"Isn't it all unnatural anyway"? Labeling of flavorings and consumer understanding

Sarah Kühl, Anke Zühlsdorf, Achim Spiller

Abstract

Many consumers prefer natural ingredients or are skeptical about additives and flavorings. This is one of the key reasons why the EU has created a uniform legal framework for the use and labeling of flavorings in food with the current EU Flavoring Regulation (Regulation [EC] No 1334/2008). However, as yet there is no empirical data on whether consumers understand the various designations for different types of flavoring that are defined in the aforementioned regulation. Based on a consumer survey, this paper shows that a considerable proportion of consumers find it difficult to differentiate between the terms used to distinguish between different flavors. In particular, consumers are often unable to identify source material(s) used for the flavorings. Generally, consumers tend to think that the level of flavoring usage is high, even if this is not indicated by the designation. Alongside more intensive consumer education, intuitive understanding of flavoring labels could also be improved by the use of more self-explanatory terms.

Keywords: ingredient marketing, flavoring, consumer behavior, food labeling, transparency, clean labeling

Introduction

High-quality ingredients are an increasingly important part of food marketing and they have the potential to significantly influence consumers' perception of quality [1–3]. Companies advertise by highlighting their use of specially selected ingredients such as spices or above-average quantities of valuable raw materials such as berries. This is often associated with a label saying that certain additives or added flavors have been left out. After the frozen food producer Frosta underwent a comprehensive change in production processes and created a new label in 2003, this type of "clean labeling" became commonplace in food marketing [4, 5].

In general, consumers tend to prefer natural ingredients in food [6] and they tend to mistrust artificial additives [7, 8]. Furthermore, consumers more readily accept natural flavorings than "unnatural" ones obtained by chemical or synthetic means [9]. One example that illustrates just how relevant these consumer preferences are on the market was the legal dispute between *Alfred Ritter GmbH & Co KG* (a chocolate company) and *Stiftung Warentest* (a German consumer organization), which received a great deal of attention. In the discussion about the labeling of the flavoring piperonal in *Ritter Sport Voll-Nuss-Schokolade* (full-nut chocolate), the specific issue was whether the flavoring used was natural.

Despite the importance of this topic, aside from the studies on consumers' preferences for natural ingredients mentioned above, even on the international level, there is surprisingly little published research that deals in greater depth with flavorings from the consumer's point of view and, for example, analyzes differences in attitudes towards different flavoring categories. General studies on ingredients indicate that consumers know little about how flavorings are developed [10] and also in-

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Designation	Explanation
Flavoring	made artificially
Natural flavoring	made from a natural raw material, but not necessarily raspberries
Natural raspberry flavoring	at least 95% made of raspberries
Raspberry flavoring	made artificially, tastes like raspberry
Flavored	flavoring has been added

Tab. 1: **Categories for flavoring labeling in accordance with Regulation (EC) No 1334/2008, based on the example of a raspberry flavor**

dicate that ideas about how to interpret a reference to fruit flavor vary [11]. A meta-analysis of research on misleading advertising claims identified the risk of misleading claims that are factually correct but nevertheless cause consumers to draw false conclusions [12]. In addition, there are indications that the way additives are named (in this case, using E-numbers) can cause consumers to mistrust the product [13]. To our knowledge, there is only one qualitative study that deals explicitly with consumer understanding of flavoring labeling and this study is, however, more than ten years old [14]. Based on consumer surveys, this study showed that a relatively high proportion of consumers have difficulties understanding the various flavoring terms. Since this study was conducted, there have been significant changes to the legal framework—the EU Flavoring Regulation. With amendment[1], which came into force in 2011, the subdivision into "identical to natural" and "artificial" flavors that was commonly used previously has now been abolished.

According to the new regulation, if flavorings are used in the recipe of a foodstuff, they must be listed in the list of ingredients with the word "flavoring" or a more precise designation, such as "raspberry flavoring". Under the Flavoring Regulation, the term "natural" is optional and may only be used if the flavor is derived from a natural raw material (but not necessarily a foodstuff). It is not possible to draw conclusions about the source material from this information. If, in the case of a natural flavoring, the source material is explicitly mentioned (e.g. "natural raspberry flavoring"), at least 95% of the flavoring must come from the mentioned foodstuff (in this example, from raspberries). In practice, the term "flavored" is also used on labels to indicate the addition of flavorings. ◆ Table 1 provides an overview of the different term categories.

One of the explicit aims of the Regulation is to protect consumers against being misled as to the "nature, freshness and quality of the ingredients used, the naturalness of a product, the naturalness of the manufacturing process, or the nutritional quality of the product" (recitals, paragraph 7). However, the amendment to the EU Flavoring Regulation has been heavily criticized in the legal literature due to a lack of conceptual clarity [9, p. 185]. Furthermore, as yet there is no empirical data on whether consumers know and understand the legally defined designations for different flavoring types used in this Regulation (EC) No. 1334/2008[1].

Against this background, this paper examines consumer understanding of flavoring labeling as currently used in Europe. The aim is not to criticize flavorings, but rather to determine whether current labeling practice enables consumers to recognize the different product compositions available on the market and then buy them in accordance with their preferences. If the terms are too difficult to understand, consumers cannot make a rational and meaningful purchasing decision because they lack the required information [15]. In addition, a lack of understanding can lead to rejection of the product [10].

- From a consumer policy perspective, whether or not a flavoring designation can be understood is of high practical relevance in terms of ensuring that consumers are protected (as the Flavoring Regulation intends) against being misled.
- For companies, this topic is relevant from an economic point of view because there are significant cost differences between the use of natural ingredients and different flavor categories.
- In the consumer advice sphere, ingredients and flavors play an important role in discussions about the clarity of food labeling. The consumer platform *Lebensmittelklarheit.de*, for example, contains numerous reports on products in which consumers do not expect any flavorings to be present in the product based on the food packaging.

[1] Regulation (EC) No 1334/2008 of the European Parliament and of the Council of 16 December 2008 on flavourings and certain food ingredients with flavouring properties for use in and on foods and amending Council Regulation (EEC) No 1601/91, Regulations (EC) No 2232/96 and (EC) No 110/2008 and Directive 2000/13/EC (Text with EEA relevance). URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008R1334 Last accessed 19.7.2019

Characteristic	Sample	National average (Germany)
Men	47.8 %	49.3 %
Women	52.2 %	50.7 %
16–29 years	19.5 %	18.9 %
30–49 years	30.1 %	30.7 %
50 years and older	50.4 %	50.4 %
Net household income < €1,300	24.3 %	23.7 %
€1,300 up to < €2,600	39.0 %	38.5 %
€2,600 up to < €4,500	24.5 %	26.0 %
€4,500 and above	12.1 %	11.8 %
No school qualification (or none yet)	5.5 %	7.5 %
Lower secondary school *(Hauptschule)* leaving certificate	34.9 %	33.0 %
Intermediate-level school *(Realschule)* leaving certificate	28 %	29.6 %
Abitur/Fachhochschulreife (German school leaving certificates that allow access to university studies)	15.6 %	14.6 %
University qualification	16 %	15.3 %
1-person household	38.1 %	41.4 %
2-person household	36.0 %	34.2 %
3-person household	12.9 %	12.2 %
Household of 4 people or more	13.0 %	12.2 %
Northern region	16.8 %	16.2 %
Central region	35.7 %	35.4 %
Eastern region	20.1 %	19.6 %
Southern region	27.4 %	28.8 %

Tab. 2: **Description of sample** (calculation by authors [16])

Methodology

The present study was conducted as an online survey in June 2017, with 1,284 German consumers aged 16 and over being recruited using an established online access panel. A distribution that reflects the German demographic structure was achieved by setting quotas for age, gender, income, education, household size and region (◆ Table 2).

Understanding of flavoring labeling was investigated using several questions. First, the respondents were asked what they thought the following flavoring designations meant using an open question without specifying response categories, using a raspberry soft drink as an example:

- "with flavoring"
- "flavored"
- "with natural flavoring"
- "with raspberry flavor" and
- "with natural raspberry flavoring".

In order to make the survey as realistic as possible, a split sample design was used, with each study participant being randomized to answer about just one term. With regard to purchasing, claims were also generally considered on an individual basis rather than comparatively [17]. In addition, it was possible to rule out influencing effects through the use of prior evaluation of other terms as part of the split sample design.

In the next step, the respondents were asked to select appropriate answers from various provided statements on flavorings for another (different) flavoring designation. Subsequently, the subjects were shown the correct definitions according to food regulations for all of the aforementioned flavoring designations and were asked to assess how easy they are to understand.

The data from the open questions was evaluated using the MAXQDA software for qualitative data analysis. The method of inductive category development according to Mayring [18] was selected. Categories were formed based on the answers given and the answers were assigned to these categories by two independent persons. The categories were identical for all flavoring designations. The descriptive evaluation was carried out using the statistics program IBM SPSS Statistics 24.

The questions on understanding of labeling were preceded by a block of questions in which two product examples (pistachio yogurt and chicken risotto) were used to investigate the extent to which the presence of added flavoring influences expectations with regard to the ingredients of a foodstuff that impart the flavor. Five dummies were designed for each product based on real-world examples, and these differed from each other only with regard to the flavoring label. All other design elements were kept the same. The taste of the products was reflected both in the names of the products and in the design of the labels (◆ Figure 1 shows an example of the dummies for pistachio yogurt). The manufacturer-neutral examples were based on products from the online platform *Lebensmittelklarheit.de* that were reported by consumers who found their labeling deceptive.

The respondents were shown a random selection of packaging variants (lists of ingredients were not shown). They were then asked to state their expectations about the origins of the product taste based on five statements (or four if there was no flavoring indicated) (five-point Likert scale). They were then asked to estimate the percentage by weight of pistachios (or chicken in the case of chicken risotto) used.

Fig. 1: **Product dummies that were presented using pistachio yogurt as an example**
(Split: each respondent was only asked about one variant)
[authors' own illustration]

The evaluation was done using IBM SPSS Statistics 24. In addition to descriptive evaluations, single-factor variance analyses (ANOVAs) were performed and supplemented with post-hoc tests to determine significant differences in perceptions of the product variants with different flavoring labels for the pistachio yogurt and the chicken risotto (significance level = 0.05). In order to simplify the interpretation of the results, percentages were chosen as the method to present the level of agreement with the statements, although the variance analyses refer to a comparison of the mean values. For the average estimated proportions, outliers (data over 50%) were excluded from the calculation in order to avoid excessive distortion of the results.

Results

Consumer understanding of labeling with regard to flavorings

◆ Table 3 shows the categorized response frequencies for the open question about the meaning of common flavoring labels using the example of a raspberry soft drink. The overall picture was very uniform. For all flavoring labels, the dominant expectation was that no raspberries or only very few raspberries were used as ingredients in the drink. Only for the designation "with natural flavoring" do less than 20% of respondents fall into this response category. It is also interesting to note that the response to the label "with natural raspberry flavoring" was very polarized. Many consumers (24.6%) assume that the product contains no raspberries (or almost no raspberries), but at the same time, 10% expect real raspberries. In addition, the respondents hardly see any

Category (expectations of the flavoring contained)	flavored (n = 397)	with flavoring (n = 439)	with raspberry flavoring (n = 421)	with natural flavoring (n = 420)	with natural raspberry flavoring (n = 475)
contains no (or hardly any) raspberries	23.7%	27.8%	30%	18.1%	24.6%
artificial flavoring/ taste	15.6%	16.6%	15%	11.2%	8%
taste comes mainly from the flavoring	9.3%	7.7%	6.2%	3.1%	5.5%
natural flavor	1.5%	0.9%	1.2%	7.4%	4.6%
contains real raspberries	0.5%	2.3%	2.9%	4.8%	10%

Tab. 3: **Categories and response frequency in response to the open question about expectations of different flavoring types as a percentage**
Data as a percentage of the mentions per flavoring designation (n), missing percentages in the columns required to reach 100% = "Miscellaneous"

Statement	flavored (n = 221)	with flavoring (n = 250)	with raspberry flavoring (n = 261)	with natural flavoring (n = 281)	with natural raspberry flavoring (n = 271)
The flavoring is made artificially.	73.3%	74.0%	68.2%	35.6%	43.5%
The flavoring was made from a natural raw material, but not from raspberries.	20.8%	21.6%	26.1%	45.2%	39.5%
The flavoring was at least 95% made of raspberries.	1.8%	3.6%	3.4%	13.9%	9.2%
Flavoring was added to the drink.	76.0%	71.2%	76.2%	70.5%	73.4%
The drink tastes like raspberry.	56.1%	51.6%	59.8%	66.9%	64.6%
The raspberry taste of the drink comes from the flavoring only.	60.2%	62.0%	65.1%	53.4%	58.7%
Based on the designation, you cannot tell what the flavoring was made from.	61.1%	64.0%	57.1%	56.6%	60.1%
I don't know exactly what the flavoring label means.	7.7%	7.6%	7.7%	6.8%	9.2%

Tab. 4: **Response frequency of the statements selected as applicable for different flavoring designations**
Data as a percentage of the mentions per flavoring designation (n); multiple responses possible

difference between the labels "with natural flavoring" and "with natural raspberry flavoring". The respondents tended to associate the label "with natural flavoring" with a natural origin more than the label "with natural raspberry flavoring".
In the next stage, the respondents were asked to choose the correct response categories from a selection of provided definitions for a flavoring label.[2] The result was a large number of incorrect categorizations for all flavoring labels (◆ Table 4). It was also noted that there was a great deal of mistrust among the respondents with regard to the transparency of flavoring labels. Between 57% and 61% of the respondents assume that none of the flavoring label types they were asked about indicate what the flavoring was made from. With regard to the "natural flavoring" and "natural raspberry flavoring" labels, a significant proportion of the respondents (35.6% and 43.5% respectively) expected that even the flavorings that were explicitly declared as "natural" would be produced artificially. Similar to the results of the open question, they are most likely to assume a flavoring made from raspberries will be called a "natural flavoring" (13.9%). The correct designation "natural raspberry flavoring" was perceived as accurate by only a few respondents (9.2%).

However, when the meaning of the flavoring labels was explained in terms of how they are used in the relevant legislation regarding foodstuffs, the majority of respondents categorized the flavoring labels as comprehensible (◆ Table 5).

Consumer expectations with regard to quantity and use of flavorings when various types of flavoring labels are used

The next step was to check which ingredient expectations were associated with the various flavoring designations with the help of two realistic product illustrations used as examples (pistachio yogurt and chicken risotto instant meal).

First of all, it is clear that the majority of respondents assume that flavorings have been added even if no indication of the addition of a flavoring has been given (◆ Figure 1, variant E). Three quarters of the respondents (76%) suspect that there will be added flavorings in a yogurt on which no indication of flavorings is shown (◆ Figure 2). 70% assume that the taste of this yogurt was mainly achieved through flavorings, and significantly less (43%) expect that the taste mainly comes from pistachios. The proportion of those who assume that flavorings have been added rises significantly to 90% and 89% respectively for yogurt packaging with the labels "with flavoring" and "flavored" respectively. With these label variants, it is clearly assumed that the taste is only derived from the flavoring and not by processing real pistachios (◆ Figure 2).
There are no significant differences between the label variants "with natural flavoring" and "with natural pistachio flavoring". However, the variant "with natural pistachio flavoring" tends to be perceived as less natural than the variant "with natural flavoring". This confirms the results shown above: consumers either do not differentiate between these two

[2] Randomization using a split sample design, but with a different flavoring label than the one used in the open question.

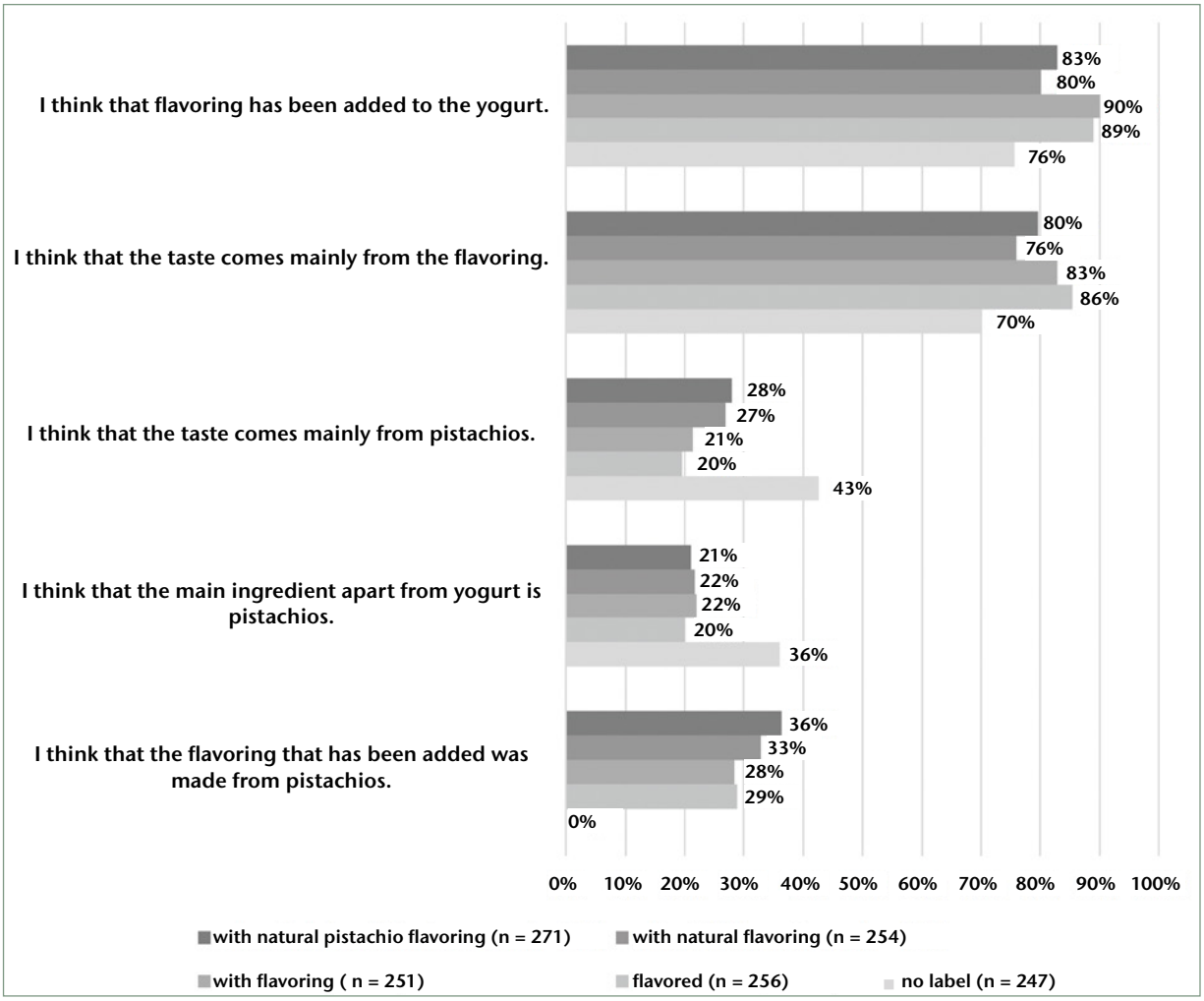

Fig. 2: **Percentage of respondents who responded to the provided answers to the question: *"What do you think when you look at this packaging?" (Figure 1)* with "Yes, definitely", or "Yes, I would say so"**
n total = 1,284; five-stage Likert scale from "No, definitely not" to "Yes, definitely"; top box responses: "Yes, I would say so" and "Yes, definitely"

labels or they have an incorrect understanding of the difference between them.

Finally, in this block, the respondents were asked what exact proportion of pistachios they expected in each yogurt. Without reference to flavorings, the average value is 8.4% pistachios in the yogurt. Consumers expect an average of 6.4% pistachio content for the "with natural pistachio flavoring" labeling variant and 6.8% for the "with natural flavoring" variant. In the case of yogurt with the "flavored" label, the figure is 8%, and the figure is 7.9% for the variant "with flavoring". The picture is very similar for the chicken risotto instant meal so only an overview is provided here. Again, the variant "with natural flavoring" is evaluated as more natural than the variant "with natural chicken flavoring". Conversely, it can again be seen that the label "with flavoring" makes consumers more likely to think that the taste comes mainly from an added flavoring and is less likely to be derived from the ingredients advertised. Overall, however, the differences are once again small, and in some cases they are not significant. When the respondents were asked to estimate the expected quantity of chicken meat, the range of responses was very broad, ranging from 0% to 50% chicken content in the risotto. On average, the expected quantities of chicken were between 10.3% (for "with natural chicken flavoring") and 12.3% (for "with natural flavoring"). The respective designations of the different flavorings did not have a great influence on the expectations with regard to quantity, nor did the presence of a flavoring label. The designation "with natural flavoring" tended to be regarded as the most demanding variant.

The explanation is	completely incompre-hensible.	not easy to understand.	I am not sure.	comprehen-sible.	very easy to understand.
flavoring – means: made artificially.	5.5%	12.8%	16.9%	32.3%	32.4%
natural flavoring – means: made of a natural raw material, but not necessarily raspberries.	9.3%	18.2%	24.0%	28.1%	20.3%
natural raspberry flavoring – means: at least 95% made of raspberries.	7.7%	12.1%	22.8%	29.0%	28.4%
raspberry flavoring – means: made artificially, tastes like raspberry.	7.4%	12.7%	16.8%	33.4%	29.8%
flavored – means: flavoring has been added.	3.8%	7.8%	14.9%	36.3%	37.2%

Tab. 5: **Evaluation of comprehensibility of flavoring labels after explanation**
Data as a percentage of the mentions (n)

Discussion

The study results show that a considerable proportion of consumers find it difficult to differentiate between the terms used in the EU Flavoring Regulation to distinguish between different flavors. In particular, consumers are often unable to identify the source material(s) used for the flavorings. Through the use of multiple questions, both open and closed, it was possible to clearly demonstrate that there is a high risk of consumers being misled by this part of the EU Flavoring Regulation.

The respondents tended to associate the label "with natural flavoring" with a natural origin more than the label "with natural raspberry flavoring". Consumers consider the first designation to be the strongest indication of the how much actual raspberries the product contains, meaning that they misinterpret the legally defined terms to a large extent. This is particularly worth taking into account when we consider the clear preference for natural ingredients among consumers [6–8]. The closed questions confirmed that it was difficult for consumers to differentiate between the different flavoring designations. When the meaning of the flavoring labels was explained in terms of how they are used in the relevant legislation regarding foodstuffs, the majority of respondents categorized the flavoring labels as comprehensible (◆ Table 4). Clearly, consumers are able to understand how the flavoring labeling system works when given an explanation, but without assistance, they have great difficulty grasping the meaning of the individual flavoring labels. Therefore, the conceptual system that the legislator has used is comprehensible in principle, but it is not intuitive for consumers.

Overall, the results show that a front-of-pack flavoring label influences expectations of the product, but the effect is much less strong than might have been expected and sometimes leads the consumer in the wrong direction. Consumers' basic attitude towards flavoring labels is skepticism. There is confusion particularly between the legally defined categories "with natural flavoring" and "with natural XY flavoring". The latter category of flavoring, for which 95% of the flavoring must come from the raw material (e. g. the fruit), is usually much more expensive to produce than natural flavorings that can be synthesized from other natural substances. However, the results of the study show that consumers are unable to consistently make their purchasing decisions based on their preferences, which can lead to incorrect decisions or the decision not to purchase [15]. There are very few incentives for manufacturers to use higher quality flavorings.

It is clear that even if no indication is given that flavorings have been added, consumers still expect that they will have been. This highlights the level of mistrust among consumers [14]. For manufacturers who do not use any flavorings at all, this means that without a "clean label" (such as one saying "no added flavorings"), the majority of consumers will expect that flavors are added to the product and will expect that these flavorings are responsible for the taste. Current labeling practice for flavoring additives therefore leads to consumer expectations that are lower than reality.

Furthermore, labels indicating flavoring additives hardly have any effect on consumer expectations regarding how much of the advertised ingredients the product contains. This highlights the widespread uncertainty regarding the meaning of the various flavoring designations. At the same time, the expected proportions are significantly higher than those of the actual product compositions.

Conclusion

The results show that without support, consumers' knowledge of the meaning of the different flavoring designations is low. If the terms are explained as part of the question, this increases the level of comprehension. However, such explanations are not currently provided on the market. Alongside more intensive consumer education, intuitive understanding of flavoring labels could also be improved by the use of more self-explanatory terms. The overhaul of the flavoring terms that was carried out in the 2008 amendment was not successful. In fact, the amendment may even have made the comprehensibility of the product labels worse in its attempts to improve it. In light of consumer uncertainty about food labeling (e.g. [7, 19, 20]), which has already been demonstrated in many studies, in future, the legislator should make greater efforts to proactively check the comprehensibility of labels. This would make the work of nutrition counselors and companies easier and could also reduce consumer skepticism about ingredients [10].

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Conflict of Interest
The authors declare no conflict of interest.

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