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A Study on the Chinese Translation of Popular Science Texts from the Perspective of Koller's Equivalence Theory: A Case Study of Medical Toxicology of Natural Substances: Foods, Fungi, Medicinal Herbs, Plants, and Venomous Animals

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Abstract

This study investigates the application of Koller's Equivalence Theory in the Chinese translation of popular science texts, using the Chinese rendition of the popular science work Medical Toxicology of Natural Substances: Foods, Fungi, Medicinal Herbs, Plants, and Venomous Animals as a case study. Based on the framework of Koller's theory, the study analyzes its practical application in translating popular science texts from five dimensions: denotative, connotative, text-normative, pragmatic, and formal-aesthetic equivalence.

Keywords

Koller's Equivalence Theory, Popular Science Texts, Chinese Translation Studies

1. Introduction

With the continuous improvement of modern living standards, public focus on health and wellness has been increasingly growing (Pait, 2025). The concept of wellness has become an integral part of daily life for modern individuals. Particularly under the influence of Traditional Chinese Medicine culture, natural remedies, as a unique means of treatment and healthcare, are gradually gaining favor among a growing number of people (Kang, Ye, Hang, Jiang, & Wang, 2025). Com-

pared with Western medicine, the distinct efficacy of natural remedies in wellness, healthcare, and disease treatment makes their promotion and popularization particularly important.

However, although natural remedies have deep roots in traditional Chinese culture, there remains a relative scarcity of popular science texts on this subject. To enable the public to better understand the scientific principles and applications of natural remedies, drawing upon relevant popular science research from abroad becomes especially crucial. Therefore, this study aims to explore how Koller's Equivalence Theory can facilitate the equivalent transmission of language, culture, and knowledge in the translation of popular science texts concerning natural remedies. It is hoped that this research will provide theoretical support and practical guidance for the popularization of natural remedies and health education, thereby enhancing public scientific understanding of natural remedies and contributing to more scientific and rational practices in wellness and healthcare.

2. Characteristics of Popular Science Text Translation

Popular science texts belong to the category of scientific and technical writing, yet they possess unique attributes (Uysal, 2021). Their primary characteristic is the integration of literary and scientific elements. These works not only describe objective scientific facts but also aim to disseminate and popularize scientific knowledge. Although popular science texts often involve a certain degree of specialization, their core purpose is to convey complex scientific information to the general public in an accessible manner. Consequently, when translating popular science texts, it is essential not only to ensure the accuracy and professionalism of the content but also to strive for clear, straightforward, and easily understandable language. The translation should simultaneously maintain a degree of literary quality, engagement, and readability. However, it is equally crucial to avoid compromising the scientific rigor of the source text for the sake of popularization (Bennett, 2024). Only by striking this balance can the intended value of popular science texts be fully realized.

3. Koller's Equivalence Theory

Building upon Nida's Functional Equivalence theory, Koller further refined the concept of "equivalence", arguing that it primarily concerns the correspondence between the source and target languages within specific contexts—namely, the relationship of comparison between certain entities and images across two languages and cultures (Beddari, 2021).

To clarify the concept of "equivalence" more precisely, Koller delineated five distinct types: denotative, connotative, text-normative, pragmatic, and formal-aesthetic equivalence (Rajesh, 2025). The applicability of each type depends on the specific translation context. Therefore, in different translation tasks, the most appropriate forms of equivalence must be selected—or combined—based on practical circumstances.

Koller's Equivalence Theory functions more as an aspirational goal in the translation process rather than a mere set of operational techniques. It provides translators with multi-level standards for equivalence, ranging from the literal meaning of words to the nuanced differences in culture and context, thereby offering comprehensive guidance for translation practice. By framing equivalence in this way, Koller's theory expands the range of strategies available to translators, enabling them to respond more flexibly to the demands of diverse translation content.

4. Application of Koller's Equivalence Theory in the Translation of Popular Science Texts

4.1. Denotative Equivalence

Denotative equivalence refers to the correspondence between the objective information or facts conveyed beyond the linguistic expressions of the source text and the target text. In essence, it concerns whether the actual meaning conveyed when describing an entity remains consistent between the source and target texts (Ma, 2024).

Example 1:

Source Text: The polysaccharides in the gel consist of glucomannans, mannans, and pectins with a wide range of molecular weights.

Target Text: 芦荟凝胶中的多糖由葡甘露聚糖、甘露聚糖和果胶组成，其分子量各不相同。

Analysis: The word "polysaccharide" means "多糖" or "多聚糖". Although it falls under the category of sugars, it should not be simply translated as "糖". Furthermore, since glucomannan, mannan, and pectin are all types of "多糖", translating "polysaccharides" as "多糖" is more precise than using the general term "糖". This ensures equivalence in the scientific concept.

Example 2:

Source Text: Treatment is supportive. Based on limited data, the primary toxic reaction to aloe vera is catharsis.

Target Text: 芦荟可用于辅助治疗。但基于有限资料，芦荟的主要毒性反应为导泻。

Analysis: The common meaning of the word "supportive" is "支持的". However, if translated as "支持的" in this sentence, the meaning would be vague and ambiguous. Consulting professional literature reveals the medical terms "supportive therapy" and "supportive treatment", which mean "辅助疗法" or "间接疗法". Therefore, translating it as "芦荟可用于辅助治疗" provides clarity and achieves a high degree of consistency in the objective information conveyed between the target text and the source text.

4.2. Connotative Equivalence

Connotative equivalence, similar to denotative equivalence, primarily focuses on equivalence at the lexical level. Its core aim is to ensure that the target language expression aligns with the source text by selecting appropriate near-synonyms,

preserving both the semantic connotation of the original and, as much as possible, its style. Connotative equivalence concerns the comparison of the specific meanings and emotional nuances words carry in different languages (Liu, 2020).

Example 3:

Source Text: Older leaves are alternate and slender with long petioles, whereas the younger leaves are round and opposite, occasionally without petioles.

Target Text: 成熟叶片互生，细长，叶柄长，而幼叶圆形、对生，偶无叶柄。

Analysis: The words "alternate" and "opposite" here do not carry their common meanings of "交替的，轮流的" and "相反的，对立的". Instead, they specifically refer to the botanical states of leaf arrangement known as "互生" and "对生". Furthermore, in literature concerning eucalyptus trees, "Older leaves" and "younger leaves" have been described variously as "异常叶" and "正常叶", "幼叶" and "成长叶", or "幼态叶" and "成熟叶片". These different terms indicate that eucalyptus leaves exhibit different states at various growth stages, with the source text specifically mentioning the young and mature stages. Therefore, translating "Older leaves" and "younger leaves" as "成熟叶" and "幼叶" in this context effectively communicates the true state of the eucalyptus leaves.

Example 4:

Source Text: Therefore, patients with suspected toxicity should be evaluated for fluid and electrolyte balance if clinically significant diarrhea occurs.

Target Text: 因此，如果临床出现明显腹泻现象，应该对疑似芦荟中毒的患者进行体液和电解质平衡评估。

Analysis: In everyday language, when an illness is not definitively confirmed but is strongly suspected based on symptoms, the common Chinese expression is "疑似……病例". Therefore, the phrase "patients with suspected toxicity" should correspond to the Chinese formulation "疑似中毒病例" or "疑似中毒的患者". Specifying the cause as aloe vera toxicity leads to the translation "疑似芦荟中毒的患者". This approach makes the translation more consistent with Chinese expression habits, thereby enhancing the text's readability.

4.3. Text-Normative Equivalence

Text-normative equivalence refers to the need, during the translation process, to first analyze the text type of the source text and then select appropriate linguistic styles and translation strategies accordingly. This ensures that the translation conforms to target culture and language conventions while maintaining the overall structure and discourse function of the source text (Liu, 2020).

Example 5:

Source Text: The major carbohydrate fraction of aloe gel contains acemannan substances, which are 1,4-linked acetylated mannan compounds interspersed with O-acetyl groups.

Target Text: 芦荟凝胶的主要糖类含有乙酰甘露聚糖物质，这种物质是由乙酰化甘露聚糖化合物与 O-乙酰基通过-1,4-(苷)键相连形成。

Analysis: The word "carbohydrate" means "碳水化合物" or "糖类", substances

that provide energy to the body. The term "碳水化合物" is more commonly used in everyday life, so translating it as "碳水化合物" might seem perfectly correct. However, the subsequent context involves a condensation reaction between two other specific types of sugars. Therefore, translating it as "糖" in this scientific description better reflects the precision and accuracy required in a popular science text.

Example 6:

Source Text: The ingestion of an estimated 0.5 - 1 m L/kg body weight by an adult was associated with coma for 12 hours followed by hallucinations and persistent, colicky diarrhea.

Target Text: 据估计，成人每千克体重摄入 0.5 - 1 毫升纯茶树油，与出现 12 小时昏迷、以及随后出现的幻觉和持续腹痛腹泻具有相关性。

Analysis: In medicine, drug dosage is related to an individual's body weight, meaning a specific dose is prescribed per kilogram of body weight. Therefore, the phrasing "成人每千克体重摄入 0.5 - 1 毫升" (ingestion of 0.5 - 1 mL per kg body weight by an adult) aligns more closely with medical practice. When conveying specialized knowledge, ensuring the correctness and rigor of the translation is an extremely important criterion for popular science texts. Translating according to the principle above accurately maintains the intended professional meaning.

4.4. Pragmatic Equivalence

Pragmatic equivalence refers to the need during the translation process to fully consider the cultural background, language habits, and psychological expectations of the target readers. This ensures that the target readers can have an emotional response and experience similar to those of the source text readers when reading the translation (Ma, 2024).

Example 7:

Source Text: Traditional uses of aloe vera include the treatment of arthritis, asthma, fungal infections, digestive and bowel disorders (e.g., constipation), lupus erythematosus, skin disorders (e.g., seborrheic dermatitis), musculoskeletal injuries, and gastroduodenal ulcers.

Target Text: 在传统医疗中芦荟可用来治疗关节炎、哮喘、真菌感染、消化不良和肠道不适(如便秘)、红斑狼疮、皮肤病(如皮脂溢性皮炎)、肌肉骨骼损伤和胃十二指溃疡。

Analysis: When translating clinical terms, it is essential to fully consider the context and common expression habits while accurately conveying the professional meaning. Diseases have response mechanisms, and describing the cause and progression of a condition requires precise description. The significant value of popular science texts lies in enabling the public to acquire professional scientific knowledge. Therefore, in translating this sentence, using parentheses after professional terms to provide further explanation and clarify meaning helps readers acquire information accurately, fully reflecting the rigor of popular science texts.

Example 8:

Source Text: The application of aloe vera preparations to skin during periods of enhanced susceptibility to dermal injury (e.g., dermabrasion, chemical peel) was associated with immediate local pain, erythema, and edema.

Target Text: 在皮肤损伤易感性增强期间(如擦皮、化学脱皮)，芦荟制剂的使用与立刻的局部疼痛、红斑和水肿等现象之间具有相关性。

Analysis: "Dermabrasion" medically refers to "擦皮法", a procedure using a high-speed rotating abrasive tool to remove surface skin layers, scars, or tattoos. The professional medical term for "chemical peel" is "化学脱皮". The translation adheres to the characteristics of a popular science text while using accessible language to enable target readers to correctly understand the specialized knowledge.

4.5. Formal-Aesthetic Equivalence

Formal-aesthetic equivalence emphasizes the correspondence between the source and target languages in terms of linguistic form and aesthetic effect, such as in rhythm, meter, syntactic structure, and rhetorical devices. Achieving formal-aesthetic equivalence requires that the translation fully considers the expressive methods of the target language while also striving to convey the artistic quality and rhetorical impact of the source text (Liu, 2020).

Example 9:

Source Text: Aloe vera is an evergreen, perennial, succulent (cactus-like) plant that has gray-green, simple, lance-shaped leaves with a pointed apex (lanceolate).

Target Text: 芦荟是多年生常绿植物，多肉质，叶片呈灰绿色，单叶，长矛状，顶端渐尖。

Analysis: Firstly, the word "simple" commonly means "简单的" or "单一的", but in a botanical context, "simple" describes a leaf that is undivided, growing as a single unit, making the translation "单叶" more accurate. Secondly, the original sentence uses six adjectives and a prepositional phrase to modify a single noun, giving it a strong literary quality. When translating, it is essential to fully consider the concise language characteristic of popular science texts, rationally adjust the sentence structure, and preserve the formal-aesthetic equivalence of the language without compromising the accuracy of the content.

Example 10:

Source Text: The flowers are regular, yellow to orange in color, and appear in terminal series of flowers on lateral stalks (racemes).

Target Text: 花朵整齐、顶生、疏散，颜色由黄色向橙色变化。

Analysis: Firstly, the common meaning of "regular" is "规则的" or "有规律的", but when specifically describing flower morphology, translating it as "规则的" or "整齐的" is more suitable for the context. Secondly, the words "terminal" and "series" indicate the position and form of the flowers respectively; namely, the flowers grow at the tip of the stalk and are numerous, appearing in clusters. The translation "花朵整齐、顶生、疏散" not only accurately conveys the meaning of the source text but also vividly describes the beautiful imagery of the flowers.

5. Conclusion

Koller's Equivalence Theory emphasizes achieving denotative, connotative, text-normative, pragmatic, and formal-aesthetic equivalence in translation, thereby ensuring a coordinated and consistent correspondence between the source and target texts in terms of content, form, and style. However, in the translation process, these five types of equivalence are not isolated; rather, they are interrelated and function comprehensively. For instance, translating a single passage may require the simultaneous application of multiple equivalence types to achieve a more precise expression. Therefore, appropriate adjustments must be made according to the specific context and the needs of the target readers, thereby effectively balancing the professionalism and general accessibility of popular science texts (Wang, 2022). Koller's Equivalence Theory provides robust theoretical support for improving the quality of popular science text translation and opens up further possibilities for the effective dissemination and popularization of scientific knowledge.

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