Translation and Translation Analysis of an Original Scientific Paper from the Domain of Biotechnical Sciences

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TRANSLATION AND TRANSLATION ANALYSIS OF AN ORIGINAL SCIENTIFIC PAPER FROM THE DOMAIN OF BIOTECHNICAL SCIENCES

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Abstract

This thesis provides the translation and translation analysis of an excerpt from an original scientific paper from the domain of biotechnology and the field of nutrition. The aim of the translation analysis was to delineate the linguistic, pragmalinguistic and intercultural problems that are common in translating scientific papers, particularly from Croatian into English. The strategies, techniques and tools for overcoming these problems were suggested and illustrated with examples, with the aim of better understanding these procedures, and thus contributing to the overall quality of scientific translation. In the analysed text, the greatest challenge was the translation of scientific terminology from the domain of biotechnology, due to the deficiency of reliable terminological resources. The syntactic and textual features were transposed in the target text in accordance with the common procedures, well established and delineated in the Croatian to English translation theory and practice. The findings point to the need for further collaboration of Croatian linguists, translators and scientists in the processes of scientific and technical terminology selection and standardization, with the aim of contributing to the international recognition of Croatian science.

Key words: translation, translation analysis, scientific translation, scientific writing syle, biotechnology, nutrition

1. Introduction

In our modern globally interconnected society scientific and technical translation are inevitable means of knowledge exchange and information flow (Byrne, 2014). Thus, the features of all scientific communication, both written and spoken, are clarity, objectivity and compliance to the universal rules of logical structuring.

Moreover, publishing in international scientific journals is an essential part of all scientific activity. This generates the need for writing and publishing papers in English, since it is the most represented language of scientific communication (Silobrčić, 1983).

For the Croatian scientific research community, as a part of the European semiperiphery (M. Marušić & Marušić, 2014), publishing in English is particularly important, since it increases the chances of achieving greater impact and visibility of research findings within the global scientific research community (Jokić et al., 2018).

In this thesis, the translation and translation analysis are carried out on an excerpt[1] from a scientific paper from the domain of biotechnical sciences. Writing and translating of scientific texts has certain specificities and requirements related to the characteristics of the scientific genre and register. For the purpose of this translation analysis, the selected scientific paper was examined from the aspects of its linguistic, pragmalinguistic and sociocultural features, supported with examples, and supplemented with a brief explication of the translation problems encountered, and the translation procedures, strategies and techniques suggested for solving them.

The main characteristics of scientific texts are unambiguous terminology, complexity, lexical density and informativity, lack of emotional content, as well as compliance to the principles of textual cohesion and coherence (Pritchard, 2015). Complying with the principle of coherence is one of the major demands in writing high quality scientific papers. This implies that they need to comply with a set of logical and formal rules for creating a logical whole in which passages follow the line of thought in accordance with the conventional formula for the writing and publishing of scientific papers. This formula includes the abstract, the introduction, the

[1] The source text excerpt selected for translation and translation analysis consists of the representative parts of the original scientific paper – the title, introduction, materials and methods, samples, data processing, results and discussion, and conclusions. It includes a total of 1,747 words, in accordance with the propositions for writing this final thesis.

materials and methods, the results, the discussion, the conclusion, and the references section (Silobrčić, 1983).

Another distinctive feature of the scientific genre and register is the abundance of highly specialised technical terminology, which needs to be clear, unambiguous and precise in order to be universally understood within the intended recipient community (Oštrec, 2014; Štefić et al., 2010).

In Chapter 2 the translation analysis of the selected text is provided, in which the linguistic, pragmalinguistic and sociocultural features are analysed and supported with examples.

Further on, the parallel and aligned Croatian to English translation of the selected text is presented in Chapter 3, with the left page providing the source text in Croatian and the right page the aligned target text in English.

In Chapter 4 the key problems encountered during the translation process are further delineated and complemented with the translation procedures, strategies, tools and techniques for solving them.

Finally, in Chapter 5 the insights based on the translation analysis are summed up and further discussed, and a conclusion is provided.

2. Translation analysis

This translation analysis is carried out on an excerpt from an original scientific paper titled *„Alergeni kikirikija u uzorcima čokolada, krem-proizvoda i kolača“* [Peanut allergens in chocolate, chocolate cream and cake samples]. The text is from the domain of biotechnical sciences and the field of nutrition. The authors of the article are I. Panjkota Krbavčić et al., and it was originally published in Croatian, in the *Croatian Journal of Food Technology, Biotechnology and Nutrition* 12 (1-2), pp. 77-82 (2017), in printed and electronic format.

The selected paper had already had its title, abstract, keywords and smaller parts of the text (for example, a part of the text in the tables) translated into English. This is in accordance with the propositions for writing and publishing scientific papers in Croatia, according to which scientific articles need to have their abstracts written in the language of the article and in one of the world languages, preferably English (Silobrčić, 1983, p. 33). However, since most of the text was written in Croatian, the translation task was particularly challenging in terms of finding adequate solutions for scientific vocabulary and terminology. These lexical units needed to be explored and verified by common translation procedures - searching the Internet for texts of similar content, comparing the possible translation solutions by using the frequency of their occurrence listed in the corpora available on the Internet, and using electronic and printed dictionaries. Furthermore, the parts of the text that had been officially translated were examined and reformulated if necessary. For, as we know, a translation task is not about seeking the correct solution, but the most appropriate one, i.e. the one closest in meaning and style to the original, and as such, it is subject to constant modification and improvement (Ivir, 1978, pp. 47-49).

Within this translation task, it was necessary to determine the purpose of the text in order to select the most appropriate translation solutions and procedures. This is in accordance with the Skopos theory, which implies that “the prime principle determining any translation process is the purpose (Skopos) of the overall translational action” (Nord, 1997, p. 27).

The purpose of this text is to inform the scientific, academic and expert public about the findings from the field of nutrition, more specifically, about allergies caused by peanut allergens present in chocolate, chocolate cream products and cakes available on the market in the City of Zagreb. The authors also focus on food labelling issues, taking into account the possible presence of

peanut allergens in these products and the potential allergy risks that the end consumers may not be aware of, due to inadequate food labelling.

In general, the characteristics of scientific style are informativity, lack of emotional and connotative content, neutrality of expression, frequent use of passive, lexical density and highly specialized technical terminology, with a significant number of tables, graphs and other paralinguistic means of conveying the message to the recipients (Pritchard, 2015, pp. 212-239).

When writing and translating scientific texts it is necessary to remain within the scope of presenting objective facts supported by the description of the materials and methods, the results, the theoretical framework within which the research was conceptualized and, if applicable, the previous research done on the subject. Considering all of the above mentioned points, it can be said that the source text is representative of the scientific style to which it belongs and it serves well the purpose for which it was intended.

If we tackle the selected text from the aspect of its function, in line with the model of language functions proposed by Roman Jakobson (Nord, 1997, pp. 39-45), it can be observed that the primary function of the text is referential (denotative), because its task is to inform the recipients as objectively and as neutrally as possible. In addition, the text warns the recipients about the problem of inadequate food labelling and, consequently, raises their awareness about the possibility of allergies occurrences. Therefore, it can be added that its function is appellative (conative) to some extent.

The aim of the translation task was to remain within the function, genre and register of the source text and to preserve the inner logic and coherence of the original. In attempting to do so, various available strategies and techniques were applied. By using them, the text was analysed and approached at various levels: the lexical, the structural and the textual one, while examining its pragmalinguistic features and the broader sociolinguistic context.

2.1. Lexical analysis

Perhaps the most challenging and time-consuming part of translating scientific and other technical texts is finding the most adequate solutions for rendering highly specialised technical vocabulary (Oštrec, 2014; Štefić et al., 2010).

In this particular source text, there is a significant amount of terminology from the domain of biotechnology which is mostly derived from Greek or Latin, and translated in the form of

internationalisms. In some cases these internationalisms were used instead of their Croatian equivalents, although the latter are not unknown in the academic and scientific discourse. The following examples illustrate what has been said: *kontaminacija* is used instead of *onečišćenje*; *protein* instead of *bjelančevina*. In some other examples, internationalisms for denoting technical terminology seemed like the best translation solution to convey the meaning, since it is questionable whether there is a Croatian equivalent for them: *alergen – allergen; homologija – homology; epitop – epitope; anafilaksija – anaphylaxis, imunoglobulin E (IgE) – immunoglobulin E (IgE).* However, the use of internationalisms vs. their translation equivalents throughout the source text is not consistent: for instance, *antibody* is sometimes refered to as *protutijelo*, while in some other parts of the text as *antitijelo*, as in the following examples: *imunoglobulin E (IgE) protutijela* vs. *antitijela (IgE) za Ara h 1 i Ara h 2*. These two examples of lexical and structural inconsistency introduce another issue, the one of compound nouns which are frequently found in texts written in English, while in Croatian these structures are formed somewhat differently.

Compound nouns are structures called *nominal groups* or *noun phrases* (Pritchard, 2015, p. 222). These structures are described by the formula:

Pre-Modifier + HEAD NOUN,

as in the following examples: *peanut allergens, peanut allergy, chocolate cream samples, peanut-induced anaphylaxis, total peanut protein content, food information, cereal products* etc.

Another possible way of forming noun phrases is:

HEAD NOUN + Postmodifier,

as in the examples *the developed countries of the West* and *immunoglobulin E (IgE) antibodies mediated*, etc.

These structures are extensively used in English technical and scientific texts because they "provide expressive conciseness, objectivity and specific description or specification of terms", which is "of particular importance in translating from English or German into Croatian" (Pritchard, 2015, p. 223). These structures do not exist in the standard Croatian language, and thus, when translated into Croatian, are replaced by the genitive case, prepositional phrases or by paraphrasing, as demonstrated in Table 1.

English noun phrase	Croatian translation equivalent
peanut allergens	*alergeni kikirikija*
peanut allergy	*alergija na kikiriki*
chocolate cream samples	*uzorci krem-proizvoda*
peanut-induced anphylaxis	*anafilaksija uzrokovana kikirikijem*
total peanut protein content	*ukupni sadržaj proteina kikirikija*
food information	*informacije o hrani*
cereal products	*proizvodi od žitarica*
developed countries of the West	*razvijene zemlje Zapada*
immunoglobulin E (IgE) antibodies mediated	*posredovan imunoglobulin E (IgE) protuijelima*

Table 1 - Examples of noun phrases translations

Furthermore, direct translation of noun phrases from English or German to Croatian might consequently lead to the creation of syntactically unacceptable and non-idiomatic word formations. Despite being grammatically inappropriate, these structures sometimes appear in Croatian translations of English and German terminology (Pritchard, 2015, p. 223).

In line with what has been said, the term *imunoglobulin E (IgE) protutijela* from the source text is an example of direct translation of the English noun phrase into Croatian, which is not in accordance with the standard. Thus, the grammatically correct form in the source text would be the prepositional phrase *protutijela za imunoglobulin E (IgE)*, as in the second example of *antitijela (IgE) za Ara h 1 i Ara h 2.*

In addition, the principle of noun phrase formulation was applied in an attempt to improve the official English translation of the title. The title of the source text *„Alergeni kikirikija u uzorcima čokolada, krem-proizvoda i kolača“* had been officially translated as *“Peanut allergens in chocolates, chocolate creams and cake samples“* which seems inadequate because the first two types of samples – chocolates and chocolate creams – were translated from Croatian as nouns in plural, while the third type of samples – cake – was left in singular, thus functioning as a premodifier (adjective). Therefore, it seemed more elegant to modify these elements of the title and translate them as noun phrases, providing the following solution: *"Peanut allergens in chocolate, chocolate cream and cake samples"*, which sounded more appropriate.

Other lexical units frequently found in the analysed text are lexical collocations. In scientific papers, especially those from natural, technical or engineering sciences it is of utmost importance to be aware of the correct translations of established collocations, since they

constitute the distinctive technical vocabulary of a particular discipline, and as such need to be clear, unambiguous, consistent and precise (Štefić et al., 2010).

In this paper, some collocations were particularly challenging to translate because the solutions offered by the MateCat computer assisted translation tool and the consulted dictionaries were litteral and inadequate for rendering the exact meaning of the collocation, as presented in Table 2.

Croatian collocation	**English collocation**	**Litteral translation**
teška reakcija	*severe reaction*	*hard reaction*
strana tvar	*foreign substance*	*foreign matter*
alergijska bolest	*allergic disease*	*allergic illness*
glavni alergen kikirikija	*major peanut allergen*	*main peanut allergen*
kikiriki i drugi orašasti plodovi	*peanuts and tree nuts*	*peanuts and other nuts*
anafilaksija izazvana kikirikijem	*peanut-induced anaphylaxis*	*peanut-caused anaphylaxis*

Table 2 – Partial translation equivalents on the examples of Croatian and English collocations

The process of finding adequate translations for technical vocabulary and collocations consisted of the standard procedures which included reading texts of the same genre, register and topic written in the target language, comparing the possible solutions, using general and specialised corpora, browsing through available glossaries of similar content and consulting experts from the field.

2.2. Structural analysis

Structural (syntactic) features of a text refer to sentence structure, the choice of grammatical forms, the use of typical word patterns, etc.

One of the main syntactic features of the analysed text is its high lexical density, which is typical of scientific, and particularly technical texts (Pritchard, 2015, p. 223). Lexical density is defined as "a measure of the proportion of lexical items (i.e. nouns, verbs, adjectives and some adverbs) in the text", and therefore, if a text has high lexical density, it means that it contains a high proportion of "content words" (nouns, verbs, adjectives, and often also adverbs) compared to the proportion of "function words" (prepositions, interjections, pronouns, conjunctions and count words) (Johansson, 2008, p. 61). This can be observed primarily in the high proportion

of technical terminology throughout the analysed text, consisting mainly of nouns and noun phrases, and a significant number of verbs and adjectives.

Another feature which is typical of scientific writing is the use of the 3rd person pronouns and the limited or no use of the 1st person pronouns. In the analysed text there are no 1st person pronouns used, not even in the Acknowledgement section. The structure most frequently used instead is the passive. The use of passive in scientific and academic writing contributes to the anonymity and objectivity of the text and moves the focus from the person performing the action (the subject) to the object on which the action is performed. This is particularly common in all types of texts that require technical clarity and objectivity, and is as such particularly present not only in scientific and technical, but also in administrative and legal texts (Pritchard, 2015, pp. 224-225).

In addition, the objectivity and impersonality of the source text are achieved by the use of patterns with active verb forms and the reflexive pronoun *„se“*, which is a common structure in Croatian scientific and technical texts (Pritchard, 2015, p. 224). In the analysed source text this structure is present in the example of *procjenjuje se*, which was translated in the target text as *it is estimated*. The latter is an example of an *it + an adjective* pattern, which is a typical structure found in English scientific and academic writing (Hornby, 2015, p. WT3).

Another structure typically found in Croatian to English scientific and technical translation is the transposition of the Croatian explicit relative clause into the English present or past participle with a relative function in the sentence (Pritchard, 2015, p. 224). In the analysed text this can be illustrated by the example of the following sentence: *„Istraživanje* ***u kojem su sudjelovale*** *662 osobe s alergijom na kikiriki pokazalo je…“* which was transposed to: *„A study* ***involving*** *662 people allergic to peanuts showed that…“.* The same structure adjustment is found in the example of: *“..sadrže informacije* ***koje upućuju na*** *moguće tragove kikirikija.“* which was translated as: *“..contain information* ***indicating*** *possible traces of peanuts.”.*

Furthermore, the structural aspects of the analysed text can be observed in the sentence length and the organization of sentence parts. The flective nature of Croatian allows for longer and more flexible sentences than is the case in English. Therefore, in the translation process it was necessary to adjust certain sentence structures from the source text and reformulate them in accordance with the English syntax. This can be illustrated by the example of the following sentence from the source text: *„Lako razumljivu metodu kako bi se predisponirani pojedinci zaštitili od slučajne konzumacije proizvoda koji sadrže kikiriki,* ***predstavljaju deklaracije***

***odnosno informacije o hrani**.“* The parts of this sentence are organized according to the formula:

object + verb + subject (O + V + S),

which is legitimate in Croatian. However, the replication of the same word order in the English translation would not be possible without interfering with the meaning. Thus, in order for the sentence to be both comprehensible and gramatically correct, it was rearranged according to the formula:

subject + verb + object (S + V + O),

which is in accordance with the English syntax: *„**Food declaration or food information is** an easily understandable method of protecting predisposed individuals from accidental consumption of products containing peanuts“.*

A similar example of word order rearrangement is present in the following sentence: *„Kako je detaljna lista sastojaka veoma važna **smatralo je 316 osoba od 322** koliko ih je sudjelovalo u istraživanju.“* It was necessary to reformulate the sentence structure from the source text *(objective relative clause + V + S)*, into the English structure *(S + V + objective relative clause)*, thus creating the following solution: *„**A total of 316 out of 322 people** who participated in the survey **believed** that a detailed list of ingredients was very important.“*

Additionally, the use of tenses in the analysed text is confined mainly to the use of the present tense for denoting the general present (as in the Introduction and the Conclusions) and the past tense (or sometimes the Present Perfect in the English translation) for the explanation of the research method applied, the analysis conducted and the results obtained.

In adjusting the sentence structures of the source text to the syntactically appropriate and idiomatic structures in the target text some typical oblique translation strategies were applied. Thus, the strategy of transposition was applied in the examples of *“..odlikuju se visokom stabilnošću..“* which was translated as *“..are highly stable..“*, and in *“..ima alergiju..“* which was transposed into *“..are allergic..“*. In both examples the nouns from the source text were translated as adjectives, without changing the meaning. In addition, these examples also illustrate the strategy of modulation applied. In the first example the verb *odlikuju se + adjective and noun in the Croatian instrumental case* became the verb *are + adverb and adjective in the English nominative case*. A similar change of perspective is present in the second example, in

which the Croatian verb *ima + noun in the accusative case* were transformed into the English verb *are + adjective in the nominative case.*

2.3. Textual analysis

On the textual level, high quality scientific papers need to comply with the principles of **cohesion, coherence and intertextuality**. These principles refer to the way in which sentences and paragraphs are put toghether to form the text as a linguistic and logical totality, and the way in which the text refers to other texts.

2.3.1. Textual cohesion

In the analysed paper, cohesion is achieved primarily by using connectors and conjunctions, such as *therefore, however, with,* etc. when starting the next logical unit. In the given text, these connectors were translated directly from Croatian. The only adjustment that needed to be carried out refers to syntax, i.e. the reorganization of the sentence structure, since English, as a non-flective language allows less flexibility in sentence structuring than Croatian, as has already been mentioned.

Another cohesive device frequently found throughout the text is the repetition of technical vocabulary, key terms and other lexical units, such as *chocolate samples*, *cakes containing cocoa parts from retail chains,* etc. This is due to the explanatory nature of the analysed text, i.e. the demand for the information to be conveyed clearly and in an understandable way, which, in this particular case, had priority over style.

Apart from the frequent use of connectors and repetition, which are mostly used, other cohesive devices are also found in the text. For example, ellipsis is found in Table 1 of the analysed texts in the food labels stating *"May contain...".* Since this is a standard formula for indicating ingredients on food products, it obviously needs to be economical. Thus, the pronoun *it* is omitted.

In addition, a combination of anaphora and ellipsis is found in the sentence from the Introduction of the source text: *"Unatoč velikim naporima proizvođača, skriveni alergeni i dalje predstavljaju problem.* ***Mogu*** *se pojaviti u hrani i proizvodima zbog križne kontaminacije.."* which was within this translation task translated as *"Despite the great efforts made by manufacturers, hidden allergens still pose a problem.* ***They may*** *appear in food and products because of cross contamination.."*. In the given example, the rhetorical figures from

the source sentence were modified in a way that only the anaphora remained in the target sentence. This is so, because omitting the pronoun *„they“* in the English version would hinder the understanding of the sentence. Therefore, the anaphora + ellipsis figure from the original sentence was reduced to only the anaphora in the target text, while the ellipsis was left out, i.e. the pronoun was kept. Both rhetorical figures enable the sentence to flow more easily, and the text to be more coherent, without unnecessary repetition. The main criteria to consider when deciding upon the strategy of translating these figures is whether their selection disrupts the meaning or not, which was also considered in this case.

Furthermore, ellipsis is found in the sentence segment included in the Results and Discussion section: *“..koji ujedno predstavlja i jedini krem-proizvod* ***među analiziranima koji****..“* which was translated directly into *“which was also the only chocolate cream product* ***among the analysed that..****“.* The ellipsis contributes to fluidity of both the source and the target sentence without interfering with the meaning and therefore it was possible to translate it directly.

Other cohesive devices, such as cataphoric references, were not found in the text. This is due to the explanatory and academic nature of the source text and the demand for exactness and clarity of the message/information transmitted. Consequently, a figure in which the unknown is first presented and then explained (as in cataphora) represents a logic which is opposite to the one of scientific writing.

2.3.2. Textual coherence

Textual coherence is achieved through formal and logical organization of the text into strictly set sections characteristic of and obligatory for scientific papers, with only minor variations regarding the sequence of particular sections allowed. These sections include the title, the abstract, the introduction, the materials and methods, the results and discussion, the acknowledgement and the references section, and were also followed in the target text.

2.3.3. Intertextuality

Intertextuality of the source text is achieved through the frequent use of in-text citations of the references listed at the end of the paper. They consist of the surname(s) of the author(s) and the year of publication, and are separated from the rest of the text by parentheses. The graphical form and the content of in-text citations was followed in the target text. The only part of the citations that needed to be translated was the *“i sur.”* element which was translated as *“et al.”*.

3. Parallel and aligned translation of an excerpt from an original scientific paper *"Peanut allergens in chocolate, chocolate cream and cake samples"*

Uvod

U razvijenim zemljama Zapada, alergijske reakcije na hranu kao i ostale alergijske bolesti posljednjih su desetljeća u porastu te zahvaćaju 1 - 10 % ukupne populacije (Štimac i sur., 2014). Alergija ili preosjetljivost na hranu je reakcija organizma na neki od sastojaka hrane, smatrajući ga stranom tvari (antigenom) s posljedičnom promjenom imunološkog odgovora organizma. Preosjetljivost (hipersenzitivnost) može biti alergijska ili nealergijska, pri čemu je alergijska najčešće posredovana imunoglobulin E (IgE) protutijelima (npr. alergije na mlijeko, jaja i kikiriki) (Johansson i sur., 2001). Učestalost alergijskih reakcija na hranu povezuje se s načinom prehrane, pripremom namirnica, kulturološkim i socijalnim čimbenicima svojstvenim pojedinim zemljama i kulturama. Tako je senzibilizacija na rižu, soju, sezam, kikiriki itd. češća u zemljama gdje se navedene namirnice konzumiraju u većim količinama (Cochrane i sur., 2009).

Najčešći nutritivni alergeni odgovorni za približno 90 % svih alergijskih reakcija su kravlje mlijeko, jaja, soja, pšenica, kikiriki, orašasti plodovi te ribe i školjkaši (Hefle i sur., 1996). Kikiriki privlači veliku pozornost među ovim namirnicama obzirom da se njegova konzumacija u osoba s nutritivnim alergijama povezuje s teškim reakcijama, uključujući i po život opasnu anafilaksiju. Najveći problem s kojim se susreću osobe alergične na kikiriki predstavlja nenamjerno izlaganje alergenima kikirikija, bilo kao dio sastojka hrane ili kao rezultat kontaminacije tijekom proizvodnje hrane (Pomés i sur., 2003).

Kikiriki može izazvati alergijsku reakciju neposredno nakon izloženosti uzrokujući različite simptome (Sampson, 2002). Istraživanje u kojem su sudjelovale 662 osobe s alergijom na kikiriki pokazalo je kako je u 76 % pojedinaca alergijska reakcija nastupila nakon 5 minuta (Hourihane i sur., 1997). Procjenjuje se kako anafilaksija izazvana kikirikijem pogađa oko 1,5 milijuna ljudi te uzrokuje 50-100 smrti godišnje u Sjedinjenim Američkim Državama (Leung i sur., 2003).

Istraživanje provedeno 2004. je pokazalo kako 0,8% adolescenata i 0,6% odraslih u SAD-u ima alergiju na kikiriki (Sampson, 2004). U Francuskoj 1% populacije ima alergiju na kikiriki, a njezina učestalost se povećala od prošlog desetljeća (Kanny i sur., 2001).

Introduction

In the developed countries of the West, during the past decades there has been an increase in the incidence of food allergies and other allergic diseases, and they affect between 1% and 10% of the total population (Štimac et al., 2014). Allergy or food sensitivity is a reaction to some food ingredients that the organism recognizes as a foreign substance (antigen), which leads to a consequent change in the immune response of the organism. Oversensitivity (hypersensitivity) can be allergic or non-allergic, and the allergic oversensitivity is most commonly immunoglobulin E (IgE) antibodies mediated (e.g. allergies to milk, eggs and peanuts) (Johansson et al., 2001). The frequency of allergic reactions to food is related to diet, food preparation, cultural and social factors inherent to certain countries and cultures. Therefore, sensitisation to rice, soy, sesame, peanuts, etc. is more common in countries where these foods are consumed in larger quantities (Cochrane et al., 2009).

The most common nutritional allergens responsible for about 90% of all allergic reactions are cow's milk, eggs, soy, wheat, peanuts, tree nuts, fish and shellfish (Hefle et al., 1996). Among these foods, a lot of attention is given to peanuts, since their consumption is related to severe reactions, including the life-threatening anaphylaxis, in people with nutritional allergies. The greatest problem that people allergic to peanuts face is inadvertent exposure to peanut allergens, which happens either as a result of food intake or as a result of contamination during food production. (Pomés et al., 2003).

Peanuts may cause an allergic reaction immediately after exposure, causing various symptoms (Sampson, 2002). A study involving 662 people allergic to peanuts showed that in 76% of them the allergic reaction occurred after 5 minutes (Hourihane et al., 1997). It is estimated that peanut-induced anaphylaxis affects about 1.5 million people and causes 50-100 deaths per year in the United States (Leung et al., 2003).

According to a study conducted in 2004, 0.8% of adolescents and 0.6% of adults in the United States have peanut allergy (Sampson, 2004). In France, 1% of the population has peanut allergy, and its incidence has increased since the last decade (Kanny et al., 2001).

Plod kikirikija sadrži u prosjeku 29 % proteina (Freeman i sur., 1954) od čega 12 % do 16 % od ukupnih proteina čini glavni alergen kikirikija Ara h 1 (vicilin-sličan protein), molekulske mase 63-64 kD. Drugi glavni alergen Ara h 2 (koglutin-sličan protein) čija molekulska masa iznosi približno 17 kD, čini 5,9 % do 9,3 % ukupnog sadržaja proteina kikirikija (Koppelman i sur., 2001). Oba navedena alergena odlikuju se visokom stabilnošću (Mondoulet i sur., 2005), a više od 95 % osoba alergičnih na kikiriki posjeduje antitijela (IgE) upravo za Ara h 1 i Ara h 2 (Scurlock i Burks, 2004). Ostali alergeni kikirikija su Ara h 3 i 4 (proteini glicinina) (Koppelman i sur., 2003), Ara h 5 (profilin), Ara h 6 i 7 (Scurlock i Burks, 2004), i Ara h 8 (Mittag i sur., 2004).

Procjenjuje se kako 20 do 50 % pojedinaca alergičnih na kikiriki ima alergiju i na orašaste plodove (Sicherer, 2003). Međutim, još uvijek je sporno da li je križna reakcija između kikirikija i orašastih plodova rezultat taksonomske bliskosti ili sličnosti u homologiji IgE-vezujućih epitopa (Maleki i sur., 2011). Strukturna sličnost između Ara h 3 kikirikija i alergena orašastih plodova poput Jug r 4 (orah), Cor a 9 (lješnjak) te Ana o 2 (indijski oraščić) sugerira na izbjegavanje orašastih plodova u osoba s alergijom na kikiriki (Ball i sur., 2011).

Unatoč velikim naporima proizvođača, skriveni alergeni i dalje predstavljaju problem. Mogu se pojaviti u hrani i proizvodima zbog križne kontaminacije ako se upotrebljava zajednička oprema ili postrojenje, zbog pogrešaka u pakiranju ili pitanja koja se odnose na opskrbni lanac (Hefle i sur., 2007). Stoga je cilj ovog istraživanja bio analizirati prisutnost potencijalnih alergena kikirikija u uzorcima zapakirane i nepretpakirane hrane te usporediti dobivene rezultate sa navodima u okviru informacija o hrani.

Materijali i metode rada

Uzorci

Ukupno su uzorkovana 32 uzorka sa zagrebačkog tržišta te analizirana na prisutnost potencijalnih alergena kikirikija ELISA metodom. Obzirom na specifičnosti navođenja informacija o hrani, uzorci su podijeljeni u grupu uzoraka zapakirane hrane (N = 16) (osam uzoraka čokolada s lješnjakom (Č1 – Č8) i osam uzoraka krem-proizvoda iz trgovačkih lanaca (KP1 – KP8)) te grupu uzoraka nepretpakirane hrane (N = 16) (šest uzoraka kolača koji sadrže kakaove dijelove iz trgovačkih lanaca (KT1 – KT6), pet uzoraka kolača koji sadrže kakaove dijelove iz slastičarnice (KS1 – KS5) i pet uzoraka kolača koji sadrže kakaove dijelove iz objekta javne prehrane, odnosno studentske kantine (KO1 – KO5)).

Peanut contains 29% of proteins on average (Freeman et al., 1954), wherein 12% to 16% of total proteins consists of the major peanut allergen Ara h 1 (viciline-like protein), the molecular weight of which is 63-64 kD. The second major allergen, Ara h 2 (coglutin-like protein), the molecular weight of which is approximately 17 kD, makes up 5.9% to 9.3% of the total peanut protein content (Koppelman et al., 2001). Both of these allergens are highly stable (Mondoulet et al., 2005), and it is Ara h 1 and Ara h 2 antibodies (IgE) that are found in more than 95% of people allergic to peanuts (Scurlock and Burks, 2004). Other peanut allergens include Ara h 3 and 4 (glycine proteins) (Koppelman et al., 2003), Ara h 5 (profilin), Ara h 6 and 7 (Scurlock and Burks, 2004), and Ara h 8 (Mittag et al., 2004).

It is estimated that 20 to 50% of individuals allergic to peanuts are also allergic to tree nuts (Sicherer, 2003). However, it is still disputable whether the cross reaction between peanuts and tree nuts is a result of taxonomic closeness or the similarity in the homology of the IgE-binding epitopes (Maleki et al., 2011). Structural similarity between Ara h 3 peanut allergens and tree nut allergens such as Jug r 4 (walnut), Cor a 9 (hazelnut) and Ana o 2 (cashew nut) suggests avoidance of nuts in patients with peanut allergy (Ball et al. 2011).

Despite the great efforts made by manufacturers, hidden allergens still pose a problem. They may appear in food and products because of cross contamination if shared equipment or facilities are used, because of packaging errors or issues related to the supply chain (Hefle et al., 2007). Therefore, the aim of this study was to analyse the presence of potential peanut allergens in samples of pre-packed and non pre-packed food and compare the obtained results with the information contained in food declarations.

Materials and Methods

Samples

A total of 32 samples from the Zagreb market were collected and analysed for the presence of potential peanut allergens by using the ELISA method. Given the specificities of food labelling, the samples were divided into a group of pre-packed food samples (N = 16) (eight samples of chocolate with hazelnuts (CH1 - CH8) and eight samples of chocolate cream products from retail chains (CP1 - CP8), and a group of non pre-packed food samples (N = 16) (six samples of cakes containing cocoa parts from retail chains (CR1 - CR6), five samples of cakes containing cocoa parts from a confectionery shop (CS1 - CS5) and five samples of cakes containing cocoa parts from a public catering facility, i.e. a students' cafeteria (CC1 - CC5)).

Obrada podataka

Dobiveni rezultati analizirani su pomoću Microsoft Excel 2013 programa. Za prikaz i raspravu rezultata korištene su standardne metode deskriptivne statistike (srednja vrijednost, SD-standardna devijacija, raspon, prosječna vrijednost).

Rezultati i rasprava

Tijekom ovog istraživanja je ELISA metodom analizirana prisutnost potencijalnih alergena kikirikija u osam uzoraka čokolade s lješnjakom i osam uzoraka krem-proizvoda iz trgovačkih lanaca te također u šest uzoraka kolača koji sadrže kakaove dijelove iz trgovačkih lanaca, pet uzoraka kolača koji sadrže kakaove dijelove iz slastičarnice te pet uzoraka kolača koji sadrže kakaove dijelove iz objekta javne prehrane, odnosno studentske kantine. Limit detekcije ELISA testa iznosio je 0,10 $mgkg^{-1}$ kako stoji u uputama proizvođača. Udio alergena kikirikija izražen je u $mgkg^{-1}$. Dobiveni rezultati uspoređeni su sa informacijama o prisutnosti alergena kikirikija navedenim na analiziranim uzorcima zapakirane (čokolada s lješnjakom i krem-proizvodi) i nepretpakirane hrane (kolači koji sadrže kakaove dijelove iz trgovačkog lanca, slastičarnice i objekta javne prehrane).

Iz rezultata određivanja alergena kikirikija ELISA testom prikazanih u tablici 1 vidljiva je prisutnost alergena kikirikija u sedam od ukupno osam analiziranih uzoraka čokolade s lješnjakom. U uzorku "Č1 " nije potvrđena prisutnost alergena kikirikija. Udio alergena kikirikija u osam analiziranih uzoraka čokolade s lješnjakom kreće se u rasponu od 0,27 do 4,05 $mgkg^{-1}$, prosječno 0,96 $mgkg^{-1}$. U svim analiziranim uzorcima krem-proizvoda detektirani su alergeni kikirikija pri čemu prosječna vrijednost iznosi 1,10 $mgkg^{-1}$, a raspon se kreće od 0,27 do 3,90 $mgkg^{-1}$. Najviši udio (3,90 $mgkg^{-1}$) pri tome je određen u uzorku krem-proizvoda ("KP8") koji ujedno predstavlja i jedini krem-proizvod među analiziranima koji, kao što je prikazano u Tablici 1, sadrži navod o mogućoj prisutnosti alergena kikirikija.

Data Processing

The obtained results were analysed using the Microsoft Excel 2013 program. For the review and discussion of the results the standard descriptive statistics methods (mean, SD-standard deviation, range, average value) were used.

Results and Discussion

In this study the ELISA method was used to analyse the presence of potential peanut allergens in eight samples of chocolate with hazelnuts and eight samples of chocolate cream products from retail chains, and also in six samples of cakes containing cocoa parts from retail chains, five samples of cakes containing cocoa parts from a confectionery shop and five samples of cakes containing cocoa parts from a public catering facility, i.e. a students' cafeteria. The limit of detection of the ELISA test was 0.10 $mgkg^{-1}$ as indicated in the manufacturer's instructions. The peanut allergens' content is expressed in $mgkg^{-1}$. The obtained results were compared with the information about the presence of peanut allergens indicated on the analysed samples of pre-packed (chocolate with hazelnuts and chocolate cream products) and non pre-packed food (cakes containing cocoa parts from a retail chain, a confectionery shop and a public catering facility).

The results of the ELISA peanut allergens test shown in Table 1 indicate the presence of peanut allergens in seven out of the total of eight analysed samples of chocolate with hazelnuts. In the "CH1" sample the presence of peanut allergens was not confirmed. The peanut allergens content in the eight analysed samples of chocolate with hazelnuts ranges from 0.27 to 4.05 $mgkg^{-1}$, averaging 0.96 $mgkg^{-1}$. In all the analysed samples of chocolate cream products peanut allergens were detected, with an average value of 1.10 $mgkg^{-1}$, and ranging from 0.27 to 3.90 $mgkg^{-1}$. The highest value (3.90 $mgkg^{-1}$) was determined in the chocolate cream sample ("CP8"), which was also the only chocolate cream product among the analysed that contained an indication of possible peanut allergens presence, as shown in Table 1.

Tablica 1. Udio ($mgkg^{-1}$) alergena kikirikija u analiziranim uzorcima zapakirane hrane te navedene informacije o hrani vezane uz prisutnost alergena kikirikija

Uzorak	Udio alergena kikirikija ($mgkg^{-1}$) (srednja vrijednost ± SD)	Informacije o hrani vezane uz prisutnost alergena kikirikija
Čokolada s lješnjakom		
Č1	< limit detekcije	"Može sadržavati tragove ostalih orašastih plodova "
Č2	0,69 ± 0,000	"Može sadržavati tragove kikirikija, ostalih orašastih plodova, glutena i jaja"
Č3	0,27 ± 0,010	"Može sadržavati drugo orašasto voće/plodove i pšenicu "
Č4	0,29 ± 0,005	"Može sadržavati badem, kikiriki, bjelanjak jajeta i gluten u tragovima"
Č5	0,42 ± 0,015	"Može sadržavati bademe, kikiriki, gluten"
Č6	4,05 ± 0,030	"Može sadržavati badem, kikiriki, bjelanjak jajeta i gluten u tragovima"
Č7	0,35 ± 0,000	"Može sadržavati tragove ostalih orašastih plodova"
Č8	0,66 ± 0,005	"Može sadržavati tragove kikirikija, ostalih orašastih plodova, glutena i jaja"
Krem proizvodi		
KP1	0,53 ± 0,015	"Bez navoda"
KP2	0,27 ± 0,010	"Bez navoda"
KP3	0,29 ± 0,000	"Bez navoda"
KP4	0,35 ± 0,000	"Bez navoda"
KP5	1,23 ± 0,025	"Bez navoda"
KP6	0,42 ± 0,000	"Bez navoda"
KP7	1,81 ± 0,015	"Bez navoda"
KP8	3,90 ± 0,020	"Proizvedeno u tvornici u kojoj se upotrebljavaju proizvodi od žitarica (pšenica) i kikiriki"

Table 1 Peanut allergens content ($mgkg^{-1}$) in analysed samples of pre-packed food and the food information related to the presence of peanut allergens

Sample	Peanut allergens content ($mgkg^{-1}$) (Mean ± SD)	Food information related to the presence of peanut allergens
Chocolate with hazelnuts		
CH1	< Limit of Detection	"May contain traces of tree nuts"
CH2	0.69 ± 0.000	"May contain traces of peanuts, tree nuts, gluten and eggs"
CH3	0.27 ± 0.010	"May contain tree nuts and wheat "
CH4	0.29 ± 0.005	"May contain traces of almond, peanuts, egg white and gluten"
CH5	0.42 ± 0.015	"May contain almond, peanuts and gluten"
CH6	4.05 ± 0.030	"May contain traces of almond, peanuts, egg white and gluten"
CH7	0.35 ± 0.000	"May contain traces of other tree nuts"
CH8	0.66 ± 0.005	"May contain traces of peanuts, tree nuts, gluten and eggs"
Chocolate cream products		
CP1	0.53 ± 0.015	"No indication"
CP2	0.27 ± 0.010	"No indication"
CP3	0.29 ± 0.000	"No indication"
CP4	0.35 ± 0.000	"No indication"
CP5	1.23 ± 0.025	"No indication"
CP6	0.42 ± 0.000	"No indication"
CP7	1.81 ± 0.015	"No indication"
CP8	3.90 ± 0.020	"Manufactured in a facility that uses cereal products (wheat) and peanuts"

Lako razumljivu metodu kako bi se predisponirani pojedinci zaštitili od slučajne konzumacije proizvoda koji sadrže kikiriki, predstavljaju deklaracije odnosno informacije o hrani. Pojednostavljenju postojećih propisa o označavanju hrane radi jedinstvene primjene te omogućavanja izbora hrane koja odgovara prehrambenim potrebama pojedinca doprinosi Uredba (EU) br. 1169/2011 o informiranju potrošača o hrani koja se u Hrvatskoj primjenjuje od prosinca 2014. godine. Podatke o tvarima ili proizvodima koji uzrokuju alergije ili netolerancije, a koji između ostalog uključuju kikiriki i proizvode od kikirikija, potrebno je navesti u okviru obveznih informacija o hrani (Uredba 1169/2011), odnosno informacija koje se odnose na hranu, a dostupne su krajnjem potrošaču putem etiketa, drugog popratnog materijala ili na bilo koji drugi način, uključujući sredstva moderne tehnologije ili verbalne komunikacije (Uredba 1169/2011).

Ovim istraživanjem analizirane su informacije o prisutnosti alergena kikirikija navedene na analiziranim uzorcima zapakirane (čokolada s lješnjakom i krem-proizvodi) hrane. Kao što je prikazano u Tablici 1, pet od sedam analiziranih uzoraka čokolada s lješnjakom u kojima su detektirani alergeni kikirikija, sadrže informacije koje upućuju na moguće tragove kikirikija. Međutim, dva analizirana uzorka čokolada s lješnjakom (Č3 i Č7) sadrže informacije u kojima nedostaju navodi o sadržaju kikirikija, iako je ovim istraživanjem detektirana njihova prisutnost (u udjelu 0,27 $mgkg^{-1}$, odnosno 0,35 $mgkg^{-1}$). Sedam od osam analiziranih krem proizvoda ne sadrži navode o prisutnosti kikirikija unatoč tome što je ovim istraživanjem potvrđena njihova prisutnost. Jedini krem proizvod među analiziranima koji, kao što je prikazano u Tablici 1, sadrži navod o mogućoj prisutnosti alergena kikirikija predstavlja krem proizvod "KP8" u kojem je ujedno i određen najviši udio potencijalnih alergena kikirikija (3,90 $mgkg^{-1}$).

Tragovi alergena kikirikija i lješnjaka češće su pronađeni u proizvodima s navodom "može sadržavati" u odnosu na one bez navoda o sadržaju istih (Pele i sur., 2007).

Food declaration or food information is an easily understandable method of protecting predisposed individuals from accidental consumption of products containing peanuts. The EU Regulation No. 1169/2011 on the provision of food information to consumers, which has been in effect in Croatia since December 2014, contributes to the simplification of the existing food labelling regulations, with the aim of enabling uniform application and providing the choice of food that corresponds to individual nutritional needs. The information on substances or products that cause allergies or intolerances and that include, among other things, peanuts and peanut products, should be indicated in the mandatory food information (Regulation 1169/2011), i.e. the food related information accessible to end consumers through labels, other supporting material or in any other way, including the means of modern technology or verbal communication (Regulation 1169/2011).

In this study the information on the presence of peanut allergens indicated on the analysed samples of pre-packed food (chocolates with hazelnuts and chocolate cream products) were analysed. As displayed in Table 1, five out of the seven analysed samples of chocolate with hazelnuts, in which peanut allergens were detected, contain information indicating possible traces of peanuts. However, the information on the packagings of two analysed samples of chocolate with hazelnuts (CH3 and CH7) lack an indication of peanut content, although its presence was detected in this study (values of 0.27 $mgkg^{-1}$ and 0.35 $mgkg^{-1}$). Seven out of the eight analysed cream products do not contain any indication of peanut presence despite its presence being confirmed by this study. The only cream product among the analysed which, as is displayed in Table 1, includes an indication of possible peanut allergens presence is the cream product "CP8", in which the highest proportion of potential peanut allergens (3.90 $mgkg^{-1}$) was also determined.

Traces of peanut and hazelnut allergens are more commonly found in products with an indication "may contain", than in those that do not contain the respective allergens' indications (Pele et al., 2007).

Informacije o hrani koje potrošači smatraju važnima u restoranima istražene su on-line upitnikom tijekom istraživanja koje su proveli Thomas i Mills (2006). Kako je detaljna lista sastojaka veoma važna smatralo je 316 osoba od 322 koliko ih je sudjelovalo u istraživanju. Važnost da svaka potencijalno alergena hrana bude označena i kao takva predstavljena potrošaču, smatralo je devet ispitanika. Kao važna stavka naveden je proces pripreme hrane obzirom da može utjecati na alergenost namirnica. Kako nedostatak informacija na hrani iz restorana može ugroziti njihovo zdravlje smatrali su potrošači s nutritivnim alergijama, specifičnim zdravstvenim tegobama ili oni koji slijede određeni način prehrane.

Također se navodi važnost poslužitelja hrane koji bi gostima trebali dati informacije o potencijalno alergenoj hrani (Thomas i Mills, 2006).

Zaključci

Između osam analiziranih uzoraka čokolade s lješnjakom, u sedam su detektirani alergeni kikirikija pri čemu dva uzorka nisu unutar informacija o hrani sadržavala navod o prisutnosti kikirikija. U svih osam analiziranih uzoraka krem-proizvoda detektirani su alergeni kikirikija pri čemu je sadržaj kikirikija naveden na samo jednom uzorku. U slučaju uzoraka nepretpakirane hrane, pet od šest analiziranih kolača koji sadrže kakaove dijelove iz trgovačkog lanca sadrži alergene kikirikija na što upućuju informacije o hrani na tri takova uzorka. Analizirani uzorci kolača koji sadrže kakaove dijelove iz slastičarnice također sadrže alergene kikirikija kao i četiri od pet analiziranih kolača koji sadrže kakaove dijelove iz objekta javne prehrane pri čemu ti proizvodi ne sadrže informacije o hrani vezane uz prisutnost alergena kikirikija. Alergeni kikirikija mogu biti prisutni kao skriveni sastojci u hrani na što je važno upozoriti potrošače u okviru informacija o hrani.

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Food information that consumers consider important in restaurants was explored in an online survey conducted by Thomas and Mills (2006). A total of 316 out of 322 people who participated in the survey believed that a detailed list of ingredients was very important. Nine respondents pointed to the importance of labelling all potentially allergenic foods and presenting them as such to the consumer. The process of food preparation was pointed out as an important factor, as it may affect food allergenicity. Consumers with nutritional allergies, specific health problems, or those who follow a specific diet believed that the lack of information about restaurant food could endanger their health.

In addition, the importance of food serving staff who should provide guests with the information on potentially allergenic food was also mentioned (Thomas and Mills, 2006).

Conclusions

Peanut allergens were detected in seven out of the eight analysed samples of chocolate with hazelnuts, with two samples not containing the claim about the peanut presence within food information. Peanut allergens were detected in all eight analysed samples of chocolate cream products, with peanut content being indicated only on the packaging of one sample. In the case of non pre-packed food samples, five out of the six analysed cakes containing cocoa parts from retail chains contained peanut allergens, as indicated in the food information on the packagings of three such samples. The analysed cake samples containing cocoa parts from a confectionery shop also contained peanut allergens, as did four out of the five analysed cakes containing cocoa parts from a public catering facility, whereby these products did not include food information related to the presence of peanut allergens. Peanut allergens can be present as hidden ingredients in food, and it is important to alert consumers about this through food labels.

4. Translation procedures, strategies, techniques and problems

Scientific texts in general strive towards being universally understood within the target community and are therefore subject to certain universal rules of writing and logical structuring of the main ideas. In the linguistic sense, the language of science is highly formal, lexically dense, with frequent occurence of academic vocabulary and technical terminology, with no colloquial expressions and jargon, and highly structured. These general rules apply to scientific texts in any given language, however, each language has its own particular rules related primarily to its lexical and syntactic distinctiveness.

In this particular translation task the latter can be observed, as has already been presented, in the differences between Croatian and English in terms of the specific choice of grammar forms, the preference of certain vocabulary, the length and the organization of sentence, etc. These differences were considered in this translation process which was conducted in accordance with the principles of the Skopos theory and by applying the procedures, strategies, techniques and tools further explained hereinafter.

Thus, in this translation process, the following steps were followed in order to convey the message of the original and transpose it into the target text:

1. Firstly, the purpose of the text was determined;

2. The Glossary of key terms, included in the Appendix, was created by using the usual translation tools, such as on-line and classical dictionaries, available on-line corpora of general and technical English and by reading other English texts of the same genre and covering the same topic for comparison;

3. The text was copied into MS Word and uploaded on the MateCat web-based computer-assisted translation (CAT) tool which provided the first, raw version of the translation. The unit of translation was sentence.

4. After downloading the integral version of the translated text from the MateCat service, the process of refining or "fine tuning" of the text was carried out. In this process the key terms, the grammatical forms and other linguistic features of the target text were once again checked by using translation tools listed in Step 2. The syntactic features of the text were further "polished" and checked manually, and, in cases where there were doubts, by using the Google

search engine for finding other examples of common sentence structures, but from reliable sources, mainly other academic and scientific writings.

5. Finally, the stylistic features of the text were further analysed and improved in order for the target text to be in accordance with the requirements of the scientific writing style.

As has already been mentioned, the most challenging part of translating this scientific paper included searching for precise technical terminology and adjusting the sentence structure, i.e. the syntax. Some of the strategies and techniques applied in transposing the lexical, structural and textual features of the source text have already been presented and supported with examples in Chapter 2.

In addition, some of the challenges that occured during the translation process are due to the subject that the paper discusses and the discipline concerned, i.e. due to the deficiency of the resources which would provide precise and unambiguous translations of the terminology from the field. This challenge was overcome by searching the available dictionaries, glossaries and corpora of related scientific fields, and by reading through other academic and scientific texts written in English that cover similar topics. Moreover, after skimming the English scientific papers and examining their terminology, it could be noticed that in some cases the terminology in the Croatian source text had been adopted and directly translated from the English resources. This can be illustrated with the examples of the names of allergenic proteins found in the source text: *koglutin-sličan protein*, *glicinin-sličan protein*, *profilin-sličan protein*, *vicilin-sličan protein*. In the given examples, the word formation follows English morphological rules, while the dative case could have been used instead for creating lexems that are more in accordance with the Croatian morphology: *protein sličan koglutinu, protein sličan glicininu,* etc.

Furthermore, in this translation task the syntax of the target text was adapted in accordance with the procedures commonly used when translating scientific texts from Croatian into English. Unlike the lexical features, which were highly dependant on the discipline concerned, and thus had to be thoroughly examined and double-checked, the syntactic rearrangment and adjustment of the source text was conducted in accordance with the usual procedures carried out in Croatian to English scientific translation, as has been presented in Section 2.2.

The least challenging part of this translation task was the adjustment of the textual features. This is so due to the scientific genre of the text which proposes a set of rules for logical structuring of the text and dividing it into strictly defined sections, which is a feature that was directly followed in the translation.

4.1. Translating numbers, abbreviations and measurement units

The analysed text includes a number of paralinguistic features, such as numbers, abbreviations and measurement units. These parts of the text may pose quite a challenge to translators, especially since they need to be adjusted not only in the linguistic sense, but also according to the intercultural and pragmalinguistic principles. In this section the procedures and strategies applied for translating these units are presented.

4.1.1. Translating numbers

In accordance with the rules of writing decimal numbers in English, all decimal numbers mentioned in the source text were modified in the way that the decimal comma from the Croatian original was substituted with the decimal point. The examples of these alterations can be found in Table 1 of the analysed texts. This process was done automatically during the "raw translation" phase provided by the MateCat web-based computer-assisted translation tool and was afterwards checked manually for possible mistakes, which were not detected.

4.1.2. Translating abbreviations

In translating abbreviations that denote particular research samples in the given text, the strategy of adaptation was applied. This was done with the aim of adjusting the target text to the English phonology and transcription. Thus, the abbreviation for the chocolate with hazelnuts sample 1 was changed from Č1 to CH1 in the target text, the chocolate cream product sample 2 KP2 was translated as CP2, the cake containing cocoa parts from retail chain sample 3 was changed from KT3 to CR3, and further on.

Other abbreviations found in the text were translated by borrowing, as their origin is either English or Latin. In the first example, the name of the research method mentioned in the source text – the *Enzyme-linked immunosorbent assay* and its abbreviation ELISA were left in the same form in the target text because translating them into Croatian and creating a new acronym would unnecessarily complicate the understanding of the text.

The same was done in the case of abbreviations for peanut and tree nuts allergens. These abbreviations are derived from the Latin names of these plants, which are part of the standard technical vocabulary in biosciences and biotechnology. Thus, Ara h 1, Ara h 2, etc. to Ara h 8, derived from *Arachis hypogaea* (peanuts), were left in the same form in the target text. The

same was done with Jug r 4 (walnut - *Juglans regia*), also with Cor a 9 (hazelnut - *Corylus avellana*) and Ana o 2 (cashew nut – *Anacardium Occidentale*).

4.1.3. Translating measurement units

The measurement units mentioned in the text, such as $mgkg^{-1}$, kD, etc. were left unchanged, in the same way the MateCat computer-assisted translation tool had translated them. Since these units are part of the metric system and are in accordance with the International System of Units (SI), they were borrowed in the target text to keep it comprehensible within the international research community. Moreover, the $mgkg^{-1}$ is a measurement unit determined by the ELISA method test-kit that was used in the research, and is produced in Austria, but applied globally in biotechnological research.

5. Discussion and conclusion

The aim of this translation was to convey the message from the selected source scientific paper written in Croatian into the target paper in English. During this process, the translation analysis was carried out by taking account of the lexical, structural and textual features of the source text, and the strategies needed for transposing these features into the target text in English.

On the lexical level, this primarily included the translation of scientific and technical vocabulary, which was the most challenging and time-consuming part of the translation process. In many cases there were no reliable terminological resources from the field that would confirm the Croatian translation equivalents of the selected terms or collocations. Consequently, other available strategies needed to be employed, such as reading through other scientific papers from the same field written in English and checking the available corpora.

Further on, the syntactic structure of the target text was adjusted to the English syntax. This meant the reformulation of word order, which is much more structured in the English sentence. Moreover, it included the change from active to passive verb forms and the adjustment of the sentence length, since Croatian allows for longer sentences than English. Additionally, the transposition of the Croatian explicit relative clause into the English present or past participle with a relative function in the sentence was also applied.

On the textual level, cohesion was achieved by using connectors and conjuctions when starting a new logical unit, and these devices were translated directly. The direct translation was possible because both Croatian and English scientific texts need to be coherent, due to their explicative and explanatory nature. Another frequently used cohesive device is the repetition of scientific vocabulary, and it was also translated directly.

In addition, textual coherence was achieved through the formal and logical organization of the text into strictly set sections characteristic of and obligatory for scientific papers. These sections include the title, the abstract, the introduction, the materials and methods, the results and discussion, the acknowledgement and the references section, and were also followed in the target text.

Furthermore, special attention was given to the paralinguistic features, such as numbers, abbreviations and measurement units. However, these were translated automatically and left in the same form as the MateCat web-based computer-assisted translation (CAT) tool suggested

during the “raw“ translation phase. The only adjustments that needed to be carried out are the ones concerning the Latin abbreviations of allergenic proteins found in peanuts and tree nuts.

All things considered, it can be argued that translating scientific papers from Croatian into English is challenging in terms of finding adequate solutions for scientific and technical vocabulary of the particular research field. On the other hand, translating and adjusting the syntactic and textual features, although challenging, presents less of a problem, mainly due to the long tradition of scientific and technical translation in Croatia. In addition, there is a significant amount of resources available for examining the structure and syntax of the English language, particularly in academic and scientific writing, since English is the most represented language of international scientific communication.

It can be concluded that in order to further improve the quality of Croatian to English scientific and technical translation, and thus contribute to the overall visibility of Croatian science, the main future task for linguists, translators and scientists would be to continue with their collaboration in the area of scientific and technical terminology selection and standardization.

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List of tables

Appendix

Glossary

English	**word class**	**Croatian**	**word class**
alert	adj.	pripravan; na oprezu	adj.
alert	n.	upozorenje; uzbuna	n.
alert	v.	alarmirati; upozoriti	v.
alert about	ph. v.	upozoriti na	v. + prep.
allergen	n.	alergen	n.
allergenic	adj.	alergen	adj.
allergenicity	n.	alergenost	n.
allergic	adj.	alergičan	adj.
allergic disease	adj. + n.	alergijska bolest	adj. + n.
anaphylaxis	n.	anafilaksija	n.
antibody	n.	protutijelo; anititjelo	n.
antigen	n.	antigen	n.
cashew nut	adj. + n.	indijski oraščić	adj. + n.
chocolate with hazelnuts	n. + prep. + n.	čokolada s lješnjacima	n. + prep. + n.
cocoa parts	adj. + n. pl.	kakaovi dijelovi	adj. + n. pl.
coglutin	n.	koglutin	n.
coglutin-like protein	adj. + n.	koglutin-sličan protein	adj. + n.
confectionery shop	adj. + n.	slastičarnica	n.
diet	n.	način prehrane	n. ph.
food	n.	namirnice	n. pl.
food serving staff	adj. + n. pl.	poslužitelji hrane	n. + n.
foreign substance	adj. + n.	strana tvar	adj. + n.
frequency	n.	učestalost	n.
glycine	n.	glicinin	n.
glycine-like protein	adj. + n.	glicinin-sličan protein	adj. + n.
homology	n.	homologija	n.
hypersensitivity	n.	hipersenzitivnost; preosjetljivost	n.
IgE-binding epitopes	adj. + n. pl.	IgE-vezujući epitopi	adj. + n. pl.
immune response	adj. + n.	imunološki odgovor	adj. + n.
immunoglobulin E (IgE) antibodies mediated	n. ph. + adj.	posredovan imunoglobulin E (IgE) protutijelima	adj. + n. ph.
immunoglobulin E (IgE) antibody	n. ph.	imunoglobulin E (IgE) protutijelo	n. ph.
incidence	n.	pojavnost	n.
include	v.	uključivati; sadržavati	v.
indicated; declared	adj.	naveden	adj.
indication	n.	navod	n.
intolerance	n.	netolerancija	n.

English	word class	Croatian	word class
life-threatening	adj.	opasan po život	n. + prep. + n.
major peanut allergen	adj. + adj. + n.	glavni alergen kikirikija	adj. + n. + n.
micro-wells	n. pl.	mikrojažice	n. pl.
non pre-packed food	adj. + n.	nepretpakirana hrana	adj. + n.
nuts	n. pl.	orašasti plodovi	adj. + n. pl.
peanut allergens	adj. + n. pl.	alergeni kikirikija	n. pl. + n. pl.
peanut allergens content	adj. + n. + n.	udio alergena kikirikija	n. + n. pl. + n. pl.
peanut allergy	adj. + n.	alergija na kikiriki	n. + prep. + n.
peanut-induced anaphylaxis	adj. + n.	anafilaksija izazvana kikirikijem	n. + adj. + n.
peanut nut	adj. + n.	plod kikirikija	n. + n.
pre-packed food	adj. + n.	zapakirana hrana	adj. + n.
profilin	n.	profilin	n.
profilin-like protein	adj. + n.	profilin-sličan protein	adj. + n.
public catering facility	adj. + adj. + n.	objekt javne prehrane	n. + adj. + n.
resulting; incurred	adj.	nastali	adj.
retail chains	adj. + n. pl.	trgovački lanci	adj. + n. pl.
sensitisation; sensibilisation	n.	senzibilizacija	n.
severe reaction	adj. + n.	teška reakcija	adj. + n.
shellfish	n. pl.	školjkaši	n. pl.
students' cafeteria	adj. + n.	studentska kantina	adj. + n.
tree nuts; other nuts	adj. + n. pl.	drugi orašasti plodovi	adj. + adj. + n.
uniform application	adj. + n.	jedinstvena primjena	adj. + n.
viciline	n.	vicilin	n.
viciline-like protein	adj. + n.	vicilin-sličan protein	adj. + n.
wells	n. pl.	jažice	n. pl.