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Allergens weaning: what is missing from commercial baby food?

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Key words

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Impact statement

This study highlights the scarcity of major food allergens in commercial baby foods and their frequent ultra-processing, emphasizing the need for healthier, allergen-inclusive products to support food allergy prevention.

Summary

Background. *Current recommendations for infant weaning suggest introducing common food allergens by the age of 12 months. While homemade meals are advisable, there is a notable demand for commercially available complementary foods (CACF). Furthermore, emerging evidence suggests a potential link between the consumption of ultra-processed products and the incidence of allergic diseases. This study aimed to examine the presence of the fourteen main food allergens in CACF ingredients through label analysis and evaluate their extent of processing.* ***Methods.*** *Between January and February 2024, labels of all CACF found in infant feeding sections of 10 Portuguese grocery retailers were analyzed. CACF were categorized based on the NOVA food classification system's processing levels. Milk formulas, products for children over 15 months, and those for children with food allergies or intolerances were excluded.* ***Results.*** *Of the 492 products analyzed, 132 contained wheat and 112 contained milk. 16 products included fish and 6 contained eggs. Soy was listed as an ingredient in 11 products, mainly as soy lecithin. Only 2 products contained nuts, and 1 product contained peanuts. None of the products contained the remaining six allergens. The majority of milk- and wheat-containing products were classified as ultra-processed and contained added sugars and/or sweeteners.* ***Conclusions.*** *Despite the current guidelines, commercial baby foods often lack major allergens, namely nuts and peanuts, eggs, and shellfish. Our results underscore the need for healthy, age-appropriate, minimally processed products that incorporate rather than exclude major food allergens.*

Introduction

The introduction of allergenic foods during complementary feeding has been a topic of significant research interest in the context of preventing food allergy in infants. Studies have indicated that the early introduction of allergenic foods, such as peanut and egg, during the complementary feeding period may reduce the risk of developing food allergies, even in infants at high risk of food allergy (1, 2). This approach represents a shift from previous recommendations of food allergen avoidance to the promotion of deliberate and regular dietary intake of these allergens during the introduction of complementary feeding (3).

Although it is advisable for parents to introduce home-prepared meals (4, 5), there is a strong consumer demand for commercially available complementary foods (CACFs), and the choice in supermarkets is vast and driven for many reasons, such as convenience, portability and food safety (6). Accordingly, although scientific evidence on infant consumption trends is still scarce, a study conducted on a cohort of infants and children from sev-

eral European countries demonstrated that the majority consume CACFs during the first two years of life (7).
The main objective of this study was to evaluate the presence of the eight main allergens (cow's milk, egg, wheat, soy, peanut, nut, fish and shellfish) as an ingredient in CACFs through the analysis of their labelling.

Materials and methods

From January to February 2024, a cross-sectional study of product labels within sections intended for infant feeding, encompassing both physical and digital retail platforms, was conducted across ten Portuguese grocery retailers/companies and infant food manufacturers. The CACFs were categorized into five distinct classes: snacks, meals, fruit pots and pouches, porridges, and yoghurt/veggie-based yoghurt pouches. Milk formulas were excluded, as well as products intended for children older than 15 months and for children with food intolerances or allergies. Ingredient lists were assessed for the presence of the fourteen substances or products causing allergies or intolerances, according to Reg EU nº 1169/2011 (cow's milk, soy, egg, wheat, peanut, tree nuts, fish, shellfish, sesame, lupine, mustard, celery, and sulfites). The content of sugar, sweeteners and additives was also analyzed, and food products were classified by degree of processing based on the groups defined by the NOVA food classification system (8).

Results

We have identified 492 CACFs for infants aged less than 15 months. Among these products, 41.5% (n = 204) were fruit pots and pouches, 20.3% (n = 100) were porridges, 13.8% (n = 68) were categorized as finger food snacks, 13.2% (n = 65) as prepared meals, and 11.2% (n = 55) as yoghurt/vegetable-based yoghurt pouches.

Food allergen presence

The food category that presented the highest presence of allergens was yoghurt/veggie-based yoghurt pouches (87%) followed by porridges (86%) whereas fruit pots and pouches was the category with the lowest presence of food allergens.
Concerning food allergen presence, the most common food allergens in CACFs were wheat, reported in 132 CACFs (26.8%), and cow's milk, reported in 121 (24.6%). Soy was identified as an ingredient in 11 products (2.2%); however, in the majority of them (10 products), it was in the form of soy lecithin for emulsifying properties. Fish was reported as an ingredient only in 16 products (3.3%), and in 3 of these was in the form of fish oil. Egg was found in 6 CACFs (1.2%), nuts in 2 (0.4%), and peanuts in only one product (0.2%). None of the products contained shellfish, sesame, lupine, mustard, celery, and sulfites.
Allergens were described and highlighted in accordance with current regulations, mostly with the whole food name, even if they were non-natural ingredients for which more terminology was required, such as hydrolyzed wheat or soy lecithin.
In this study, 168 (34.1%) CACFs had allergens listed in the first three ingredients of their labels. For all CACFs, these allergens were wheat and/or cow's milk, except for those containing fish. None of the products listed the specific percentage of milk, wheat, soy, fish, egg, nut or peanut protein present, not enabling an estimation of the quantity in grams of food allergen present per serve.

Precautionary allergen labelling

Precautionary allergen labelling, which is voluntary and not standardized following the legislation issued by the European Union (Reg EU nº 1169/2011), was found in 17.7% of products (n = 87). The most frequently reported allergen in labelling warnings was soy (n = 60), followed by milk (n = 48) and nuts (n = 23).

Sugar content and degree of processing of the CACFs containing major food allergens

The analysis also included an assessment of added sugar, free sugars, and artificial sweeteners content in CACFs. Among products containing cow's milk and wheat, 86.8% (n = 105) and 72.0% (n = 95), respectively, were found to contain sugars and/or sweeteners. All soy lecithin-containing products also contained sugars and/or sweeteners, and similarly, the three fish products containing fish oil were found to be sweetened. Regarding products containing eggs, half of them also contained sugar/sweeteners. No products with nuts and peanuts contain sugar or sweeteners.
Food products were also classified by degree of processing, based on the groups defined by the NOVA food classification system (8). The NOVA system classifies all foods and food products into four groups, according to the nature, extent, and purpose of industrial food processing applied. Group 4 corresponds to ultra-processed foods (UPF), defined as formulations of ingredients (as oils, fats, sugars, starch, protein isolates), primarily designed for industrial applications, that are submitted to various sequences of industrial processes, often necessitating high-tech equipment. These processes include the fractioning of whole foods, use of techniques such as extrusion, molding and pre-frying, and the use of additives at various stages of manufacture (9). In this sample, 253 of the total CACF were classified as UPF, 76 as processed food (PF), and 163 as minimum processed food (MPF). The CACF class with the most products classified as UPF were fruit pots and pouches (99 products), followed by porridges (n = 81) and yoghurt/veggie-based yoghurt pouches (n = 30). The results also showed that most products containing milk (n = 110; 90.9%) and wheat (n = 97; 73.5%) were UPF. 2 of the 6 egg-containing products were also UPF.

Discussion and conclusions

The results of our study reveal that CACFs in Portugal have a generally low presence of major food allergens, not reflecting the

current infant feeding and allergy prevention guidelines that the prioritize inclusion of food allergens in order to foster oral tolerance and diminish the likelihood of food allergy development.
The latest Portuguese national recommendations for complementary feeding date from 2019 (10), and despite advising that the introduction of potentially allergenic foods not be delayed, they are still silent regarding the imperative of introducing these allergens in terms of allergy prevention. Notably absent from these guidelines is explicit guidance on introducing tree nuts, peanuts and shellfish, potentially influencing both household attitudes and product development by the food industry, notwithstanding the broader context provided by international guidelines.
Few studies exist on the prevalence of food allergies in Portugal. Two studies in pediatric age reported a prevalence of food allergies of 1% in children and adolescents (11, 12), and for adults, the reported prevalence was between 1% and 4% (13, 14). However, considering the study period or the studies' geographical specificity, the results may not be fully representative.
Nevertheless, data from these studies (11-14) show that most foods implicated in allergic reactions are included in the so-called "big eight allergens". Likewise, the Portuguese Anaphylaxis Registry reported that food is the leading cause of anaphylaxis in the pediatric population, with cow's milk, tree nuts, shellfish, egg, fresh fruits, fish, and peanut being the main elicitors (15). These data reinforce the importance of concerted strategies regarding food allergy prevention, particularly for major food allergens.
Different studies in different countries have focused on nutritional analysis of CACF (16-19), however there is a paucity of works that address the allergen content of weaning foods. In this context, our results are in line with previous results reported in Australia (20) and United Kingdom (21), where low availability of CACF with food allergens is also reported. Although the legal, commercial and epidemiological contexts differ between Portugal and these two countries, the results taken together highlight the need for greater effort in developing and accepting CACF with allergens for infants.
We found that in addition to the low allergen content of CACF, those that contain them are mostly UPF and contain sugar and/or sweeteners, making them not nutritionally compliant to be widely recommended. Recommendations for complementary feeding have been consistent in recommending not to introduce/limit sugars and sweeteners (22). For UPF, emerging evidence suggests that the consumption of ultra-processed products could be positively associated with the occurrence of food allergic diseases and may affect allergy prevention, possible mainly due to the presence of advanced glycation end products (AGEs) (23, 24), emulsifiers (25) and changes in gut microbiome composition (26).
Apart from the limited presence of allergen-containing products and their nutritional quality, it is crucial to highlight that the recommended age ranges specified by manufacturers may also not align with allergen weaning guidelines. For instance, despite the recommendation to introduce nuts and peanuts from 6 months onwards (3, 22), the available products are marketed for children aged over 9 and 12 months, respectively. This point also deserves some reflection, considering consumption trends in Portugal, which reflect a growing presence of nuts in the population's diet (27), and the fact that peanuts are one of the allergens associated with anaphylactic reactions (15).
Our study has limitations such as the fact that we analyzed a small number of products that can be introduced into children's diets, despite having analyzed practically all of those that are marketed to them. Despite these limitations, our study allows us to characterize the national supply in terms of CACFS considering its use for the allergens weaning. It is also, to our knowledge, the first work that specifically relates the content of allergenic ingredients with the content of added sugar and sweeteners and the degree of processing.
Our results reinforce the need for more significant investment in developing healthy, age-adapted, minimally processed products that include, rather than avoid, major food allergens. At the same time, continual public health messaging strategies are essential for effectively encouraging caregivers to safely introduce major food allergens into home-prepared meals and also nationally adapted, scientific and practical guidance that meets the potential for preventing allergic disease.

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Contributions

RBS: conceptualization, methodology, formal analysis, investigation, writing – original draft. AM, BP: conceptualization, methodology, formal analysis, investigation. IP: conceptualization, methodology, writing – review & editing, visualization, supervision.

Conflict of interests

The authors declare that they have no conflict of interests.

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