the right meat products for elderly nutrition. In addition, the recommendations for the development of meat products for elderly nutrition are mainly aimed at reducing the level of malnutrition among the elderly population as a whole, and do not take into account the individual nutritional needs of older people. It is important that in addition to recommendations for the development of meat products for elderly nutrition, there is also a need for the use of psychological methods to change the eating behavior of older people.

[24] Abzhanova, Sh., Baybolova, L., Kulazhanov, T., Rskeldiev, B. Uzakov, Ya. 2019. Study of qualitative characteristics and properties of horsemeat. *Journal of Pharmacy and Nutrition Sciences*, 104–109. DOI: https://setpublisher.com/downloads/jpansv9n2a8/

CONCLUSIONS

The attitude of older people to the most significant factors determining meat consumption, and, to a significant extent, influencing consumer behavior, is characterized by the attributes of health, safety and taste. The assessment of habitual meat consumption based on the history of the diet, supplemented by repeated measurements in combination with observations, allows you to calculate the cumulative average consumption of elderly nutrition over time, which reduces the number of random errors and increases the accuracy of estimates. Nevertheless, it is impossible to exclude some incorrect information and incorrect classification of the diet, even despite reliable and objective measurements.

Finally, in any observational study, some residual confusion may persist. With elderly nutrition, higher consumption of processed meat, as opposed to red meat or poultry, is associated with an increased risk of impaired mobility and function of the lower extremities in the elderly. At the moment, there is no evidence that meat, despite its high protein content, has a protective effect against violations of physical functioning. These results should be confirmed in future studies on samples with a higher level of consumption of meat and meat products with elderly nutrition.

Interestingly, concern about the hormones and antibiotics contained in meat products is quite noticeable, and exceeds concern about fat and cholesterol in red meat and poultry. Accordingly, it is advisable for farmers and producers of meat and meat products to take responsibility for the transparency of their own production methods in order to avoid loss of consumer confidence in their own products. In the course of further research, it is necessary to clarify to what extent the mass media and the Internet influence the consumer behavior of older people in relation to meat products of elderly nutrition. Recommendations regarding cholesterol intake have changed significantly over the past few years, and recommendations regarding fat intake are constantly being updated. As the cholesterol guidelines show, it takes a long time before new information is accepted and consumers gain confidence in themselves. Consequently, the development of new tools to guide the healthy consumer behavior of older people in relation to meat products of elderly nutrition is on the agenda.

SUMMARY

The relevance of the presented research on the development of meat products of elderly nutrition is due to the fact that the relative preferences provided by older people to various sources of protein, including such sources of animal protein as red meat and poultry, as well as alternative sources of vegetable protein, have not yet been identified. The choice of

food by elderly people has not been studied, their preferences and willingness to pay for various carbon labels depending on the protein source have not been studied. The purpose of the study is to consider the current state and prospects for the development of meat products of elderly nutrition. In this article, a research attempt is made to describe potential ways to develop nutritionally balanced meat products of elderly nutrition aimed at helping older people to maintain an active and healthy aging process. The object of the study is age-related changes in the consumption of meat products. Age undoubtedly affects the thresholds for recognizing basic tastes, especially sweet and salty. In particular, higher thresholds for sucrose and sodium chloride were found among the elderly, compared with young people. Higher thresholds of taste recognition cause a natural need to add sugar and salt to food. Qualitative content analysis of the collected material was used as a research methodology. At the first stage, the texts of publications devoted to the production of meat products of elderly nutrition were read and re-read entirely, that is, the so-called naive reading was carried out. Then, reflections on the integrity and on the important elements of the publications read were recorded, arising on the basis of impressions aroused under the influence of naive reading. Further, all parts of the publications related to the purpose of the study of meat products of elderly nutrition were divided into approximately the same semantic units. Qualitative content analysis included grouping of meat products of elderly nutrition by identifying common characteristics between them, in accordance with production processes and ingredients. At the subsequent stage, semantic units were codified, a number of categories with subcategories emerged. Finally, after all the texts of the publications were read, the texts were compared with the results of the content analysis undertaken, which made it possible to verify the reality of the coverage of the selected categories and subcategories of the content of the texts of publications and codes in full.

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