

Market analysis of potentially cardio-protective foods in context of legal health and nutrition claims

Focus: meat, dairy and egg products

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Abstract

As there has been an increase in nutrition-associated cardiovascular diseases in Germany, the present article considers the extent to which the German retail food market was penetrated in 2016 by healthier meat, dairy and egg products. Furthermore, a market potential analysis was performed based on mean domestic expenditure for these foods in families with cardiovascular patients or hypertension. Market penetration by foods of healthier composition is relatively low, corresponding to 1.9% for meat products and 1.6% for dairy and egg products. This is in stark contrast to the potential market share of 2.5–38%, with an annual sales volume of 1.5–15.4 billion €, depending on the assumptions or scenario – either a defensive scenario for cardiovascular patients or a more offensive scenario for hypertensives. Although the decisive factors in preventing cardiovascular disease are adherence to a healthy diet based on vegetables, fruit and fiber – as well as a healthy lifestyle –, reformulated foods can help patients to improve their nutrition. The following article shows that the market potential for such foods is far from exhausted.

Keywords: cardiovascular diseases, meat and sausage products, dairy and egg products, market analysis, nutriCARD

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Introduction

Cardiovascular diseases are still much the most important causes of death in Germany. According to the 2015 mortality statistics, 356,600 deaths (39%) were due to cardiovascular diseases [1]. According to the International Study on Disease Burden, 44% of these were associated with nutrition [2]. Thus, healthier (cardiovascular) nutrition could have avoided about 157,000 premature deaths in 2015.

Causes, costs and prevention of cardiovascular diseases

There are many different causes of cardiovascular diseases (CVD) and these may be subdivided into variable factors (e.g. nutrition, tobacco consumption, lack of exercise) and fixed factors (age, gender, genetic predisposition) [3]. Most CVD are related to the magnitude of variable risk factors. The main risk factors are imbalanced nutrition and high blood pressure [4]. Although there was a continuous decrease in premature deaths from nutrition-associated CVD in Germany between 1990 and 2010 (from 213,000 to 145,000), the value rose again to 157,000 by 2015. This is explained by the following risk factors (in

order of decreasing importance): (i) inadequate consumption of vegetables and nuts, (ii) excessive consumption of salt, (iii) inadequate consumption of fruit, n-3 fatty acids and wholegrain cereals, and (iv) excessive consumption of sausage products [2]. On the basis of representative data from the study on health in Germany (DEGS1), it was calculated that approximately 24 million people aged 18–80 suffer from high blood pressure [5].

CVD also takes a leading position with respect to high treatment costs. In all, 14.5% of direct disease costs are caused by CVD [6, 7]. This corresponds to a sum of approximately 37 billion € per year, and is increasing [6]. In 2008, just the excessive consumption of salt, sugar and saturated fats led to direct costs for the treatment of CVD of 7.7 billion € (5.1 billion from salt, 2.2 billion € from sugar and 0.4 billion € from the excessive consumption of saturated fats) [8].

There is inherent potential to improve nutritional habits, yet this can only be exploited if there are commercially available products that permit a cardioprotective nutrition. However, there have been virtually no scientific studies on the availability of cardioprotective foods – either for Germany or for the rest of Europe. This particularly applies to surveys which consider the actual fraction of products in food retailers that contain explicit information on approved health-related components or nutritional values. One of the few studies on the occurrence of health claims in food retail in various European countries was performed by HIEKE et al. [9]. The study of KAUR et al. [10] presented results for Great Britain. On the basis of these results, the fol-

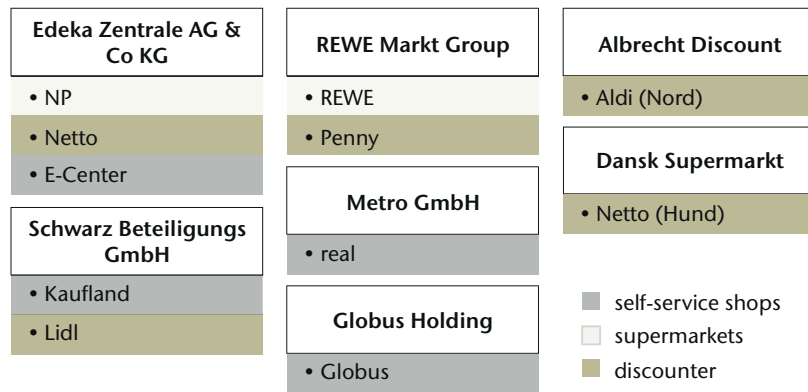


Fig. 1: Overview of the food retailers examined in this study (including parent company and market type)

lowing questions are addressed in this study:

I. How great is market penetration by cardioprotective foods in German food retailers (focus on meat, dairy and egg products; ♦ Table 1)?

II. How great is the proportion of foods that contain health-associated or nutritional value-associated information on a favorable effect on the cardiovascular system (health or nutrition claims)?

III. How great is the financial market for cardioprotective foods in Germany?

The study was performed in the context of the Competence Cluster for Nutrition and Cardiovascular Health (nutriCARD) Halle-Jena-Leipzig, in order to support the successful market launch of cardioprotective foods.

Methods

Study scope

The present study focusses on meat products (meat and sausage products), as well as dairy and egg products with potentially cardioprotective

ingredients, as novel product developments within the competence cluster nutriCARD concentrate on these food groups. Moreover, these food groups were selected – rather than vegetables, pulses, fruit, or wholegrain products – as they contain problematical ingredients (saturated fatty acids, salt, sugar, etc.), which can raise the cardiovascular risk.

Reformulation can replace these ingredients with cardioprotective ingredients (n-3 fatty acids, fiber, plant protein, etc.), but without impairing the sensory quality of the products. Another reason for the focus of this study is that – according to the 2013 Nutrition Report of the German Nutrition Society (DGE; $N_{men} = 6,160$, $N_{women} = 7,593$), consumption of “meat and sausage products” (men: 81 g/day, women 42 g/day), “dairy products” (men: 90 g/day, women: 98 g/day), eggs (men: 12 g/day, women 10 g/day) and butter (men: 14 g/day, women 8 g/day) are the principle elements of daily nutrition in Germany. This is the reason that fat ingestion corresponds to 35.5% of energy (E%) in

Potentially cardioprotective meat products	Potentially cardioprotective dairy and egg products
All meat and sausage products (including meat substitutes) which include a health and/or nutrition claim associated with cardiovascular protection and/or ingredients with potential cardioprotective activity	All dairy and egg products (including substitute products) which include a health and/or nutrition claim associated with cardiovascular protection and/or ingredients with potential cardioprotective activity

Tab. 1: Systematization of the ranges in the retail survey

Potentially cardioprotective ingredients or nutrients		Reference
fiber	beta-glucans	EFSA [30–33]
	chitosan	EFSA [34]
	pectin	EFSA [35]
	glucomannan	EFSA [36]
	guar gum	EFSA [37]
	hydroxypropylmethylcellulose	EFSA [38]
	components containing fiber on the basis of	
oat	EFSA [31]	
barley	EFSA [32, 33]	
B-vitamins	vitamin B ₁ (thiamine)	EFSA [39]
	vitamin B ₂ (riboflavine)	EFSA [40]
	vitamin B ₆ (pyridoxine)	EFSA [41]
	vitamin B ₉ (folic acid)	EFSA [42]
	vitamin B ₁₂ (cobalamin)	EFSA [43]
pulses		FDA [44], FDA [45]
minerals	potassium	EFSA [46]
	magnesium	EFSA [47]
salt (NaCl) (reduction)		EFSA [48]
n-3 fatty acids and oils containing n-3 fatty acids	alpha-linolenic acid	EFSA [49, 48]
	icosapentaenoic acid	EFSA [50–52]
	docosahexaenoic acid	EFSA [50–53]
	rapeseed oil	EFSA [54]
phytosterols, phytosterol esters, phytostanols and phytostanol esters		EFSA [55–57]
walnuts		EFSA [58]
other nuts		FDA [45]

Tab. 2: **Cardioprotective ingredients and/or nutrients considered in the market analysis**
 EFSA = European Food Safety Authority; FDA = Food and Drug Administration

men and 34.1 E% in women (medians). According to the Nutrition Report, the ingestion of saturated fatty acids (SFA) in 2006 corresponded to 15 E% in men and women, of mono-unsaturated fatty acids (MUFA) to 11–12 E% and of polyunsaturated fatty acids (PUFA) to only 4.8 E% [11]. If these nutritional habits are continued over the long term, this can contribute to increases in body weight, in blood pressure and in blood fats.

In order to determine the extent of the availability of cardioprotective products in the food segments covered in this study, a comprehensive on-site survey was carried out in 11 food retailers in the city Halle/Saale (Germany) (♦ Figure 1) over a period of 2 weeks (09.–23.05.2016). Health food shops, wholefood shops, reform houses, etc. were not included.

The classification of the cardioprotective products covered in this study is based on an ex-ante systematization in accordance with the following food categories (♦ Table 1).

Potentially cardioprotective foods are defined as products that support a healthy heart or the health of the cardiovascular system. In this study, they are defined as all foods that have been demonstrated to contribute to the prevention of CVD due to the ingredients in their list of ingredients and/or a corresponding nutrition and/or health claim. At this, the study was orientated towards the authorized nutrition and health claims of Art. 13(1) and Art. 14(1)(a) [12–15] of the Health Claims Regulation, which suggest that the following substances are of relevance for cardioprotective health: fiber, B vitamins, potassium,

magnesium, sodium chloride (reduction), n-3 fatty acids, oils containing n-3 fatty acids, plant sterols, and walnuts. The approved health claims of the American Food and Drug Administration (FDA) for legumes (peas and beans) and other nuts (besides walnuts) were also considered when these were relevant in terms of cardiovascular health.

♦ Table 2 gives an overview of the ingredients and nutrients considered. ♦ Table 4 (online supplement) lists additional information, including health claim, conditions of use, health relationship, etc. (→ www.ernaehrungs-umschau.de). The identified claims were not checked in terms of food law and current jurisdiction.

In the fieldwork phase, the relevant products were identified in the markets, counted and assigned to food categories. It was also recorded whether the product packaging not only gives the list of ingredients, but also nutrition and health claims in accordance with the Health Claims Regulation (EU No. 1924/2006), when these assign a positive cardiovascular effect to the ingredients of the product [12–15]. The identified products were compared to the total number of products in the corresponding range, in order to calculate market penetration.

Model to estimate the market volume of cardioprotective foods

To quantify the market potential, a linear model was developed to calculate the financial market volume for cardioprotective meat products, as well as dairy and egg products. The model set-up can be summarized in four steps which are analogous to the following questions.

1. For which sections of the German population are cardioprotective foods of relevance?

The section of the population rele-

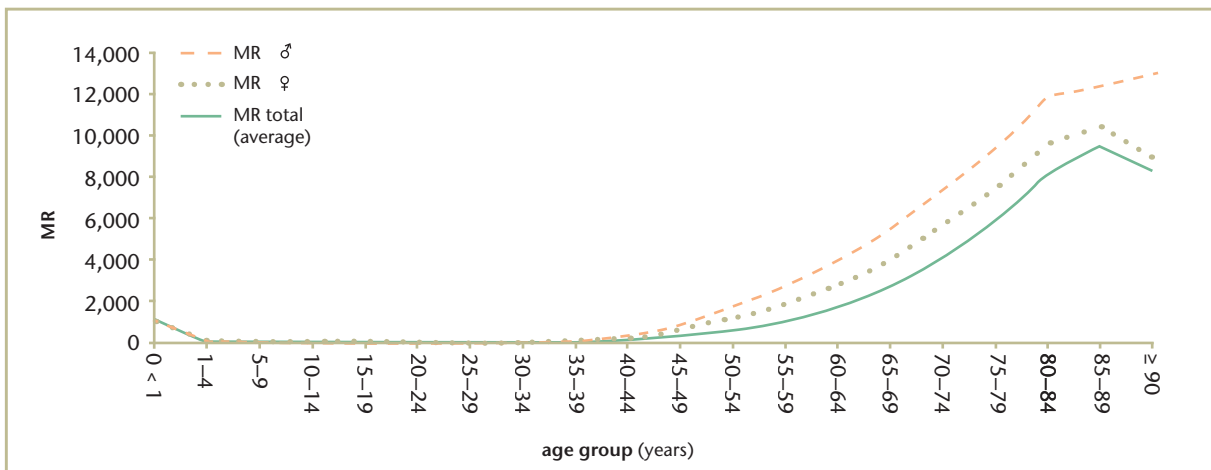


Fig. 2: Inpatient morbidity rate^a (full inpatients per 100,000 inhabitants) for CVD in Germany in 2013 by age group (own calculation and depiction [16])

^a The analyses of the morbidity rates refer to: ischemic heart disease (coronary heart disease), heart valve diseases, cardiac arrhythmias, heart failure and congenital malformations of the circulatory system
 CVD = cardiovascular disease; MR = morbidity rate

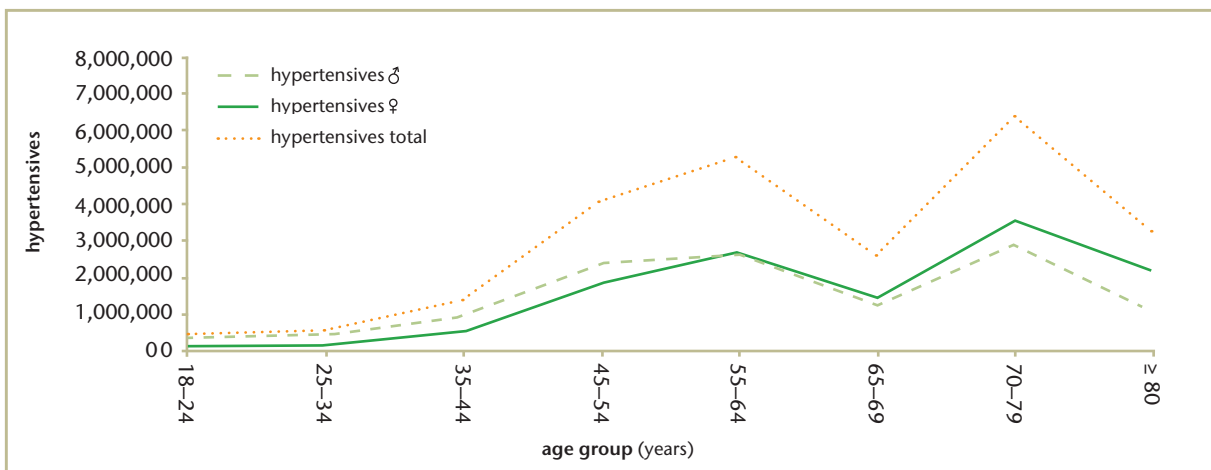


Fig. 3: Number of hypertensives (adult) in Germany by age group (own calculation and depiction [16])

vant to the consumption of more cardioprotective foods was calculated from the inpatient morbidity rate (MR)¹ for CVD and the hypertension statistics for 2013. Because of the quantitative differences between the two values, this implies either a defensive scenario (CVD-MR, ♦ Figure 2) or an offensive scenario (hypertensives, ♦ Figure 3). In analogy to the procedure in the German Heart Report, the calculation was based on the following ICD-10 codes: ischemic heart diseases (I20–25), chronic rheumatic heart diseases (I05–09), other heart diseases (I34–39, I44–50), and

congenital malformations of the circulatory system (Q20–28) [16].

2. What is the available income of the relevant section of the population?

The available income is determined on the basis of the last income and consumer sample (ICS; *Einkommens- und Verbrauchsstichprobe* [EVS]) of the Federal Statistical Office for 2013. This uses the statistics for the expenditure of private households on food, drinks and tobacco products and also includes the income data for different age groups in a

household [17]. As different people can live in a household, the ICS assigns the age category in accordance with the age of the principle source of income. In a household of several people, an individual (aged at least 18) counts as the principle source of income when he or she contributes the greatest sum to the net income of

¹ The inpatient or stationary MR is a parameter to measure the demands on hospitals and gives the number of full in-patients per 100,000 inhabitants.

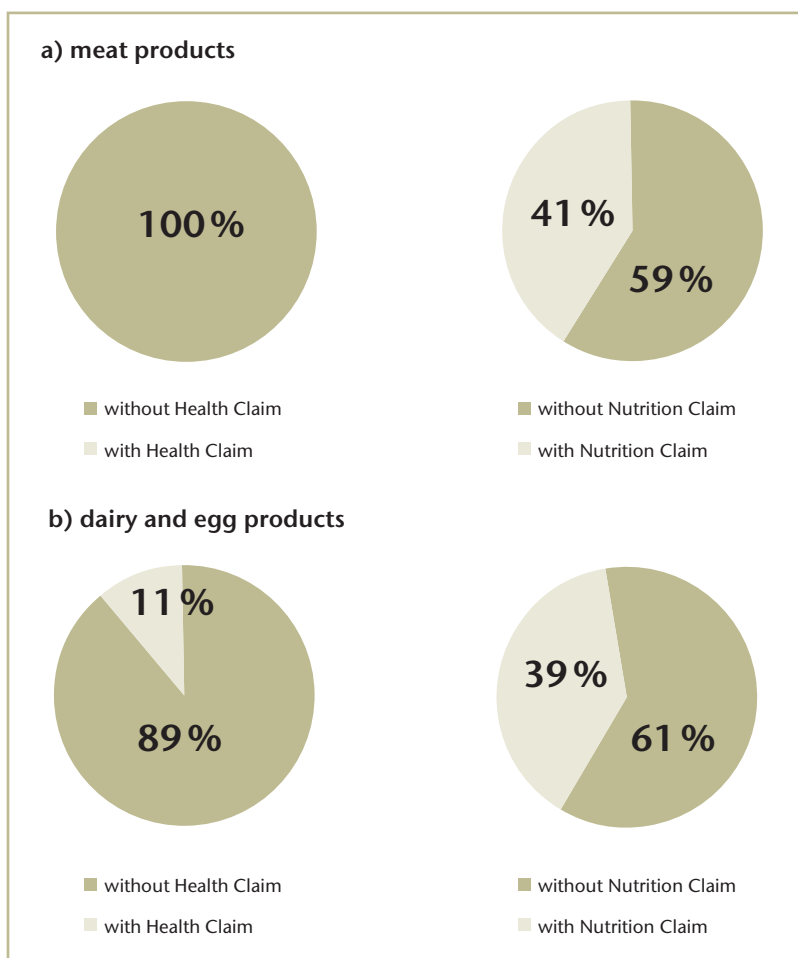


Fig. 4: Fraction of health-related (Health Claim^a) and nutrition-related information (Nutrition Claim^a) in potentially cardioprotective meat products (a) and dairy and egg products (b) in food retailing

^a Nos. 432 (Health Claims) and 1924 (Nutrition Claims) of the EU Regulation

the household. In this step, the number of individuals suffering from CVD or hypertension is calculated for each household and then the available income estimated. It was necessary to use ICS data, as the patient statistics used [5, 16] do not provide any information on the patient's statistics or their domestic income.

3. What mean fraction of their income does the relevant section of the population spend on food?

Calculation of the food expenses was also based on the ICS database. The procedure was also analogous to that used to determine the available income. The calculation of the avail-

able funds was based on expenses for the private consumption of food and alcohol-free beverages in 2013.

4. How much on average does the relevant section of the population spend on foods within the categories examined?

In the last step, all information was combined and used to calculate the market volume for cardioprotective foods. For this purpose, the fractional consumption of the available income was calculated that was spent by individuals in Germany with cardiovascular disease (CVD-MR) or hypertension on meat, and dairy and egg products.

Results

Cardioprotective meat products in retail

For all the retailers taken together, a total of 6,281 meat products were counted (including double counts). In accordance with the above classification, 118 of these were classified as potentially cardioprotective (including double counts). Without double counts, 83 items were identified. However, the calculation of the total market penetration must include double counts in different retailers. Market penetration was then calculated as 1.9%, with major fluctuations between the retailers (from 0–5.7%).

Ingredients and manufacturers

Evaluation of the potentially cardioprotective ingredients showed that rapeseed oil was found in 58% of products, peas and beans (pulses) and proteins derived from pulses in 51% and n-3 fatty acids (not classified more closely) in 7% of the products. Information on product manufacturers was also evaluated for the survey. The range of potentially cardioprotective meat products was headed by Rügenwalder Mühle (Carl Müller GmbH and Co. KG), which contributed a total of 14% to the identified product range. Second was Vefo GmbH with 12%, followed by Tivall Europe B.V. with 11%.

Health and nutrition claims

None of the products classified as potentially cardioprotective bore an approved health-related claim (health claim). In contrast, a total of 41% meat products (34 of 83) bore a nutrition claim (♦ Figure 4a).

Cardioprotective dairy and egg products in retail

Within the range of dairy and egg products, a total of 12,417 products were counted in all the food retailers (including double counts). 198 of these products were classified as po-

	meat products	dairy and egg products
total expenditures for the whole of Germany (all households: 39.3 million)	23.6 billion €	17.5 billion €
market potential of cardioprotective foods:		
defensive estimation scenario (based on 950,000 households with CVD patients)	600.5 Mio. €	444.4 Mio. €
offensive estimation scenario (based on 13.4 million hypertension households)	8.9 billion €	6.5 billion €
potential market share of cardioprotective foods (observed market share)	2.5–37.7 % (0–5.7 %)	2.5–37.1 % (0.6–2.7 %)

Tab. 3: **Potential market for cardioprotective meat, dairy and egg products in Germany in food retail in 2013**
 CVD = cardiovascular diseases

tentially cardioprotective (without double counts 106), giving a mean market penetration of 1.6% for all food retailers (range: 0.6–5.7%).

Ingredients and manufacturers

As regards to the ingredients of the potentially cardioprotective foods, it was found that 41% of the products contain B vitamins and 40% n-3 fatty acids. The third place was occupied by pulses which were given on 26% of the product packages. A total of 17% of the identified articles were manufactured by the firm WhiteWave Foods. The second place was taken by the company Friesland Campina Cheese GmbH with 8.5% and the third place by Alnatura Produktions- und Handels GmbH with 7.5% of the articles found.

Health and nutrition claims

Health-related information in accordance with the positive list of Art. 13(1) and Art. 14(1)(a) of the Health Claims Regulation was found for 11% (12 of 106) of the dairy and egg products classified as cardioprotective (Health Claim). 39% of these products (41 of 106) exhibited nutrition-related information (nutrition claim) (♦ Figure 4b).

Market estimate I (defensive scenario: CVD-MR)

In 2013, there were approximately

1.6 million people in Germany who suffered from CVD in accordance with the morbidity rate. This corresponds to approximately 951,000 households which spent a mean of 270 € per month on food and non-alcoholic beverages. Thus, the potential monetary expenditure for food and non-alcoholic beverages is ca. 3.1 billion € for the section of the population who suffer from CVD.

Estimate of the monetary expenditure for meat products

A total of 19.5% of the expenditure for food and non-alcoholic beverages was used for the consumption of meat products. Relative to the calculated potential expenditure for food and non-alcoholic beverages, this gives a value of 600,535 € for the total expenditure on cardioprotective meat products, or a monthly expenditure of 52.62 € per household with CVD patients (♦ Table 3),

Estimate of the monetary expenditure for dairy and egg products

In households with CVD patients, 14.4% of the expenditure on foods and non-alcoholic beverages was employed for consumption of dairy and egg products. Thus, relative to the total expenditure, 444,396 € (or 38.94 € per household) could have been used for the consumption of cardioprotective dairy and egg products (♦ Table 3).

Market estimate II (offensive scenario: hypertensives)

In 2013, the number of adult hypertensives was approximately 24 million, corresponding to approximately 13.4 million hypertension households, each of which spent a mean of 283 € per month on food and non-alcoholic beverages. Thus, for the section of the population suffering from hypertension, the potential monthly expenditure for food and non-alcoholic beverages is approximately 45.5 billion €.

Estimate of the monetary expenditure on meat products

In hypertension households, 19.5% of the expenditure for foods and non-alcoholic beverages is used for the consumption of meat products. Relative to the calculated monetary expenditure for food and non-alcoholic beverages, this gives an annual expenditure for cardioprotective meat products of approximately 8.85 billion €, or a monthly expenditure of 55.10 € per hypertension household (♦ Table 3).

Estimate of the monetary expenditure on dairy and egg products

In hypertension households, 14.4% of the expenditure for foods and non-alcoholic beverages is used for the consumption of dairy and egg products. Relative to the calculated monetary expenditure for food and non-alcoholic beverages, this corresponds to a market potential of approximately 6.5 billion € per year for cardioprotective dairy and egg products. This means that 40.77 € per month is potentially available to each hypertension household (♦ Table 3).

Discussion

The present study is the first survey of the market penetration of potentially cardioprotective meat, dairy and egg products in Germany (region: Halle/Saale) for 2016. In ad-

dition, a market analysis was performed to determine the potential sales of these foods. There was a vast discrepancy between the actual market penetration of the range (0–5.7%) and the potential market share of these ranges of products (depending on the scenario of estimation 2.5–38%), so that cardioprotective foods clearly possess great potential.

As product listings in retail and ultimately purchasing decisions are influenced by a series of factors, it may be asked which specific individual measures might most efficiently increase the demand, sales and consumption of cardioprotective foods. Various relevant enhancing and inhibitory factors have been discussed at the marketing and regulatory levels (tax increases or decreases, agreement on mandatory targets, certification systems, etc.). However, it would be beyond the scope of the present article to submit these to a systematic evaluation (cf. [18–20]). At the end of 2016, the Federal Ministry of Food and Agriculture formulated the following very promising objective, “in collaboration with the food industry and science, to take specific steps, particularly to reduce the contents of salts, saturated fats and sugar [in food]” [21].

However, the regulatory environment tends to make it difficult for manufacturers to be innovative, as it now takes a great deal of time and money to extend the existing positive list in accordance with the Health Claims Regulation by new claims, or to qualify the manufacturer’s own products with health or nutrition claims [22]. As BRANDENBURGER and BIRNINGER [23] show, this is particularly the case for small and middle-sized companies. Moreover, there is scientific dispute about the extent to which explicit health claims can enhance sales [24–28]. From the aspect of public consumer and health protection, current regulations of the European Food Safety Authority (EFSA) do not go

far enough in allowing consumers to implement expedient consumption of food that is better for cardiovascular health. It thus remains to be seen to what extent the current regulations on health and nutrition claims can be developed further in the coming years.

Limitations

The reliability of the present study is limited, as the calculation of the market penetration was solely based on a cross-section of food retailers in the city Halle/Saale during a two-week period in 2016. Moreover, it was restricted to meat, and dairy and egg products. Other groups of food with high potential cardioprotective activity (vegetables, fruits, wholegrain products, etc.) were mentioned in the introduction, but were not further considered in the study.

In addition, the calculation of the market potential was based on assumptions which were essential to the quantification of the monetary market volume. Firstly, this estimate is based on the assumption that all members of the identified households with CVD patients or hypertensives exhibited the corresponding clinical pictures. A more precise, member specific assessment is not feasible, as the ICS collates data solely on household level. Secondly, it had to be assumed that all identified households covered their supplies of meat, dairy and egg products through food retailers to the same extent. We did not consider possible purchases of cardioprotective foods in external markets (through wholesalers) or through direct marketing.

We also failed to consider cost and price effects (readiness to pay higher prices or price elasticity, added costs from reformulation or labelling, etc.), which should be considered in the development of new products. However, a consumer acceptance

study performed within the competence cluster nutriCARD has shown that – depending on socioeconomic factors – consumers are prepared to pay about 20% higher prices for cardioprotective products (acceptance of higher prices: sausage products: 19–22%, egg products: 21–24% [29]).

Conclusion

As diet-associated CVD are gradually rising, the supply of cardioprotective foods in food retailers should be gradually increased. The currently marginal market penetration of these foods should be regarded as an opportunity to extend product reformulation, product diversification and to address new consumer groups. In parallel, these measures should be embedded in tailor-made communication strategies to inform customers about the pros/cons of cardioprotective foods in context of a balanced nutrition.

Support

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Conflict of Interest

The authors declare no conflict of interest.

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 49. EFSA (2009) Scientific opinion [...] related to alpha linolenic acid and maintenance of normal blood cholesterol concentrations (ID 493) and maintenance of normal blood pressure (ID 625) pursuant to Article 13 (1) of Regulation (EC) No 1924/2006. EFSA Journal 7: 1252
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