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MAPPING OF FOODS WITH WHEY PROTEIN BY PATENTAL DOCUMENTS

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ABSTRACT

The proteins contained in whey have a wide nutritional application and present bioactive and functional well-defined characteristics. Its wide use in the food market provided specific benefits in food and nutrition area. The objective of this study was to map the foods containing the whey protein at the National Institute of Industrial Property (INPI) and Espacenet®. This search resulted in a total of 46 patent documents in Espacenet® base. Documents with more than 20 years were excluded, therefore only the documents from 1995 to 2015 were used, totaling 26 documents. It was found that in Brazil there is a high consumption pattern of proteins, but there is little development of technological products and patents related to proteins, mainly due to lack of fiscal and scientific incentives by the government.

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INTRODUCTION

Whey is considered a by-product of the cheese manufacture by milk coagulation, casein or similar products (Codex Alimentarius, 2003) since 1970 and now is considered a food of high nutritional importance due to its bioactive and functional properties which deserves attention in the food industry due to its variety of use (Pacheco, 2005). Proteins contained in whey have high biological value, due to the presence of essential and non-essential aminoacids, they are

rich in branched-chain aminoacids (valine, isoleucine and leucine) and rich in cysteine, precursor of glutathione peroxidase. These characteristics promote a positive nitrogen balance, a rapid gastric emptying and an excellent antioxidant activity, respectively (Cruzat, 2014). The consumption of whey proteins in concentrated or isolated forms has been suggested in the treatment of infectious diseases, in the nutritional monitoring of HIV virus carriers, in co-morbidities reduction caused by chronic non-transmissible diseases (Sgarbieri, 2004). In addition, there are several chemically

defined nutritional formulas, that are marketed, using whey protein in its composition in order to maintain intestinal integrity, a higher rate of gastric emptying that may benefit children with gastro-esophageal reflux and in allergies such as atopic dermatitis (Botteman, 2015). A large use of products containing whey protein in specific areas such as physical activity, aimed at improving the performance of athletes due to exhaustive training and nutritional supplements administration (Almeida, 2014). Several studies also relate the consumption of this protein with well-defined physiological and metabolic activities in clinical practice, reinforcing its immunomodulatory action by the increased immunoglobulin production and improved immune response, as well as cardiovascular protection and anticancer action (Almeida, 2014; Zarogoulidis, 2015). Based on the above, this article aimed to map foods that use whey protein in their compositions through patent documents. The use of this methodology can provide important information for the strategic planning, aiding in the decision making. In addition, it can contribute to a better understanding of its use and the dangers of overconsumption by the population.

MATERIALS AND METHODS

In order to perform the mapping on foods containing whey protein, the databases of the National Institute of Industrial Property (INPI) and Espacenet® were used to search for patent documents.

"The search was conducted in June 2015, using the keywords "whey protein" and "food" in the title and summary. Data processing was performed with the help of the Microsoft Excel program (Version 2010). For the quantitative analysis of the patents, the repeated documents were initially eliminated, and then the analysis was performed using the following criteria: date of publication, depository institutions of the patent documents and their nationalities. In order to discriminate the technological trends that were most exploited by the patent documents found, the International Patent Classification (IPC) was used, which is a hierarchical system represented by letters and numbers, responsible for grouping the patents according to their respective technical areas. All IPC classes of each patent were quantified.

RESULTS AND DISCUSSION

The search for patents related to foods containing whey protein resulted in a total of 46 patent documents on the Espacenet® base. Patents older than 20 years were excluded, therefore, only the documents from 1995 to 2015 were used, totaling 26. The data obtained were treated according to defined criteria, and can be visualized in the figures below. The time evolution analysis of deposited patent documents related to whey protein foods revealed that there is an increase in the number of deposits from 2004, showing peaks in the years 2006 and 2009 (Figure 1). The temporal evolution began in 1980 and became more expressive recently.

Table 1. Categories of the International Patent Classification (IPC) to which the patent documents related foods contain whey protein

IPC	NAME	No of Patents
A23C21/08	Dairy products, for example: milk, butter, cheese, milk or cheese substitutes; production of these (obtaining protein compositions for food products; preparation of proteins in general) / Whey; Preparations based on whey (containing other organic additives, for example: products of animal or vegetable origin)	4
A23C21/06	Dairy products, for example: milk, butter, cheese, milk or cheese substitutes; production of these (obtaining protein compositions for food products; preparation of proteins in general) / Whey; Preparations based on whey (Mixtures of whey with milk products or components)	1
A23C11/04	Dairy products, for example: milk, butter, cheese, milk or cheese substitutes; production of these (obtaining protein compositions for food products; preparation of proteins in general) / Milk substitutes, for example: coffee whitening compositions (cheese substitutes for butter, milk replacer substitutes) / containing fats other than milk, but protein other than milk	1
A23C9/152	Dairy products, for example: milk, butter, cheese, milk or cheese substitutes; production of these (obtaining protein compositions for food products; preparation of proteins in general) / Dairy products; Processes specially adapted thereto / containing additives (fermented milk preparations containing additives)	2
A23C9/15	Dairy preparations; Milk powder or milk powder preparations: preservation; milk chocolate; ice cream, mixtures for the preparation of ice creams; puddings, dry powder puddings, containing additives. Recombinant or recombined milk products not containing fats other than milk or protein other than milk (containing thickening substances, mixtures of whey, milk products or milk components)	1
A23C9/20	Dairy preparations; Milk powder or milk powder preparations: preservation; milk chocolate; ice cream, mixtures for the preparation of ice creams; puddings, dry powder puddings, containing additives. / Dietetic dairy products, not	1
A23C19/068	Cheese; Cheese-based preparations; Preparation of the same (cheese substitutes, casein) / Particular types of cheeses	1
A23C19/082	Cheese; Cheese-based preparations; Preparation of the same / Addition of substances to the rennet before or during the melting; Melting salts	1
A21D13/08	Treatment, for example: preservation, of flour or pasta, for example: by the addition of substances; cooking; bakery products; preservation of the products / Bakery products, finished or semi-finished / Pastry, for example: cakes, biscuits, clad pasta (covering of icing or crystallized sugar or mixtures thereof).	1
A21D13/06	Treatment, eg preservation, of flour or pasta, for example: by the addition of substances; cooking; bakery products; preservation of the products / Finished or semi-finished bakery products / breads in which the starch or protein content has been modified	1
A23J1/20	Protein-based compositions for food products; preparation of proteins for food products; phosphatide compositions for food products / Obtaining of protein-based compositions for food products; Opening eggs in bulk and separating egg yolks / egg whites / from milk, for example: casein (curds or cheeses); from buttermilk	3
A23J3/08	Protein-based compositions for food products; preparation of proteins for food products; phosphatide compositions for food products/ Preparation of proteins for food products / Dairy proteins	4
A23L1/305	Food, food or non-alcoholic beverages not covered by subclasses 23 B to 23 J; preparation or treatment, for example: cooking, modification of nutritional qualities, physical treatment (modeling or processing not fully covered by this subclass at 23 P) / Food or foodstuffs; their preparation or treatment / Amino acids, peptides or proteins (protein processing for food products)	3
A23L1/29	Food, food or non-alcoholic beverages not covered by subclasses 23 B to 23 J; preparation or treatment, for example: cooking, modification of nutritional qualities, physical treatment (modeling or processing not fully covered by this subclass at 23 P) / Food or foodstuffs; its preparation or treatment / modifications in the nutritional qualities of foods; Dietetic products (dietetic substitutes 1/22 salt, enriched flour, milk-based preparations)	2

Correa and Navarro⁸ stated that from the year 2000 there was a significant increase in the use of food supplements with clinical and aesthetic objectives. The strong appeal of the media and the functional benefits of these supplements quickly popularized these products, including whey protein. This assertion coincides with the increase in patent documents from the year 2002 shown in Figure 1.

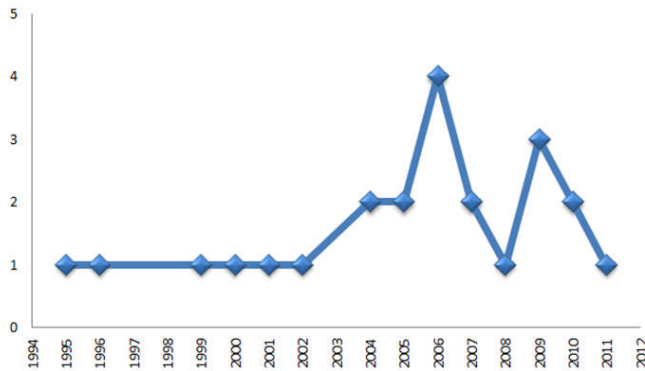


Figure 1. Time evolution of patent documents containing “whey protein” and “food”. Fortaleza, 2015

When analyzing the nationality of the depository institutions of the patent documents, it was observed that some countries stand out, such as: Japan, the United States and Germany, being responsible respectively for 31%, 19% and 12% of the protections related to foods containing whey protein as we can see in Figure 2, where we observe the percentage of patents deposited by each country. There are also contributions from China (8%), South Korea (8%), New Zealand (8%), and other countries.

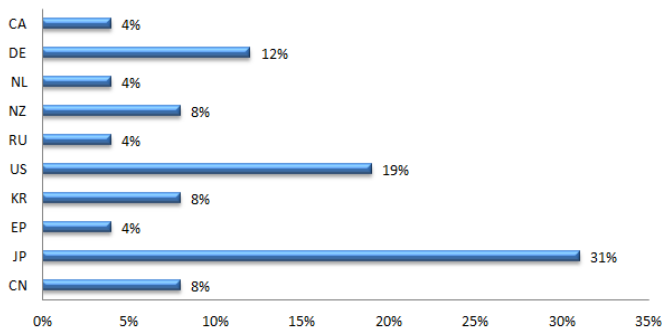


Figure 2. Nationality of depository institutions of patent documents related to “whey protein” and “food”. Fortaleza, 2015

In general, the socio-political context of each country interferes directly in the international scenario of technological performance. Cruz⁹ points out that Japan has been notable for imitating or increasing innovations in patents already determined. This fact, according to the author, can be evidenced in all scientific areas. When analyzing the International Patent Classification (IPC), it is observed that the classes with the largest number of patents belong to the areas of human needs and food products. Table 1 shows the 14 most frequent classes. Among the 26 patent documents found, 4 belong to the class A23C21/08, which includes dairy products, for example: milk, butter, cheese, milk or cheese substitutes; production of these (obtaining protein compositions for food products; preparation of proteins in general)/Whey; preparations based on whey (containing other organic additives, such as, products of animal or vegetable origin); and 4 belong to class A23J3/08, protein-based compositions for

food products; preparation of proteins for food products; phosphatide compositions for food products/protein preparation for dairy foodstuffs/ proteins.

Conclusion

It was found that Japan, followed by the United States and Germany stand out on patent filings for foods containing whey protein. These researched regions contribute directly to the knowledge and dissemination of products with this functional ingredient. Despite the large-scale consumption of this product in Brazil, the Brazilian patent deposit is still tiny. This fact characterizes the low investment in technologies that exploit the potential of whey protein in the country in contrast to the production and the high consumption of milks and derivatives that we evidenced in the most diverse regions of the country. Considered a high biological value and low commercial cost, whey protein appears in the food industry as a food with a great growth potential. This study demonstrates the current scale of use of whey protein in several categories of classification as: dietary substitutes for salt, enriched flour, baking products, mixtures for ice cream preparation, particular types of cheeses, among others. Such information serves as a basis for further research exploring the potential of this ingredient. The prospects of evolution in related areas related to its use allow to broaden its functional characteristics in order to provide a health demand. Unfortunately, in relation to the number of patents deposited in recent years, Brazil does not present an expressive number. Therefore, it is worth mentioning the possibility of further studies and national investments that will enable Brazil to be prominent in the use of this ingredient, in addition to the conscious consumption of whey protein by the population.

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