

## Biotechnological Terminology in the Research of Ukrainian Linguists

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**Abstract.** The purpose of this review article is to systematize the results of scientific research by Ukrainian linguists devoted to the study of English biotechnological terminology. Biotechnology, as an important field of scientific research and technological development, is developing extremely fast, which requires constant updating and expansion of lexical and terminological bases. Ukrainian linguists analyze the origin and structure of biotechnological terms, classification and evolution of terminology in this field. Aspects of neologization and innovation in the terminology of biotechnology are also considered. The article notes the achieved results of Ukrainian linguists in the study of the origin, semantic and morphological analyzes of terms. It is emphasized that Ukrainian researchers are actively working on the systematization and classification of terminology, as well as researching the specifics of the formation and structure of biotechnological terms. The author identifies problems that require further research. First, the biotech industry continues to grow and evolve, resulting in new terms and concepts. This dynamic requires constant updating and expansion of terminological bases. Some aspects of the semantic nuances of the terms may also require further clarification and analysis. Secondly, an important task is to study the translation of biotechnological terminology and its adaptation to the Ukrainian language. Translation of terms and expressions sometimes requires the creation of new analogues that would reflect the essence of biotechnological processes and concepts. This can be a difficult task due to the specifics of the industry and the ambiguity of some terms. In general, the study of biotechnological terminology is an important element in the development of scientific research and education in Ukraine. The integration of Ukrainian science and education into the global scientific space requires the understanding and use of current terminology, which promotes effective communication and knowledge exchange in this important field. It was emphasized that the further development of biotechnology and the study of its terminology is an important task for scientific research and education in Ukraine, which contributes to the integration of Ukrainian science and education into the global scientific space.

**Keywords:** biotechnological terminology, research, Ukrainian linguists, scientific articles.

**Introduction.** The modern world of scientific research and technological development requires constant updating and expansion of lexical and terminological bases in various fields of science. One of these fields is biotechnology, which is experiencing extremely rapid development and has a great impact on modern society. The growth of innovations and the dynamics of this field make the systematization and research of its terminology an important task.

It is important to emphasize that nowadays the English-language terminology of the field of biotechnology is being actively studied. Biotechnological science is served exclusively by English-language terminology, although the development of scientific research in the field of biotechnology is not a priority of the Anglo-American community. With the development of biotechnology, the

terminological apparatus of this field is gradually being formed. It should be emphasized that the language of biotechnology in modern English is a complex system correlated with a certain professional sphere of human activity aimed at the creation and use of genetically transformed biological objects (for example, transgenic plants, somatic hybrids, etc.).

Research of biotechnology terminology becomes an important task for linguists and specialists in the field of biotechnology. The study and analysis of terminology in this field helps to better understand the principles and processes used in biotechnology, and also contributes to the development of Ukrainian biotechnology science and education.

In this article, we will review current research on biotechnological terminology

conducted by Ukrainian linguists, and identify the results achieved, as well as those aspects that require further research. Analysis of these studies will help to understand the complexity and dynamics of biotechnological terminology and its important role in the development of modern scientific research and technology.

Ukrainian linguists, studying biotechnological terminology, take into account global and local influences on the formation of this complex lexical system. Systematic analysis makes it possible to determine the main groups of terms that belong to the general scientific, basic and proprietary terminology of biotechnology. An important requirement is the constant updating of terminological bases, because biotechnology is developing at an extraordinary speed, and new discoveries and innovations are necessarily accompanied by the creation of new terms.

Considerable attention is paid to the study of biotechnological terminology not only for linguistic aspects, but also for the study of its translation, features of adaptation to the Ukrainian language. An important task is to ensure the clarity and consistency of the terminology of Ukrainian biotechnological science and education.

The further development of biotechnology and the study of its terminology is of great importance for scientific research and education in Ukraine. Research in this field contributes to the high-quality training of specialists in biotechnology and provides the necessary professional communication in scientific circles and the international community. The study of biotechnological terminology in the Ukrainian context is an important element of the integration of Ukrainian science and education into the global scientific space.

**Methodology.** The research was conducted on the basis of the analysis of scientific publications related to the topic of biotechnological terminology and its study by Ukrainian linguists. The main methods were collection and systematization of information, analysis and comparison of available data, as well as generalization of results.

**The aim** of this review article is to systematize the results of scientific research by Ukrainian linguists devoted to the study of English biotechnological terminology, as well

as to determine the prospects for its further development.

The study and description of terms arising in new fields of knowledge is one of the topical areas of modern linguistic research. Of course, the field of biotechnology, which has been actively developing in recent years, is no exception. The appeal to issues of biotechnological terminology is explained by the rapid pace of development of this field, the discovery of new objects and phenomena of reality that require a terminological nomination.

**Literature Review.** Numerous works of Ukrainian linguists, who have recently paid some attention to it, testify to the relevance of the study of the biotechnology terminology. An in-depth analysis of the features of processes and trends of its development is covered in the works by L. Rytikova "Peculiarities of the formation of biotechnological terminology of the English language" (2008), "Biotechnological terminology in the context of the formation of a scientific field" (2010).

The researcher's works note the globality and diversity of the lexical composition of the biotechnology language, which has at its disposal one of the widest and most complex in terms of conceptual and substantive term systems [Rytikova, 2008, 2010].

A number of articles related to biotechnological terminology were written by O. Myshak: "The main means of formation of biotechnological terms" (2017), "Definition of the Term Biotechnology" (2019), "Morphological peculiarities of English one component terms of biotechnologies" (2017), "Formation of English biotechnological terms on the basis of Greek and Latin prefixes" (2018), "Abbreviation as a method of terminology formation used in biotechnology" (2017).

O. Myshak devoted a large number of studies to the structural and semantic analysis of English biotechnological terminology, its classification and evolution (Myshak, 2016, 2017).

**Results and Discussion.** Researchers agree that biotechnological terminology, which is at the stage of formation in connection with the high level of innovation and dynamism of biotechnology, requires the arrangement of a special

vocabulary, which makes the development of a classification of its terms relevant. The systematization of terms in the form of a classification will contribute to a deep understanding of the content of lexical units in the field of biotechnology.

In the article by O. Myshak "Classification of English biotechnological terminology" (2017), it is emphasized that the biotechnological terminology is a complex phenomenon, since the science of biotechnology itself at the beginning of the 21st century transformed into a complex integrative science that unites several dozen sections and directions. It is characterized by the use of terms borrowed from the terminology of related disciplines – biology, medicine, microbiology, genetics, ecology, bioethics, philosophy, sociology, psychology (Myshak, 2017).

O. Myshak proposed a classification of English-language biotechnological terminology, in which the main groups of terms belonging to the general scientific, basic and proprietary terminology, which appeared within the framework of this science, are highlighted. From the point of view of the formation and development of terminology in the terminological system under study, it singles out the following groups of terms: 1) basic terms that were borrowed from other terminological systems and retained their original meaning (aerobe, gene, enzyme, chromosome, molecule, carbon, cell, pectinase, plastid); 2) derived and complex terms (phrases) (autonomous (ly) replicating segment, bacteriostatic agent, catalytic antibody (abzyme), cell suspension, chromosomal aberration, embryo transfer, feedback inhibition, polymerase chain reaction, packaging cell line, recombinant vaccine); 3) terms borrowed from terminology systems related to biotechnology, but which partially changed their semantics (Myshak, 2017).

In the course of researching English biotechnological terminology, O. Myshak singles out six thematic groups: 1) technologies and methods of obtaining genetically modified products; 2) names of biotechnological products; 3) agents and substances used in biotechnology; 4) organizations whose activities are related to the biotechnological industry; 5) legal and ethical aspects of biotechnology; 6) scientific

studies of genetic engineering; 7) biotechnology industry and business; 8) problems of biosafety of the use of GMOs (Myshak, 2017).

The systematization of biotechnological terminology still remains a debatable issue, which is probably connected with the constant replenishment of the lexicon of the specialty.

For example, researchers O. Syrotina and O. Syrotin in the work "Classification of English biotechnological terminology by thematic groups" (2020) propose to group biotechnological terms into thematic groups based on their semantic properties, denoting raw materials, biological objects, biotechnological products, technologies, processes and devices that have found their application in the field of biotechnology (Syrotina & Syrotin, 2020).

O. Myshak pays due attention to semantic derivation as one of the first word-forming means of forming terminological nominations. Thus, her articles "Structural and derivational analysis of English biotechnology terminology" (2016), "The main means of formation of biotechnology terms" (2017), "Greek-Latin word-forming elements in English biotechnology terminology" (2018) are devoted to structural and semantic and derivational analysis of English biotechnological terminology.

In his other article "Formation of biotechnological terms in English and Ukrainian languages" (2017), O. Myshak analyzes the specifics of the formation and structure of single-component biotechnological terms in English and Ukrainian languages. The author identified common trends in word formation characteristic of both studied languages, which include cases of affixation preponderance as a way of creating biotechnological terms, features of the formation of composites with a preference for terms with a connecting vowel in the Ukrainian language, and writing words with a hyphen in the English language. On the basis of the analysis of the existing forms of single-component terms, the most productive methods of their formation by the affix method using a large number of Latin and Greek elements have been established (Myshak, 2017).

The scientific studies of O. Syrotin

"Multi-component English terms of Biotechnology sphere" (2017) and "Peculiarities of the structure and translation of biotechnological terms" (2012) are devoted to the study of multi-component biotechnological terms and their translation, in which the specifics of the functioning terms-phrases and complex cases are considered their translation due to semantic and syntactic inconsistencies of structures in the Ukrainian and English languages. Based on a comprehensive study of the subject area of biotechnology, the author concludes that the heterogeneity of its composition and content, its depth and multifacetedness have a huge impact on the branching of the lexical system of biotechnology and its terminology in particular. The late development of science and, accordingly, the terminology system justifies the use of the terminologies it has already formed in a number of related fields of knowledge, therefore the terms-phrases are the most typical for the terminology system of biotechnological science. The researcher examines the functioning of multi-component biotechnological terms and possible options for their translation, draws attention to the fact that biotechnological terminology is prone to polyvariance during translation, polysemy or homonymy, and complex words mostly require special knowledge and understanding when translating them (Syrotina, 2012, 2017).

The question of neologization in the terminology of the biotechnological sphere was in O. Syrotina's field of vision (Syrotina, 2020). The researcher's article "Neologisms in the English terminology of the field of biotechnology" (2020) is devoted to the presentation of the study results of one of the possible ways of the appearance of terms in the biotechnology field, namely neologization, and the study of the terms-neologisms widely represented in its terminology. The author studied neologisms in the English language of the biotechnology biotechnology, which arose at the end of the 20th - the beginning of the 21st centuries in connection with the rapid pace of its development, approaches to the classification of innovations were revealed. Special attention was paid in the work to the representation of the most common models of the formation of neologisms of the English language in the terminology of the biotechnology field. Analyzing the structural

and semantic features of the neologisms of the specified field, O. Syrotina came to the conclusion that the English language of the biotechnology field finds resources for replenishing the vocabulary due to lexical and semantic derivation. The word structure plays a leading role in the creation of neologisms in the biotechnology field. A more productive way of word formation of neologisms is the morphological way, which is based on affixation, word formation, conversion, telescoping, reduction in the form of abbreviation and acronymization. All methods of formation of neologisms are based on the principle of "economy of language", when new words become more informative than their predecessors, acquiring a new semantic meaning. The research carried out indicates the perspective of studying neologisms in the field of biotechnology. Thanks to rapid development, this branch of science can contribute to the emergence of new terms that will spread and acquire the status of neologisms.

L. Rogach focuses his attention mainly on the semantic phenomena characterizing the English biotechnological terminology (Rogach, 2019). In her work, the author also set a goal to determine and describe the special meanings of English terms of biotechnology in comparison with the words of the common language and terms of other sciences, as well as to analyze terminological synonymy and polysemy. The analysis made it possible to reveal that a certain number of terms in the English terminology of biotechnology were formed by the terminology of commonly used units. The ratio of special and commonly used vocabulary was revealed using the selection of common semantic features, i.e. sem.

The article "Paradigmatic relations in the English terminology of Biotechnology" deals with paradigmatic relations in the English terminology of the biotechnology sphere (Syrotina, 2021). The aim of this work is to study such paradigmatic relations in biotechnological terminology as synonymy and antonymy. The author focuses on the generalization of theoretical views on the essence of the phenomena of synonymy and antonymy in terminology in general. Using the example of terminological units in the biotechnology sphere, the features of the use of synonymous and antonymic units in

English for the purpose of differential nomination of a fragment of the linguistic picture of the world are shown. The author identified and analyzed the main types of synonyms and antonyms and their structural features in the studied term system.

At this time, we can probably talk about the quantitative predominance of articles on biotechnological terminology written in the aspect of a formal-structural approach. At the same time, terminologists emphasize the relevance of the cognitive approach, noting that it is the key to researching new concepts in the biotechnology field.

Over the past few years, O. Syrotina has published several articles, devoted to conceptual dominants and cognitive categories of English-language biotechnological terminology (Syrotina, 2020, 2021). Syrotina's research "Concept categories expressed in English terms of the biotechnology sphere" (2022), "Representation of the space category in the English terminology of biotechnology" (2021), "Means of representation of the feature category in the English biotechnology terminology" (2021) deals with the study of modern terminology of biotechnology within the framework of the cognitive paradigm.

The study of biotechnological terminology from the perspective of cognitive linguistics is associated with the research of the role of epistemological categories and their linguistic expression in the terminology being studied. It has been established that certain categories play an important role both in the emergence of a scientific concept and in the formation of the name that reflects it. The author sets himself the goal of revealing the functional features of the categories of space, process and attribute in the language of biotechnology and identifying a set of tools in the English language that serve to express these categories.

In her study "Linguocognitive aspect of metaphorization in the English language terminology of biotechnology sphere" (2020), O. Syrotina has concluded that metaphorization is a common phenomenon that needs attention from linguists. The processes of metaphorization have demonstrated extraordinary activity in terminology, being based on the use of signs of some subject spheres to refer to others.

Based on the theory of conceptual metaphor in the framework of biotechnological terminology, the author identifies the main donor zones, which are considered as a source of metaphorical nominations of biotechnological terms. In her article, the researcher presents the main categories of metaphorization types of the studied terminology and definitions of biotechnological terms, at the same time distinguishes the lexical meanings of source words and their semantic components involved in the transfer of meaning. O. Syrotina concluded that the processes of metaphorization showed extraordinary activity in terminology, based on the use of signs of some subject areas to denote others [Syrotina, 2020]. The author found out the main areas-sources of metaphorical nominations within the field of "biotechnology", among which the HUMAN donor zone is the most productive.

O. Syrotina's article "Anthropomorphic metaphor in the English terminological system of biotechnology" is devoted to the analysis of the most effective way of creating terminological units in the biotechnology terminological system based on anthropomorphic metaphorization. The author considers the semantic groups of metaphor terms formed on the basis of the cognitive transfer of lexemes relating to the structure of the human body, his behavior, mental states and moods, life activities and everyday life, into a specialized field due to the external or functional similarity between the objects of the source field and target fields [Syrotina, 2020].

**Conclusion.** Therefore, Ukrainian linguists pay considerable attention to the study and analysis of English-language biotechnological terminology. Researchers view biotechnology terminology as complex and diverse because it combines elements from various scientific fields such as biology, medicine, microbiology, genetics, ecology, and others. Such a synthesized terminology requires the systematization and classification of terms for a better understanding of their meanings and usage.

In these studies of Ukrainian linguists, significant results were achieved in the study of biotechnological terminology. Researchers have already analyzed the origin and structure of biotechnological terms,

established their roots in Greek and Latin, and examined the main components of the terms. Some studies have already proposed a classification of biotechnological terminology based on its semantic properties. The proposed research examines neologization processes in biotechnological terminology in detail, identifies and classifies new terms and innovations in this field.

Linguists emphasize a cognitive approach to the study of biotechnological terminology. This approach is considered the key to understanding new concepts in biotechnology. Studies by linguists indicate the importance of epistemological categories in the formation of scientific concepts and the choice of appropriate terminology. The categories of space, process, and sign appear to be key in the formulation of scientific concepts in biotechnology.

Attention is focused on the phenomenon of metaphorization in the English terminology system of biotechnology, which is actively used to create terms and nominations in this field.

However, the biotechnological terminosphere needs further investigation. Here are some of those aspects.

Terminology development: given the rapid changes and innovations in biotechnology, further research is needed to continually update and expand the terminology and adapt it to new discoveries and technologies.

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Language differences and translation of terminology: an important aspect is the study of language differences between Ukrainian and English biotechnology terminology and the development of effective strategies for their translation and adaptation in the Ukrainian context. English biotechnology terminology has a significant influence on the Ukrainian language due to global processes and innovations in this field. The attention of linguists should be drawn to the significance of the process of borrowing English-language biotechnological vocabulary into the Ukrainian language. Researchers should study the processes of word formation, adaptation and use of foreign words in the Ukrainian language. It is necessary to investigate the structural, semantic and syntactic features of these borrowings, as well as their influence on the lexical composition of the language.

Semantic analysis of terminology: further research into the semantic properties of terms and their use in different contexts can contribute to a better understanding of the essence of biotechnological concepts.

Standardization and unification of terminology: it is important to continue work on standardization and unification of terminology in this field to ensure its quality and consistency.

All these tasks are important for the further development of biotechnological terminology and its successful use in scientific research and education.

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**Біотехнологічна термінологія в дослідженнях українських мовознавців**

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**Анотація.** Мета цієї оглядової статті полягає у систематизації результатів наукових досліджень українських мовознавців, присвячених вивченню біотехнологічної термінології. Біотехнологія, як важлива галузь наукових досліджень та технологічного розвитку, надзвичайно швидко розвивається, що вимагає постійного оновлення та розширення лексичних та термінологічних баз. Українськими мовознавцями аналізуються походження та структура біотехнологічних термінів, класифікація та еволюція термінології в цій галузі. Також розглядаються аспекти неологізації та інновацій в термінології біотехнології. У статті відзначаються досягнені результати українських мовознавців у вивченні походження, семантичного та морфологічного аналізів термінів. Наголошено на тому, що українські дослідники активно працюють над систематизацією та класифікацією термінології, а також досліджують специфіку формування та структуру біотехнологічних термінів. Автором визначаються проблеми, які потребують подальших досліджень. По-перше, біотехнологічна галузь продовжує зростати та розвиватися, що призводить до появи нових термінів та концепцій. Ця динаміка вимагає постійного оновлення та розширення термінологічних баз. Деякі аспекти семантичних відтінків термінів також можуть вимагати подальшого уточнення та аналізу. По-друге, важливим завданням є вивчення перекладу біотехнологічної термінології та адаптації її до української мови. Переклад термінів та виражень інколи вимагає створення нових аналогів, які б відображали сутність біотехнологічних процесів та концепцій. Це може бути важкою задачею через специфіку галузі та неоднозначність деяких термінів. Загалом, вивчення біотехнологічної термінології є важливим елементом розвитку наукових досліджень та освіти в Україні. Інтеграція української науки та освіти у глобальний науковий простір вимагає розуміння та використання актуальної термінології, що сприяє ефективній комунікації та обміну знаннями в цій важливій галузі. Наголошено, що подальший розвиток біотехнології та вивчення її термінології є важливим завданням для наукових досліджень та освіти в Україні, що сприяє інтеграції української науки та освіти у глобальний науковий простір.

**Ключові слова:** біотехнологічна термінологія, дослідження, українські дослідники, наукові статті.