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BIOTECHNOLOGICAL TERMINOLOGY IN ENGLISH AND UZBEK: LINGUISTIC AND CONCEPTUAL PERSPECTIVES

Ismoilov Alisher Pulatjon ugli

Teacher of Kokand University Andijan Branch

Abstract: The rapid development of biotechnology as a multidisciplinary science has led to the emergence of a vast number of new terms and concepts. This paper explores the formation, classification, and translation of biotechnological terms in English and Uzbek. Special attention is given to the linguistic processes involved in terminology creation, including borrowing, derivation, and transliteration. The article also highlights challenges in maintaining terminological accuracy and equivalence between the two languages, emphasizing the role of language policy and education in shaping scientific discourse in Uzbekistan

Introduction

In the 21st century, biotechnology has become one of the most significant drivers of scientific and technological progress. It connects biology, chemistry, genetics, informatics, and engineering in the development of innovative solutions for medicine, agriculture, and industry. As a result, biotechnology has generated a specialized terminology that reflects its interdisciplinary nature.

In Uzbekistan, the translation and adaptation of English biotechnological terminology into Uzbek is an ongoing process. The need for accurate and standardized equivalents has become increasingly urgent as the country's universities and research institutions integrate international scientific literature and participate in global projects. Therefore, the study of biotechnological terminology from a linguistic perspective is essential for effective communication, education, and research.

The Nature of Biotechnological Terminology

Terminology, according to linguistic theory, is a system of words or expressions used to name concepts specific to a field of knowledge. In biotechnology, terms often reflect complex biological and chemical phenomena. Many of them are formed using Greek and Latin roots—for instance, *bio-* ("life"), *gen-* ("origin, creation"), and *techno-* ("skill, art").

The field's terminology can be divided into several conceptual groups:

1. **Molecular and genetic terms:** *gene*, *DNA*, *RNA*, *genome*, *mutation*
2. **Technical and laboratory terms:** *bioreactor*, *centrifuge*, *fermenter*
3. **Processes and methods:** *cloning*, *genetic modification*, *hybridization*
4. **Applied biotechnology:** *vaccine production*, *bioremediation*, *bioinformatics*

Each of these groups demonstrates the interdisciplinary character of biotechnology, where terminology overlaps with that of medicine, chemistry, and computer science.

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Formation of Biotechnological Terms in English

English, being the dominant language of international science, serves as the primary source for most modern biotechnological terms. The formation of such terms in English follows several linguistic patterns:

- **Derivation:** Adding prefixes and suffixes, e.g. *bioengineering*, *microbiology*, *transgenesis*.
- **Compounding:** Combining two or more roots, e.g. *cell culture*, *gene therapy*.
- **Borrowing from classical languages:** e.g. *enzyme* (Greek *enzymos* – "in yeast"), *virus* (Latin – "poison").
- **Abbreviation and acronym formation:** e.g. *DNA* (Deoxyribonucleic Acid), *PCR* (Polymerase Chain Reaction).

These processes show that English terminology in biotechnology is dynamic and continuously evolving with scientific discoveries.

Adaptation and Translation of Biotechnological Terms into Uzbek

In the Uzbek language, most biotechnological terms have been borrowed from English, often through Russian intermediaries. For instance, *gene* → *ген* (Russian) → *gen* (Uzbek). Such borrowing ensures international intelligibility but also poses linguistic challenges in terms of pronunciation, orthography, and grammatical adaptation.

Three main strategies are used to render biotechnological terms in Uzbek:

1. **Transliteration:** Directly adapting the English spelling to Uzbek phonetics — e.g., *cloning* → *klonlash*, *genome* → *genom*.
2. **Loan translation (calque):** Translating the components of a term — e.g., *genetic engineering* → *genetik muhandislik*.
3. **Semantic substitution:** Using an Uzbek word with a close meaning — e.g., *enzyme* sometimes rendered as *ferment*.

The challenge lies in maintaining scientific precision while ensuring the term is comprehensible to Uzbek speakers. Over time, some transliterated terms become fully integrated into the Uzbek lexicon, losing their foreign feel.

Linguistic Characteristics of Biotechnological Terms

Biotechnological terms display several notable linguistic features:

- **Polysemy:** Some terms have multiple meanings depending on context. For example, *vector* may refer to a plasmid in genetic engineering or a carrier of disease in epidemiology.
- **Eponymy:** Terms named after scientists, e.g., *PCR* (Kary Mullis's method), *Pasteurization* (Louis Pasteur).
- **Internationalism:** Many terms are identical across languages due to Latin and Greek origins, e.g., *DNA*, *virus*, *cell*.

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- **Abbreviation and symbolic notation:** Common in scientific writing to save space and ensure precision.

These features make biotechnological terminology both universal and highly specialized.

The Problem of Equivalence in Translation

Achieving terminological equivalence between English and Uzbek is a complex task. The translator must consider not only the lexical meaning but also the conceptual structure and cultural context of scientific discourse. For example, the English term *bioinformatics* represents an entire scientific discipline that may still be emerging in Uzbek academia. Therefore, literal translation alone is insufficient; explanatory definitions or context-based adaptations are often required.

Moreover, inconsistencies arise when different institutions use varying Uzbek equivalents for the same term. For instance, *bioreactor* is sometimes translated as *bioreaktor* and sometimes as *tirik hujayralar reaktori*. Standardization through academic glossaries and linguistic commissions is therefore essential.

Comparative Examples

English Term	Uzbek Equivalent	Notes on Usage
Gene editing	Genlarni tahrirlash	Commonly used in molecular genetics.
Cell culture	Hujayra madaniyati	A literal calque from English.
Transgenic organism	Transgen organizm	Borrowed with slight orthographic adaptation.
Biotechnology	Biotexnologiya	Fully integrated loanword.
Recombinant DNA	Rekombinant DNK	International term, widely recognized.

These examples show how Uzbek scientific language closely mirrors English while retaining grammatical harmony and phonetic adaptation.

Theoretical Framework: Cognitive and Terminological Aspects

From a theoretical standpoint, biotechnological terminology reflects the **cognitive structure** of scientific knowledge. According to cognitive linguistics, each term represents a mental concept that categorizes a fragment of reality. Translating such terms, therefore, requires understanding both linguistic and cognitive equivalence.

In terminological theory (Cabré, 1999; Temmerman, 2000), the creation of scientific terms is seen as a process of **conceptual mapping**—linking new discoveries to existing linguistic frameworks. For Uzbek linguistics, this implies not only borrowing foreign terms but also constructing native conceptual systems that correspond to global scientific categories.

The Role of Education and Lexicography

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Universities and scientific institutions play a crucial role in shaping terminological practice. Compiling bilingual glossaries, developing standardized curricula, and encouraging consistent usage across textbooks are essential for maintaining clarity in biotechnological discourse.

In recent years, Uzbekistan has launched several initiatives to modernize scientific language and support bilingual education in English and Uzbek. The creation of specialized dictionaries in biotechnology, genetics, and molecular biology is a promising step toward establishing terminological stability.

Conclusion

Biotechnological terminology represents a dynamic and evolving linguistic system that bridges scientific innovation and linguistic adaptation. The interaction between English and Uzbek in this field illustrates broader trends in globalization and language modernization.

To ensure effective communication and knowledge transfer, Uzbek scientists and educators must focus on the standardization of terms, the development of national glossaries, and the integration of linguistic theory with practical translation work. As biotechnology continues to advance, language will remain an essential tool for understanding, teaching, and shaping the science of life itself.

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