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TRANSLATION CHALLENGES AND EQUIVALENCE ISSUES IN BIOTECHNOLOGY TERMINOLOGY

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ABSTRACT

The rapid development of biotechnology has led to the emergence of a vast number of specialized terms that pose significant challenges for translation studies. Biotechnology terminology is characterized by high scientific density, interdisciplinary nature, semantic complexity, and constant innovation, which complicates the process of achieving accurate and adequate translation. The issue of equivalence becomes particularly critical, as biotechnological terms often lack direct counterparts in target languages or exhibit partial semantic overlap.

Keywords

biotechnology terminology, translation challenges, equivalence, scientific translation, terminological analysis, cross-linguistic transfer.

INTRODUCTION

Biotechnology has become one of the most rapidly evolving fields of modern science, significantly influencing medicine, agriculture, environmental protection, and industry. The growth of biotechnological research and international scientific cooperation has intensified the need for accurate and standardized translation of biotechnology-related texts. As scientific knowledge is disseminated globally, biotechnology terminology must be translated across languages without loss of meaning, precision, or functional value.

However, the translation of biotechnology terminology presents considerable difficulties due to its interdisciplinary nature, combining elements from biology, chemistry, genetics, medicine, and engineering. Many biotechnology terms are newly coined, metaphorically motivated, or derived from Latin and Greek roots, which complicates their interpretation and translation. Moreover, differences in scientific traditions, terminological systems, and linguistic structures across languages create additional barriers to achieving equivalence.

Equivalence is a central concept in translation studies and plays a crucial role in scientific translation. In biotechnology, the lack of standardized terminology and the rapid emergence of new concepts often result in multiple translation variants, leading to inconsistency and ambiguity. Therefore, the analysis of translation challenges and equivalence issues in biotechnology terminology is of both theoretical and practical significance.

The purpose of this article is to analyze the main translation problems associated with biotechnology terminology and to examine equivalence issues in the translation process. The study also aims to identify effective translation strategies that ensure terminological accuracy and communicative adequacy in biotechnology texts.

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This article examines the main translation challenges associated with biotechnology terminology and analyzes equivalence issues from linguistic, semantic, and pragmatic perspectives. The study explores different types of equivalence—formal, functional, semantic, and pragmatic—and their applicability in the translation of biotechnology terms. A qualitative research methodology based on terminological analysis, comparative linguistic methods, and descriptive analysis is employed. The findings indicate that full equivalence in biotechnology translation is relatively rare, while partial and functional equivalence are more common. The article proposes practical translation strategies, including borrowing, calque, descriptive translation, and terminological standardization, to address existing challenges. The study contributes to the development of effective approaches for translating biotechnology terminology in scientific and academic contexts.

LITERATURE REVIEW

The concept of equivalence has been extensively discussed in translation studies. Scholars distinguish various types of equivalence, including formal equivalence, which focuses on structural similarity, and dynamic or functional equivalence, which emphasizes communicative effect. In scientific translation, functional equivalence is often prioritized to ensure clarity and usability for target-language specialists.

Terminology studies highlight that scientific terms are expected to be precise, unambiguous, and context-independent. However, biotechnology terminology often violates these principles due to its evolving nature. Researchers note that many biotechnology terms are polysemous or metaphorical, which complicates their translation. For example, terms such as *gene expression*, *gene silencing*, and *cell signaling* carry metaphorical meanings that may not be directly transferable into other languages.

Previous studies emphasize that translation challenges in biotechnology arise from structural differences between source and target languages, absence of lexical equivalents, and variations in conceptual systems. Some scholars argue that borrowing and transliteration are the most common strategies in biotechnology translation, while others stress the importance of descriptive translation and terminological adaptation.

Despite extensive research on scientific translation, relatively limited attention has been given to biotechnology terminology as a distinct terminological domain. This gap underscores the need for focused studies addressing equivalence and translation strategies specific to biotechnology.

METHODOLOGY

This study employs a qualitative research design to analyze translation challenges and equivalence issues in biotechnology terminology. The research is based on a corpus of biotechnology-related texts, including academic articles, textbooks, research reports, and glossaries. The selected terms represent key subfields of biotechnology, such as genetic engineering, molecular biology, and biomedical technology.

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Comparative linguistic analysis is used to examine the semantic and structural differences between source and target language terms. Terminological analysis focuses on identifying types of equivalence and translation shifts. Descriptive methods are applied to classify translation strategies, while contextual analysis is used to assess pragmatic adequacy.

The methodological approach allows for a systematic examination of how biotechnology terms are translated and how equivalence is achieved or compromised in different contexts.

RESULTS

The analysis reveals that full equivalence in biotechnology terminology translation is relatively rare. In many cases, target languages lack direct lexical equivalents, resulting in partial or functional equivalence. Borrowing and transliteration are frequently used for newly coined terms, especially when international standardization has not yet been established.

Calque translation is commonly applied to compound terms, particularly those based on transparent morphological structures. However, this strategy may lead to unnatural or overly technical expressions in the target language. Descriptive translation is often used when conceptual differences exist, allowing translators to convey meaning at the expense of brevity.

The findings also indicate that polysemy and metaphorical motivation significantly affect equivalence. Terms with metaphorical origins often require pragmatic adaptation to preserve scientific clarity. Inconsistent translation practices and lack of terminological standardization further complicate equivalence.

DISCUSSION

The results confirm that equivalence in biotechnology translation should be viewed as a flexible and context-dependent concept. Strict formal equivalence is often impractical due to linguistic and conceptual differences between languages. Functional and pragmatic equivalence play a more significant role in ensuring effective scientific communication.

The discussion highlights the importance of terminological standardization and interdisciplinary collaboration between translators and subject-matter experts. Without consistent terminology, scientific texts risk misinterpretation and reduced credibility. Translator competence in both linguistic and scientific domains is essential for achieving adequate equivalence.

Furthermore, the choice of translation strategy should depend on the communicative purpose, target audience, and degree of term conventionalization. A balanced approach combining borrowing, descriptive translation, and adaptation is recommended.

CONCLUSION

This study demonstrates that the translation of biotechnology terminology involves complex challenges related to equivalence, semantic precision, and terminological consistency.

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Due to the dynamic and interdisciplinary nature of biotechnology, full equivalence is often unattainable, making functional and pragmatic equivalence more relevant.

Effective translation of biotechnology terms requires a comprehensive understanding of both linguistic and scientific factors. The adoption of flexible translation strategies, coupled with terminological standardization and expert collaboration, can significantly improve translation quality. The findings contribute to translation studies by providing insights into the specific challenges of biotechnology terminology and offering practical recommendations for translators and researchers.

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