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INNOVATIVE TRENDS IN THE PRODUCTION OF MEAT SUBSTITUTES

Entry. Meat and meat products play an important role in the human nutrition system, although according to the WHO: red meat (natural) is a group 2A carcinogen; Processed meats (sausages, sausages, cured meats) are a group 1 carcinogen. The content of certain compounds in red meat (L-carnitine, heme, etc.) and meat products can affect cardiovascular diseases, lead to intestinal inflammation and cancer¹. It should be noted that the rational amount of red meat consumed by humans is still a debatable topic, but it cannot be denied that meat and natural meat products are the main source of high-quality protein and trace elements.

Source: Author's research²

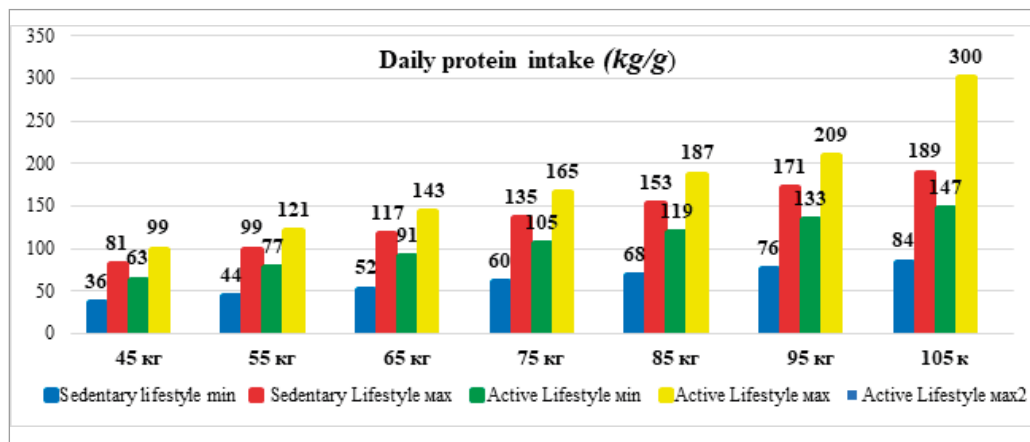


Figure 1. Approximate calculation of daily protein intake (kg/g)

- 1 World Health Organization (WHO). Statistical reports from WHO programs. URL: <https://www.who.int/data/gho/publications/world-health-statistics>.
- 2 Драган С. (2024). Білок у продуктах: все, що вам потрібно знати для здорового харчування. Здорове та правильне харчування. 2024. URL: <https://fitomarket.com.ua/ua/fitoblog/belok-v-produktah-vsjo-chto-vam-nuzhno-znat-dlja-zdorovogo-pitanija>.

Figure 1 gives an approximate calculation of the daily protein intake (kg/g) according to a person's lifestyle (active, sedentary).

In 2024, the Nobel Prize was shared by: David Baker (Howard Hughes University of Medicine, USA) and Demis Gassabis and John Jumper (Google DeepMind, Britain). Scientists worked in the direction of computer design of protein and prediction of protein structure, and the award of the study indicates the relevance of protein topics³.

Different analogues of food products, as well as a less tolerant ability to call imitation food products, are indeed, become a target for consumers. The researchers of the queen of the food industry are trying to develop alternatives to the mixture of the animal campaign – substitutes for analogues of the plant, as to repeat the organoleptic and living quality of natural meat with the use of herbal plants for the seeds of ingredients, the growth of birch (leguminous dear, cereals, mountains, spinach, avocado, garmelon plant, sprouted buckwheat, rice, flax plant); edible mushrooms (champignons, White mushrooms); seitana; sea waters (sea cabbage, leaf nori, spiruliny); Insects.

The so-called “artificial meat” is intended to be consumed as a substitute for conventional meat and an alternative source of protein. Alternative meat products continue to gain their adherents among consumers. Meat analogues, to one degree or another, imitate its organoleptic and technological properties. The term “artificial meat” is not established, so it can cause confusion among consumers. According to the Law of Ukraine “On the Basic Principles and Requirements for Food Safety and Quality”⁴, the newest food products are food products that have not been in circulation in Ukraine as of a certain date and are characterized by a number of features. Meat analogues include the following: the latest food product can be produced from plants or their parts, from animals or their parts, isolated or produced from cell culture or tissue culture derived from animals, plants, microorganisms, fungi or algae. So, the newest food product consists of either isolated or produced from:

- microorganisms, fungi or algae;
- plants or parts thereof, except for cases where the food product has a history of safe food consumption in Ukraine and consists or is isolated

³ Саркісян В. Нобелівка – 2024. 2024. Куншт. URL: <https://kunsht.com.ua/articles/nobelivka-2024-khimiia-bilky-zavukho-ta-tudy-de-sukho>.

⁴ «Про основні принципи та вимоги до безпечності та якості харчових продуктів» Закон України від 23.12.1997 р. № 771/97-ВР (зі змінами). URL: <https://zakon.rada.gov.ua/laws/show/771/97-%D0%B2%D1%80#Text> (дата звернення 18.02.2025).

or produced from a plant or plant variety of the same species, which are obtained by using plants or parts thereof, except for cases where the food product has a history of safe food consumption in Ukraine and consists or is isolated or produced from a plant or plant variety of the same species, which are obtained by using:

- from animals or parts thereof, except for food products isolated or produced from animals bred by traditional methods, which were used for the production of food products on the territory of Ukraine before the established date and have a history of safe food consumption in Ukraine;
- from cell culture or tissue culture derived from animals, plants, microorganisms, fungi or algae;
- produced by applying a production process that has not been used on the territory of Ukraine before the established date and which can lead to significant changes in the composition or structure of the food product, affect its nutritional value, metabolism or the level of inclusion of undesirable substances.

There are different opinions about the possibility, expediency of production and introduction into everyday diets of food products that, to one degree or another, imitate its organoleptic and technological properties. Basically, meat analogues are of interest to consumers such as adherents of a healthy diet, vegans, as well as those who have certain medical contraindications to the use of natural meat. There is also a considerable group of consumers-experimenters who seek to evaluate market novelties from their own experience. Consumer interest in substitute products is growing. It should be noted that retail chains in Ukraine have already found a place on their shelves for meat analogues – first of all, this applies to more widespread products from plant raw materials in the world.

1. Scientific research and development of meat substitutes of domestic and international practices. Despite objective and subjective warnings, meat substitutes are an important means of overcoming the deficiency of dietary proteins, and various products of meat alternatives are gradually becoming the subject of consumer demand. Therefore, it is advisable to properly study and systematize information on meat analogues for regulatory regulation of their safety and quality. Recently, scientists involved in the study and promotion of meat substitutes have been actively conducting research in this direction. Con-

sider the topics of research in the meat direction, which are directly related to the topic of meat substitutes. Powerful research topics in the meat field are: breeding (20.2 % of the total number of studies); technology (19.4 %); methodology (10.5 %). Scientific developments and research on meat substitutes are actively discussed, analyzed and put into practice. (Fig.2)

Source: Author's research

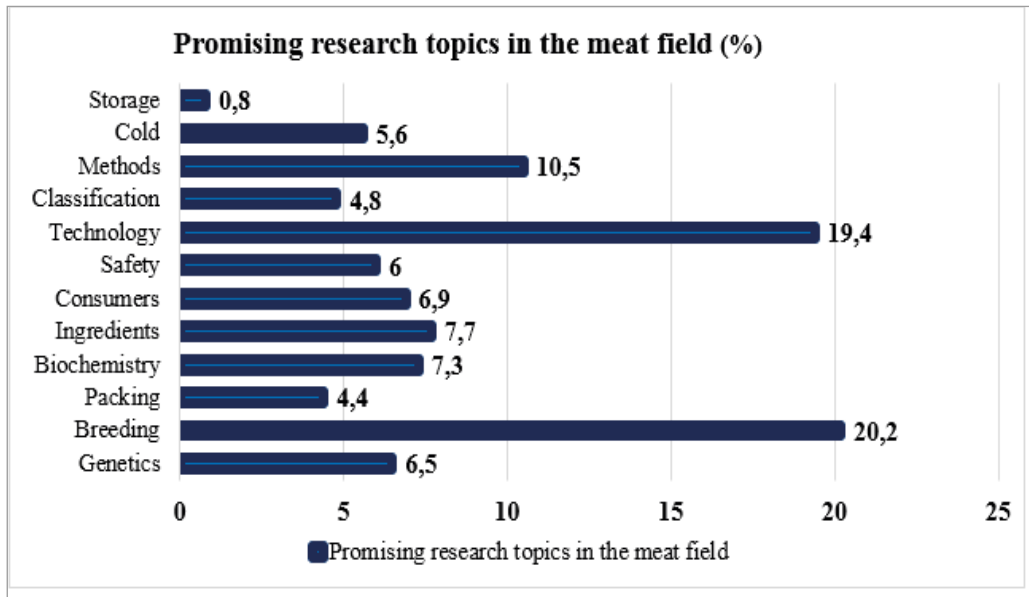


Figure 2. Promising research topics in the meat field

One of the key topics of research in the meat field is technological innovation, which includes new developments in meat substitutes (Table 1).

Table 1

Current research topics in the field of meat substitutes

Source: Author's research

N	Theme	Trends
1	2	3
1	Technology for the manufacture of meat substitutes from legumes (peas, soybeans, etc.).	▼
2	Technology for the manufacture of meat substitutes from cereals (wheat, etc.).	▼
3	Technology for the manufacture of meat substitutes from micro-raw materials.	▲
4	Technology for the manufacture of meat substitutes from insect biomass.	▲

Continuation of table 1

1	2	3
5	Cultured meat: technical and technological issues.	▲
6	Cultured meat: consumer safety and ethical issues.	▲
7	Technology for the manufacture of meat substitutes from milk and other raw materials of animal origin.	▼
8	Assessment of consumers' perception of meat substitute products within diets by region of residence and social groups.	▲

The scientific community is interested in the topics of development and production technologies: cultured meat (technical and technological issues, safety for consumers and ethical issues); meat substitutes from micro-raw materials, fungi and insect biomass. To date, it has been researched and clarified that meat of plant origin usually consists of vegetable protein, as the main raw material, combined with several different components, such as water, fat, polysaccharide, flavors, dyes and other substances. Particular attention is paid to the study of assessing consumer perception of meat substitute products within the framework of diets by region of residence and social groups.

The most common meat analogues are cultured meat (produced by direct cultivation of animal cells), products of plant origin (making a mixture from plants that have a high protein content) and analogues obtained using fermentation (products with a unique taste and modified texture). (Fig. 3).

Source: Author's research

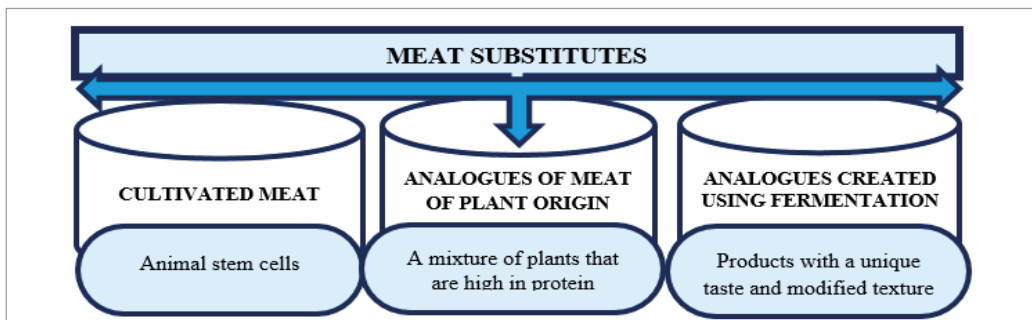


Figure 3. Meat substitutes

Cultured meat. Cultured meat is made up of the same types of cells and replicates the sensory and nutritional properties of regular meat. The resulting animal stem cells are grown in bioreactors with simultaneous saturation with

amino acids, glucose, vitamins and inorganic salts, proteins, etc. Changes in the composition of the environment cause cells to differentiate into skeletal muscle, fat, and connective tissue, which make up meat. The whole process can take anywhere from 2 to 8 weeks. For the first time, cultured meat received official recognition in December 2020, when the Food Agency of Singapore approved the world's first product made from cultured chicken meat for sale. As of the end of 2022, several large companies were already producing cultured meat at pilot facilities.

These products are not products of animal slaughter, that is, they are not meat according to the current regulatory documents that define it. On the other hand, meat analogues, to one degree or another, mimic its organoleptic and technological properties. The most common varieties of meat analogues in the world production and commercial practice are cultured (artificial) meat produced by growing tissue from natural meat cells, as well as imitation meat, for the manufacture of which plant raw materials (vegetables, legumes, fruits, mushrooms, etc.) and raw materials of animal origin (milk, insect biomass, etc.) are used. In a broad sense, the development of these meat analogues, their production and mass presentation on the global food market is one of the directions for overcoming protein deficiency, which is one of the most important nutrients in human nutrition⁵.

Analogues of meat of plant origin. Although plants do not have muscles, they contain protein, fat, vitamins, minerals and water, which are also part of animal meat. Plant-based meat takes advantage of this biochemical similarity between plants and animals. The general method of producing meat of plant origin consists of three main stages:

- cultivation of plant crops (as a source of raw materials);
- processing, purification of raw materials and obtaining proteins, fats and fiber, which will become the basis of a meat product of plant origin;
- forming a mixture of all to create a muscle texture.

Analogues created using fermentation. Nature provides food developers with an almost limitless palette of molecules from which flavors, textures and aromas can be created. However, not all of these ingredients are easy to obtain in large volumes and at an acceptable cost. Through the use of microbial cells,

5 Jimenez MF. Perspectivas de carne cultivada y carne vegetal. Carnetec. 2022 URL: <https://www.carnetec.com/Industry/Blogs/Details/97469>.

precise fermentation allows for the production of almost any ingredient at scale. Enzymatic processing of raw materials of plant origin with the creation of innovative products has prospects. For example, significant disadvantages of meat substitutes include the discrepancy between taste and smell and natural animal products. If you take the ingredients of cereals, which are responsible for the structure, nutritional value and composition of a new product, and add edible mushrooms that are similar in taste to natural meat, you can get a substitute that is at most similar to it. Consequently, cultivated meat and its other analogues may well replace, partially or completely, natural livestock products. The topic is debatable, requires thorough research and public discussion.

Despite multi-vector research and rapid growth of the food market, obvious obstacles to the growth of the production of vegetable meat analogues are: insufficient production efficiency; technological problems of imitating texture; imperfect processing technologies; insufficient similarity to meat in terms of organoleptic characteristics; unacceptably low protein content; concerns about potentially negative effects on human health due to systematic use.

Thus, it can be stated that meat analogues from plant raw materials are an important means of overcoming the deficiency of dietary proteins, and a variety of products produced from this raw material are gradually becoming the subject of consumer demand. There is a lot of work ahead to properly study the issue and create the necessary regulatory framework (technical regulations, standards, technical conditions) to regulate the safety and quality of these products.

2. Challenges and prospects of meat substitutes in Ukraine. Innovative technologies for new meat analogues are not on the rise. Companies such as Upside Foods (USA), Mosa Meat (Netherlands), Aleph Farms (Israel) are already producing the first commercial batches. In 2020, Singapore became the first country to legalize the sale of cultured chicken. The ranking of the most innovative and technological startups of the FoodTech 500 was headed by food companies: Nature's Fynd (USA, Chicago) – growing a nutritious protein of non-animal origin called Fy™ based on the fungus *Fusarium strain flavolapis*); Ÿnsect (France) – production of natural proteins from insects; Nobell Foods (USA) – “programming” soybeans for milk protein production. Food technology company Motif FoodWorks (USA) has launched its first product, Motif Beef-Works plant-based burgers. The global agribusiness giant Cargill, together with Cubiq Foods (Spain), is working on a new technology for the production of fats,

and American engineers have described a method of growing artificial fat in the laboratory ⁶. The food company Meati Foods (USA) makes whole meat from fermented mycelium. Meati Foods co-founder Tyler Huggins believes that Meati meat is a nutritious whole-food protein that uses only a fraction of the ingredients that go into making plant-based meats. In fact, the final product is just mycelium with seasonings. A model for the production of meat analogues from plant raw materials is proposed (Fig. 4).

Source: Author's research

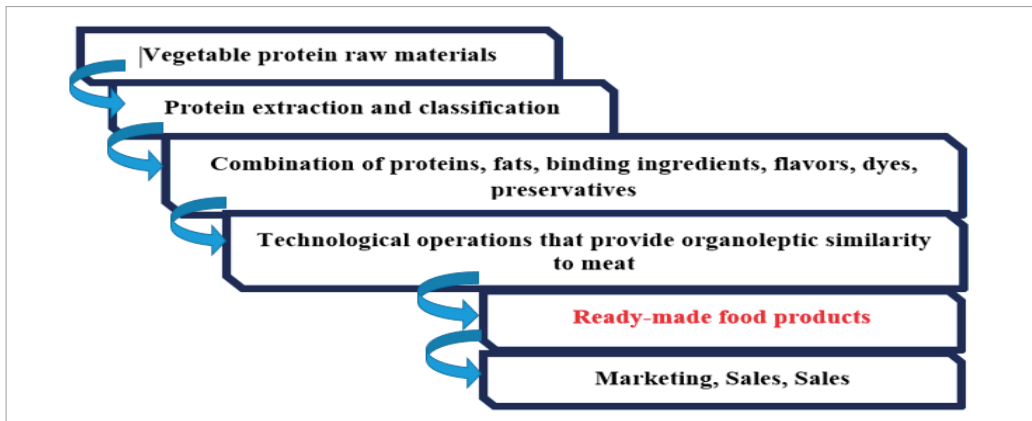


Figure 4. Model of production and sale of meat analogues from plant raw materials

The production of meat substitutes based on plant-based raw materials in Ukraine is also developing: from classic products (minced meat Eat Me At, DreamEat cutlets) to unique ones (marble steak from Green Go, Kyiv cutlets from Wanted Vegan). Table 2 shows analogues of meat from Ukrainian producers that can be found on supermarket shelves.

Table 2

Ukrainian producers of meat substitutes in Ukraine

Source: Author's research ⁷

Manufacturer	Product	Basis	Supermarkets, shops
1	2	3	4
Beyond Meat	vegan burgers	Pea protein	Eco-Shop, Metro, Vegetus, WineTime, GoodWine.

⁶ Лиса А. (2024). До 2050 року дві третини м'яса та молока замінять альтернативні продукти. Landlord. URL: <https://landlord.ua/news/do-2050-roku-dvi-tretyny-myasa-ta-moloka-zaminyat-alternatyvni-produkty>

⁷ Федевич А. (2021). Веганське м'ясо в Україні: підбірка рослинних аналогів м'яса, що присутні на українському ринку. Posteat. 2021. URL: <https://posteat.ua/position/veganske-myaso-v-ukra%D1%97ni-pidbirka-roslinnix-analogiv-myasa-shho-prisutni-na-ukra%D1%97nskomu-rinku/>

Continuation of table 2

1	2	3	4
Nestle- лінія Garden Gourmet	burger patties, sausages, meatballs, nuggets	Vegetable protein	Lviv
Naturly	mince	Soy protein	
Eat Me At	mince	Soybean Insulator	Online store, Maosfood, Vegetus, Eco World and FireFlies (Lviv)
Dream Eat (KK ABK)	burger patties	Soybean Insulator	
TM Vegetus	burger patties.	Appetizing-based tofu, signature-blend of soy and wheat protein, gourmet wheat protein	Vegetus brand stores and on the website
TM Yummy-Yummy	burger patties	Soy protein	Shop Provence, Madame Broccoli and Eggplant (Odesa)
Vegurman	dry pieces of white and red meat	Vegetable protein	
Wanted Vegan	Vegan minced meat		Wintime and Megamarket chains

Having analyzed the main ingredients of meat substitutes from Ukrainian manufacturers, we can single out the use of soybean, pea and wheat insulators, which are available on the Ukrainian market. (Tables 2, 3, 4).

Table 3

Composition and nutritional value of meat substitutes in Ukraine

Source: Author's research⁸

Manufacturer	Product	Nutritional value	Content (r/100r)	Key Ingredients
1	2	3	4	5
Beyond Meat	vegan burgers	265.5 kcal	fats 17.7 g; carbohydrates 9.7 g; proteins 17.7 g; does not contain salt and sugar.	water, pea protein isolate (18 %), canola oil, refined coconut oil, smoking flavors, stabilizers...

⁸ Федевич А. (2021). Веганське м'ясо в Україні: підбірка рослинних аналогів м'яса, що присутні на українському ринку. Posteat. 2021. URL: <https://posteat.ua/position/veganske-myaso-v-ukra%D1%97ni-pidbirka-roslinnix-analogiv-myasa-shho-prisutni-na-ukra%D1%97nskomu-rinku/>

Continuation of table 3

1	2	3	4	5
Naturly	mince	814 kcal	proteins 18 g; fats 10 g; Carbohydrates 6.2 g.	Rehydrated Soy Protein/Isolate (58 %), Water, Coconut Oil, Soy Flour, Wheat Gluten, Almonds, Tomato, Fermented Dextrose, Tapioca Starch, Salt...
Eat Me At	mince	270 kcal;	proteins 15.4 g; fats 19.8 g; carbohydrates 7.6 g; salt 0.71 g; does not contain sugar.	drinking water, soy protein isolate, refined sunflower oil, coconut oil, potato protein, methylcellulose...
Dream Eat (кондитерська компанія АВК)	burger patties	260 kcal	fats 18.0 g; carbohydrates 5.0 g (of which 0.7 g); proteins 18.0 g.	drinking water, high-oleic sunflower vegetable oil, soy protein isolate, wheat gluten, starch, wheat fiber, 2 % or less: sea salt, gelling agents: carrageenan, konjac gum, sodium alginate; Natural flavors, fermented red rice, onion...
TM Vegetus	burger patties.	181,3 ккал	fats 8.5 g; carbohydrates 11.2 g (of which sugars 1.7 g); proteins 15.0 g; salt 1.62 g.	soy protein, wheat protein, rice flour, drinking water, corn starch, sunflower oil, coconut oil, spices (cumin, onion, pepper, smoked paprika), flavorings, hydrolyzed vegetable protein, vegetable fibers...
TM Yummy-Yummy	burger patties	250 kcal;	fats 20 g; proteins 18 g; carbohydrates 4 g; salt 0.8 g.	water, soy protein, vegetable oil, natural flavors, dye beet extract, methylcellulose...
Vegurman	dry pieces of white and red meat		fats 1.0 g; carbohydrates 20.0 g; proteins 58 g; salt 0.1 g.	edible soy flour, wheat gluten, soy protein isolate, edible salt, baking powder – sodium bicarbonate (baking soda)...
Dynameat	Cutlets	256 kcal	fats 16.2 g; carbohydrates 9.1 g; proteins 21 g; sugar 0 g; salt 0.9 g.	water, pea protein isolate, olive oil, onion, soy flour, methylcellulose stabilizer...
Bobinata	sold ready-made	247 kcal	fats 8 g; proteins 30 g; carbohydrates 14 g.	soy isolate, wheat protein, salt, sugar, baking soda, sunflower oil, natural dye «red rice», spices...
Wanted Vegan	Vegan minced meat	145 kcal	fats 6.45 g; proteins 15 g; carbohydrates 6.16 g, salt 1.2 g.	water, textured wheat protein (wheat, pea), refined sunflower oil, stabilizing system (legume protein, pea protein, methylcellulose, salt, «Chicken» flavoring, onion extract...

Meat substitutes are gaining popularity, and their assortment in Ukraine is gradually growing, although it has not yet reached the level of Western Europe or the United States. On store shelves you can find both vegetable analogues of meat and products based on mushrooms, legumes or soybeans.

Soy products are one of the most common meat substitutes. They are high in protein, low in fat, and cholesterol-free. In Ukraine, you can find soy meat in the form of minced meat, steaks, nuggets or sausages.

Mushrooms-based products (such as champignons, shiitake or mycelium) are becoming more and more popular. They have a natural meaty texture and absorb the flavor of spices and marinades well.

Plant-based meat based on legumes (peas, beans, chickpeas, lentils) is gaining popularity due to its high protein content and the absence of GMOs. Pea protein is especially popular in vegan burgers and sausages.

Seitan (wheat protein, “wheat meat”) is a high-protein product that resembles chicken or pork in texture. It can be used in dishes instead of meat.

Table 4

The main types of meat substitutes in Ukraine

Source: Author's research⁹

№	Type of meat substitutes	Advantages	Distributed Product	Popular brands in Ukraine	Challenges
1	2	3	4	5	6
1	Soy meat	high protein content, affordable price, long shelf life	minced meat, steaks, nuggets, sausages	Vega Foods, Naturli', Green Cow	some people avoid soy due to allergies, soy-based products may contain genetically modified organisms (GMOs)
2	Mushroom meat	natural product, contains a lot of fiber, has an «umami» taste similar to meat	mushroom burger patties, mushroom sausages and sausages	n/a	do not contain enough protein compared to other substitutes, perishable

⁹ Федевич А. (2021). Веганське м'ясо в Україні: підбірка рослинних аналогів м'яса, що присутні на українському ринку. Posteat. 2021. URL: <https://posteat.ua/position/veganske-myaso-v-ukra%D1%97ni-pidbirka-roslinnix-analogiv-myasa-shho-prisutni-na-ukra%D1%97nskomu-rinku/>

Continuation of table 4

1	2	3	4	5	6
3	Vegetable meat based on legumes (peas, beans, chickpeas, lentils)	High protein content, free of soy and GMOs, mimics the texture of meat well	vegan burgers, sausages	Beyond Meat, Green Go, Eat Me At	High price compared to traditional meats, some foods contain many additives to improve texture
4	Seitan (wheat protein, «wheat meat»)	high protein content, absorbs spices and marinades well, has a meaty texture	seitan minced meat, seitan sausages	TM Vegetus	not suitable for people with gluten intolerance, not as common in Ukraine as soy meat

McKinsey & Company estimates that by 2030, the global market for meat substitutes could reach \$25 billion, and by 2040 it could account for 35 % of the entire meat market. The main factors driving the development of the meat substitute market are: – environmental friendliness (reduction of greenhouse gas emissions, reduction of water and land use);

- ethics (no need to slaughter animals);
- the growing demand for alternative proteins among vegetarians, vegans and people seeking a healthy diet. It is Ukraine that has a number of advantages that can contribute to the development of this direction:
- a powerful agricultural sector (sufficient land and water resources, extensive experience in food production);
- low cost of production (cheap agricultural products, sufficient labor resource, high qualification of employees);
- strong biotechnological base (powerful scientific base and innovative laboratories). However, so far there are no companies in Ukraine that specialize in meat substitutes, and the market itself is at the stage of discussing and saving potential investments. For the broad prospects of the meat substitute market in Ukraine, there are a number of obstacles that hinder the development of this direction, namely;
- high cost of technology (meat substitute is much more expensive than natural traditional meat);
- imperfection of the regulatory and legislative framework and the lack of state standards and certificates of quality and safety of the product;

- state regulation and control;
- insufficient number of investors (support for startups in the field of biotechnology, state and international grants); – poor consumer awareness and educational communications (explaining the benefits of meat substitutes through the media, social networks, advertising); – partnership with international companies and exchange of experience (cooperation with global manufacturers). Popular places to buy meat substitutes are supermarkets (“Silpo”, “ATB”, “MegaMarket”), health food stores and online platforms (e.g. Rozetka, Vegano, Ecoshop), etc. Among the problems of mass sale of plant-based meat in Ukraine is the high retail price. After all, such production uses the latest technologies, expensive resources and needs to be scaled, especially in the early stages. Competition will help reduce prices. It will also contribute to the emergence of even more innovative products (Table 5).

Table 5

Prices for meat producers analogues of Ukrainian

Source: Author's research¹⁰

Manu- facturer	Product	Price		Weight	Product Links
		2021	2024		
		UAH	UAH	G	
1	2	3	4	5	6
Beyond Meat	vegan burgers	250	315-610	2x113,5	https://vegetus.ua/beyond-meat-146 https://fermergreen.com.ua
	Minced meat vegetable		315,50	250	https://vegetus.ua/farsh-tempe-sejtan-103
Nestle- Garden Gour- met	vegetable cutlets	240		dish	https://www.nestle.ua/media/pressreleases/allpressreleases/nestl-garden-go96
Naturly	mince	187	225	400	

¹⁰ Федевич А.. Веганське м'ясо в Україні: підбірка рослинних аналогів м'яса, що присутні на українському ринку. Posteat. 2021. URL: <https://posteat.ua/position/veganske-myaso-v-ukra%D1%97ni-pidbirka-ros-linnix-analogiv-myasa-shho-prisutni-na-ukra%D1%97nskomu-rinku/>; «VEGETUS» Україна. 2020. Інтернет-магазин. <https://vegetus.ua/>; FermerGreen. Смачні та свіжі продукти від фермерів та крафтових виробників. 2024. <https://fermergreen.com.ua/>; Wanted Vegan. Просто.Рослинно. Смачно. 2024. URL: <https://wantedvegan.com/>

Continuation of table 5

1	2	3	4	5	6
Eat Me At	Minced vegetable	160	225	350	https://vegetus.ua/farsh-tempe-sejtan/farsheat-me-at-350g-6461.htm
	Vegetable superballs		187	225 (9 pcs)	https://vegetus.ua/farsh-tempe-sejtan/superboli-eat-me-at-225g-8313.html
Dream Eat (KK ABK)	burger patties	100	124	2x120 r	https://www.avk.ua/ua/uk/news/article/123
TM Vegetus	burger patties.	112,8	176	2x120 r	https://ecozaryad.com/product/kotleta-dlya-burdera-2h120g-tm-vegetus/
	Vegetable sausages		132	360	https://ecozaryad.com/product/so-sysky-roslynni-360-g-tm-vegetus/
Yummy-Yummy	burger patties	88		2x120 r	
Vegurman	dry pieces of meat	65 470		100 r 1000r	https://www.vegurman.ua/
	White Fillet Vegan Kebab Burgers		199 145,165	400 200,250	https://www.vegurman.ua/
Dynameat	Cutlets	140	160	2x110 r.	https://www.instagram.com/dynameat.co/
Bobinata	Ready	160		400	
Wanted Vegan	Vegan minced meat	180	160	230	https://wantedvegan.com/product/burger-roslynnij/
	Kiev cutlet		205	230	https://wantedvegan.com/product/kotleta-po-kyivsky-z-grybamy/
	Vegetable nuggets		185	230	https://wantedvegan.com/product/nagetsy-roslynni/
Meet not meat	Minced meat vegetable		240	500	https://vegetus.ua/farsh-tempe-sejtan/-meet-not-meat-500g-8354.html
Fineorganic	Minced plants. «Chicken»		279,20	400	https://vegetus.ua/farsh-tempe-sejtan/-fineorganic-400g-9334.html

Meat substitutes have huge potential for development in Ukraine, but this requires an integrated approach: state support, investments, educational campaigns and scientific research. If these conditions are met, Ukraine can not only become a consumer, but also a full-fledged competitive producer for the domestic and international markets.

Conclusions. The global food sector is undergoing revolutionary changes aimed at finding environmentally friendly and ethical alternatives to traditional animal husbandry. One of the most promising areas is meat substitutes. Ukraine, having a developed agricultural sector and scientific potential, can also take its place in this market. However, for the successful development of meat substitutes in the country, a number of challenges must be overcome, such as high cost, consumer mistrust, and the need to improve technology. Any innovation – meat substitutes has both advantages and disadvantages. Meat substitutes are becoming more and more available on the Ukrainian market, although so far their popularity is inferior to traditional meat products. They have many benefits – from health benefits to reducing the negative impact on the environment (Table 6).

Table 6

Meat substitutes: pros and cons of the product

Source: Author's research

Nº	Pros of meat substitutes	Cons of meat substitutes
1	Ecology	High cost
2	Humanity and no animal slaughter	Long-term effects on human health not studied
3	Ability to control the composition of the product	Psychological factor and consumer trust
4	Safety against animal disease	Power consumption
5	Food security	Texture and flavor problems

Taking into account global trends, we can expect that the range of meat substitutes in Ukraine will expand, and their cost will gradually decrease. This opens up new opportunities for the development of healthy and ecological nutrition in the country, which is one of the main directions of sustainable development of the state.

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