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Semantic Phenomena Characterizing English Terminology of Biotechnology

Анотація. Статтю присвячено аналізу семантичних процесів всередині англійської терміносистеми біотехнології. Мета дослідження полягає у визначенні та описі спеціальних значень англійських термінів біотехнології у порівнянні зі словами загальнонавчаної мови та термінами інших наук, а також аналізу термінологічної синонімії і полісемії. Мовний матеріал склали англійські терміни біотехнології зі спеціальним тлумаченням, що були вибрані з термінологічних словників, а також загальнонавчаними значеннями для вивчення процесів, що пов'язують цю термінологію із загальнонавчаною мовою.

Аналіз дозволив виявити, що певна кількість термінів у англійській термінології біотехнології утворилася шляхом термінологізації загальнонавчаних одиниць. Співвідношення спеціальної та загальнонавчаної лексики вивчаємо за допомогою виділення спільних семантичних ознак, тобто сем. У процесі аналізу було виявлено існування синонімічних термінів у досліджуваній терміносистемі.

Ключові слова: термін біотехнології, загальнонавчане значення, терміносистема, сема, термінологізація, термінологічне значення, полісемія, синонімія.

Abstract. The article deals with the analysis of the main semantic processes in the English terminological system of biotechnology. The importance of our investigation lies in the fact that biotechnology is still a rather new sphere of human activity that is rapidly developing at present, thus the special language of biotechnology reflecting these rapid changes demands great attention on the part of terminologists as the new concepts should be nominated and different semantic processes described. The aim of the research is to define and describe terminological meanings of the English terms of biotechnology in comparison with other words of general language and terms of other spheres of human activity and analyze such semantic processes as polysemy and synonymy inside this terminology. In order to achieve the aim of the work it is necessary to study English biotechnology terms and their meanings on the basis of explanatory and terminological dictionaries and to analyze different semantic processes in the

English biotechnological terminology. The language material of our investigation is 1000 English biotechnology terms with the explanation of their terminological and general meanings. The words are taken from terminological and explanatory dictionaries. The analysis showed that many English biotechnology terms were formed by means of terminologization of common language words. The correlation of special and common language lexis is studied by means of selection of common semantic features (semes). Special emphasis in the articles is also laid on the study of polysemy and synonymy in English terminology of biotechnology

Keywords: a term of biotechnology, common language meaning, terminological system, seme, terminologization, terminological meaning, polysemy, synonymy.

Introduction. Semantic analysis of terms is especially relevant in the sense of acquiring new special meaning by the terms already existing in other special languages, and those terminological units which were formed as a result of reconsideration of common language words. This phenomenon is called semantic way of term formation, or terminologization.

The systems of terminological meanings are mainly examined in separate well-organized terminological systems taking into account the features of lexical and semantical modifications of terminological units, that are carried out by the analysis of the semantic structure of special lexemes, exposure of integral semantic signs and different components of meaning.

The research of term formation enables scientists to expose subtypes of terminological vocabulary connected with different kinds of reinterpretation of meaning, define the role of motivational semantic signs, features of metaphorical and metonymical transfers, to set directions of forming and development of terminologization in a language, and also some regularities of the use of semantically reconsidered terms and their functional loading.

The study of modern scientific literature shows that semantics of terms becomes one of the leading research tasks. The problem of terminologization affects the whole complex of important questions, that determine the necessity of functional-semantic approach, bringing in new ways and research methods, analysis of deep processes, that are going on in the semantic structure of a word.

Examining the process of terminologization, we are motivated not only on different signs of a term and a generally used word but also on general, uniting signs, taking into account the results of the newest researches in the area of terminology, showing, that terminology and commonly used vocabulary cannot be clearly differentiated, as far as a term and a commonly used word are closely interconnected in many aspects [7, p.136].

We can state that terminologization is a process, that is why it is possible to expose the stages of this process and set the typology of semantic transformations:

1) the process, not accompanied by the changes in the semantic structure of a word, the usage of an already existing term in a language or a commonly used word in a linguistic text (linguistic specialization);

2) the process, characterized by the changes of semantic structure of a word within the framework of polysemy (semantic modulation);

3) the process, accompanied by the changes of semantic structure of word, resulting in formation of words-homonyms (semantic derivation).

The **relevance** of our investigation lies in the fact that biotechnology is rapidly developing at present, thus the special language of biotechnology reflecting these rapid changes demands great attention on the part of terminologists as the new concepts should be nominated and different semantic processes described.

The main **aim** of the research is to define and describe terminological meanings of the English terms of biotechnology in comparison with other words of general language and to study semantic processes inside this terminology and those connecting it with general language.

To achieve the aim the following **objectives** have been put forward: 1) to clarify the meaning of such linguistic notions as “terminologization”, “synonymy”, “polysemy” in reference to terminological studies; 2) to study English biotechnology terms and their meanings on the basis of explanatory and terminological dictionaries; 3) to analyze different semantic processes going on in the English biotechnological terminology laying special emphasis on semantic way of term-formation.

Methodology of investigation. Our research is based on the methods of linguistic analysis. V.M. Leychyk states that in the study of terms by means of linguistic methods two approaches are applied: one can study the formal and semantic structure of separate terms, or terms as constituent parts of terminology and terminological systems, that is, one can proceed from a separate lexical unit to groups of these units, or from the typical features of lexical units to their individual peculiarities [3, p. 142-143].

We classify linguistic methods according to aspects and techniques of investigation. According to the aspects of investigation methods are classified into linguistic and extralinguistic. We suggest the following methods of linguistic analysis of English terminology of biotechnology: 1) componental analysis that reveals general components of meaning (semes) in semantics of terminological units of biotechnology; 2) analysis of lexicographic definitions from the published and electronic sources; 3) method „meaning – sense”, which presupposes the detection of general invariant component and changing senses in the term of biotechnology.

In our investigation we made use of structural methods, one of which is the method of oppositions and field method. The main techniques, that are used in the investigation are differentiation and identification of terminological units. Structural-semantic analysis of biotechnology term presupposes description of the meaning of biotechnology term in special terminological dictionary aimed at the

description of the place of biotechnological term in terminological field and determine the way of its connection with other special lexical units. S.Y. Nikitina considers methods of componental and definitional analysis to be the most effective ones in the study of the term [4, p. 51].

The analysis of biotechnological terminology as a system presupposes the study of the elements of terminological system in their connections. Within this terminology, hierarchical links are identified based on the selection of integral and differential senses of biotechnology terms. T.L. Kandelaki considers that in the definition of the term there is a totality of important characteristics of the object in question, from which the necessary and ample characteristics are selected. These characteristics should be reflected in the sound form of the term [2, p. 9].

One of the commonly used and universal methods of linguistic research is componental analysis. The problem of word boundaries, the character of semantic transformations in the process of terminologization cannot be solved without application of this method. We examine the process of terminologization from the positions of complex approach to the research of linguistic semantics, where the semantic structure of a word is understood as a unity of interactive meanings of different levels, organized within the limits of a separate word by a certain method in accordance with the system of this language and with regularities of functioning of this system in speech. As a leading principle of term analysis the differential method is usually used, when a term is opposed to a commonly used word [1, p.270]. It allows to expose a number of substantial properties of a term and a word, find out similarities in their semantics, structure, grammatical form, and define the features of paradigm, unique qualities in the structure of a sentence and a text.

Results and discussion. Investigation of semantic features of English terms of biotechnology was performed on the basis of lexicographical data fixed in the English explanatory dictionaries and terminological dictionaries of biotechnology. 1000 terms of biotechnology have been selected in order to investigate the main semantic features of these terminological units as general language words and terms. The main aim of the investigation was to define their correlation with terms of other sciences and common language words.

In the English language there exist certain common language lexical units, which having acquired specific meaning in biotechnology sphere of human activity became the components of this terminological system. This process occurs without the change of the initial meaning in common language lexis. Such words become terminologized if, having received a special definition, occupy their place in terminological system of biotechnology. For example, the word *gap* in Longman dictionary is explained as 1) *a space between two objects or two parts of an object, especially because something is missing*; 2) *a big difference between two situations, amounts, groups of people etc*; 3) *something missing that stops something else from being good or complete*; 4) *a period of time when nothing is happening, that exists between two other periods of time when something is happening* [Longman Dictionary of Contemporary English]. In biotechnology this

term is characterized by two meanings: 1) *period of time, during the cell cycle, between M and S phases*; 2) *a missing section on one of the strands of double-stranded DNA* [Glossary of Biotechnology and Genetic Engineering]. As we can see, the semantic features of *period of time* and *space* were taken from the common language meaning and used in terminology to denote two special notions of biotechnology connected with *a cell*. The word *label* denotes 1) *a piece of paper or another material that is attached to something and gives information about it*; and 2) *a word or phrase which is used to describe a person, group, or thing, but which is unfair or not correct* [Longman Dictionary of Contemporary English]. In biotechnological terminology the term *label* is defined as *a compound or atom that is either attached to or incorporated into a macromolecule and is used to detect the presence of a compound, substance, or macromolecule in a sample* [Glossary of Biotechnology and Genetic Engineering]. It is quite evident that terminological meaning developed from the common language one modifying the semantic feature of *being attached to a compound or atom that is detected*. Lexical unit *to amplify* is used in common language in the meaning *to increase the effects or strength of something* [Longman Dictionary of Contemporary English], whereas in biotechnology this verb means *to increase the number of copies of a DNA sequence, either in vivo by inserting into a cloning vector that replicates within a host cell, or in vitro by polymerase chain reaction* [Glossary of Biotechnology and Genetic Engineering]. The common semantic component in these meanings is *to increase*. The term *bridge* in special dictionary is fixed as *a filter paper or other substrate used as a wick and support structure for a plant tissue in culture when a liquid medium is used* [Glossary of Biotechnology and Genetic Engineering]. As a common language lexical unit the word *bridge* denotes *a structure built over a river, road etc that allows people or vehicles to cross from one side to the other and something that provides a connection between two things* [Longman Dictionary of Contemporary English]. The same *supporting structure* was taken as a basis for terminologization of the word *bridge* [Longman Dictionary of Contemporary English]. Biotechnological term *cohesion* is used in the special meaning *a force holding a solid to a solid or a solid to a liquid, owing to attraction between like molecules*. If there is *cohesion* among a group of people, a set of ideas etc, *all the parts or members of it are connected or related in a reasonable way to form a whole* [Longman Dictionary of Contemporary English]. As we see the term *cohesion* developed its special meaning on the basis of the same *holding together, connection*.

The problem of usage of one and the same term in several terminological systems of the language is very urgent and still remains unsettled. The parallel use of a term in several terminologies is caused by the intersection of different branches of sciences. Some scientists treat this phenomenon as homonymy. Other linguists consider it to be a polysemy. Thorough investigation of terminology of biotechnology allows agreeing with the latter. The simultaneous use of one term in biotechnology, physics, medicine, art, sports, etc. is regarded as intersystem

terminological polysemy, because the similarity of processes in different spheres of scientific activity lays in the basis of this phenomenon [8, p.25]. For example, the term of biotechnology *development* is used in the meaning *the sum total of events that contribute to the progressive elaboration of an organism*. In economics this term denotes *the process of increasing business, trade, and industrial activity*, whereas in building terminology it means *the process of planning and building new houses, streets etc. on land* [Longman Dictionary of Contemporary English]. These meanings are united by the semantic feature of *increasing, elaboration*. The term *absorption* in biotechnology means *the taking up by capillary, osmotic, chemical or solvent action, such as the taking up of a gas by a solid or liquid, or taking up of a liquid by a solid*; in biology *absorption* is *the movement of a fluid or a dissolved substance across a cell membrane*. *Adaptation* in biotechnology is used in the meaning *adjustment of a population to changed environment over generations, associated (at least in part) with genetic changes resulting from selection imposed by the changed environment*. In biology this term denotes *adjustment of a sense organ to the intensity or quality of stimulation* [Longman Dictionary of Contemporary English]. The semantic structures of these terms are united on the basis of the semantic feature *adjustment*. The term *conversion* is used in different terminologies: in biotechnology it means *the development of a somatic embryo into a plant*; in religion – *an experience associated with the definite and decisive adoption of a religion*; in mathematics *reduction of a mathematical expression by clearing of fractions* [Longman Dictionary of Contemporary English].

Polysemy is the capacity for a sign (e.g. a word, phrase, etc.) or signs to have multiple meanings, i.e. a wide semantic field. In terminology polysemy is understood as interrelation of one term with more than one concept within one terminological system or between the bordering terminological systems. In general language lexical polysemy is considered to be a positive process of language development and existence. Opinions of scientists concerning terminological polysemy differ greatly. Some linguists believe that a scientific term must have only one meaning, that is, must be monosemantic. There is an opposite viewpoint that in terminology, as well as in general lexis, polysemy is rather spread, in spite of the fact that one of the requirements to be met by a term is monosemy. Our analysis has shown that English terminology of biotechnology has many terms containing in their semantic structure more than two meanings. For example, the term *aggregate* is explained in terminology of biotechnology by means of four meanings: 1) *a clump or mass formed by gathering or collecting units*; 2) *a body of loosely associated cells, such as a friable callus or cell suspension*; 3) *coarse inert material, such as gravel, that is mixed with soil to increase its porosity*; 4) *a serological reaction (aggregation) in which the antibody and antigen react and precipitate out of solution* [Glossary of Biotechnology and Genetic Engineering]. The term *amplification* in biotechnology denotes four notions: 1) *treatment (e.g., use of chloramphenicol) designed to increase the proportion of plasmid DNA*

relative to that of bacterial (host) DNA; 2) replication of a gene library in bulk; 3) duplication of gene(s) within a chromosomal segment; 4) creation of many copies of a segment of DNA by the polymerase chain reaction (PCR). The term *biomass* is fixed in the special dictionary as having three meanings: 1) *the cell mass produced by a population of living organisms; 2) the organic mass that can be used either as a source of energy or for its chemical components; 3) all the organic matter that derives from the photosynthetic conversion of solar energy* [Glossary of Biotechnology and Genetic Engineering].

One of the tasks of our investigation was to study the phenomenon of synonymy in the English terminology of biotechnology. Synonymy is a kind of semantic relation among words. Technically, it occurs when two or more linguistic forms are used to substitute one another in any context in which their common meaning is not affected denotatively or connotatively. Along the same line, B. Hjørland [5, p. 95] believes that synonymy is a kind of semantic relation. That is, words or phrases are synonymous only if they have the same meaning. However, there are cases where words or phrases may have subtle meanings and may therefore give rise to different word associations.

According to J. Lyons, there are two kinds of common language synonymy: complete synonymy and partial synonymy. Complete synonymy is regarded as words having identical meaning components. According to J. Lyons, this kind of synonymy does not exist simply because it is impossible to define, and the meanings of words in monolingual or multilingual settings are constantly changing [6, p. 54]. Therefore, words may share most of the constituents with one another, but not all the constituents. As for partial synonymy, it is when words share most of the necessary components or constituents. Since complete synonymy does not exist in monolingual settings, let alone across languages, partial synonymy has been emphasized. This dichotomy between complete and partial synonymy has added salt to injury in dealing with the notion of equivalence in translation or whether translation is a form of synonymy.

The synonym in terminology somewhat differs from the synonym in common language. In common language synonyms are, as a rule, words of one part of speech. In terminology synonyms can be lexical units of different structural levels and different forms of expression. In modern linguistics there is a widespread point of view that when two or more terms correspond to the same scientific concept of one terminological system and have one definition, they are not synonyms, but doublets. In terminology there is also an opposite opinion according to which the phenomenon of terminological synonymy cannot be reduced to doublets.

The investigation showed that in English terminology of biotechnology all synonyms exist in the form of doublets. They appear due to such causes:

1) existence in the terminological system of a Latin borrowing and native term for the designation of the same concept: *false fruit* – *pseudocarp*, *fascicle* – *vascular bundle*, *assortment* – *segregation*;

2) existence of different borrowings for the same notion: *ampometric* – *enzyme electrode*, *base substitution* – *transition* – *transversion* (replacement of one base by another in a DNA molecule);

3) terms word-combinations consisting of the same attribute and different nouns: *allosteric control* – *allosteric regulation*, *anaerobic digestion* – *anaerobic respiration* (digestion of materials in the absence of oxygen);

4) terms word-combination consisting of the same nouns and different attributes (often of native and borrowed origin): *bifunctional vector* – *shuttle vector*, *freeze preservation* – *cryobiological preservation*, *anti-oncogene* – *recessive oncogene*; *flush-end cut* – *blunt-end cut*; *affinity tag* – *purification tag* (an amino acid sequence that has been engineered into a protein to make its purification easier);

5) different spelling forms of one and the same term: *chloroplastid* – *chloroplast*, *allelomorph* – *allele*, *cellulose nitrate* – *nitrocellulose*, *estrogen* – *oestrogen*, *fetus* – *foetus*, *four-base cutter* – *four-base-pair-cutter* – *four-cutter*;

6) abbreviation and the full form of the term: *EGS* – *external guide sequence*, *HGH* – *Human growth hormone*, *IGS* – *Internal guide sequence*, *IVEP* – *in vitro embryo production*, *LCR* – *ligase chain reaction*.

Conclusions. Semantic analysis of the English terminology of biotechnology enabled us to make the conclusion that the investigated terminology is characterised by several semantic peculiarities that are very important for understanding the deep processes going on in this terminological system. We have come to the conclusion that terminology and commonly used vocabulary cannot be clearly differentiated, as far as a term and a commonly used word are closely interconnected in many aspects. In our study this connection is quite vivid as a number of terms in terminology of biotechnology was formed by means of semantic term formation. This process occurs without the change of the initial meaning in common language lexis. Such words become terminologized if, having received a special definition, occupy their place in the terminological system of biotechnology. Some of the English terms of biotechnology are also terms of other spheres of human activity. The analysis of terminological polysemy showed that in the English terminology of biotechnology a lot of terms are polysemantic i.e. denote more than one scientific notion. Our language material convincingly proved that synonymy is a rather spread semantic process in English terminology of biotechnology. Terms in our material can be described as synonymous only if they replace each other in all contexts without any change in either the cognitive or emotive import.

Summarizing, we can state that the English terminology of biotechnology is a relatively new and still developing terminological system which is not completely defined and studied yet. The process of formation, standardization and outline of the prospects for further development of this terminology require a lot of attention of biotechnology specialists and linguists.

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