

# AHFES

## A QUADRUPLE HELIX ATLANTIC AREA HEALTHY FOOD ECOSYSTEM FOR GROWTH OF SMES

### Nutrition for Aging and chronic diseases Report

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## Content

1	Introduction.....	6
2	Specific group nutrition.....	8
2.1	Protein .....	9
2.2	Iron .....	9
2.3	Salt .....	9
2.4	Calcium.....	9
2.5	B vitamins .....	10
2.6	D vitamin.....	10
3	Nutragenetics .....	11
4	Conclusion.....	13

## Figures

Figure 1.	Population between 2000 and 2050 <sup>1</sup> .....	6
Figure 2.	Prevalence of chronic diseases <sup>2</sup> .....	6
Figure 3.	Nutritional approaches .....	7
Figure 4.	Product development critical phases <sup>4</sup> .....	8
Figure 5.	Nutritional genomics in food chain <sup>7</sup> .....	11
Figure 6.	Factors influencing personalised nutrition <sup>8</sup> .....	12

## Tables

**Não foi encontrada nenhuma entrada do índice de ilustrações.**

## Abbreviations and Acronyms

Abbreviations were not used.

## Executive summary

With the forecast of population growth over the age of 60 and with the economic and health implications, it is necessary to create strategies to prevent the development of chronic diseases. As adults age, they are at risk for “nutritional frailty,” which can compromise the ability to meet nutritional needs. This report gives the perspective that the basis for the population's health is nutrition and its importance in all stages of life. In this way, the industry must soon consider increasingly involving science, mainly nutrigenomics, so that they can develop innovative products in the area of fortified and functional foods.

# 1 Introduction

With technological advances in health, the demographic age of the world population has been changing. According to the World Health Organization, between 2000 and 2050, the proportion of the population over 60 will increase from 11% to 22% (figure 1)<sup>1</sup>.

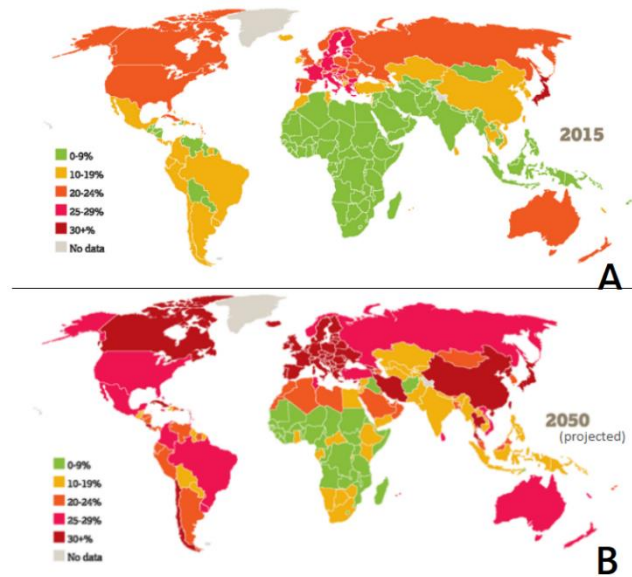


Figure 1. Population between 2000 and 2050<sup>1</sup>

This increase may represent a challenge for society soon because it was observed that there is a greater prevalence of chronic diseases with advancing age (figure 2). Thus, there will be a growing need for health care for chronic diseases in the most fragile part of the population (the elderly people)<sup>2</sup>.

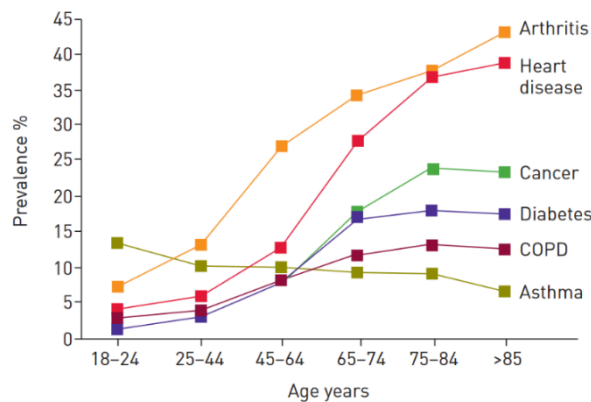


Figure 2. Prevalence of chronic diseases<sup>2</sup>

<sup>1</sup><https://www.who.int/news/item/30-09-2015-who-number-of-people-over-60-years-set-to-double-by-2050-major-societal-changes-required>

<sup>2</sup> Kennedy, B. K., Berger, S. L., Brunet, A., Campisi, J., Cuervo, A. M., Epel, E. S., Franceschi, C., Lithgow, G. J., Morimoto, R. I., Pessin, J. E., Rando, T. A., Richardson, A., Schadt, E. E., Wyss-Coray, T.; Sierra, F. (2014). Geroscience: Linking aging to chronic disease. In Cell (Vol. 159, Issue 4, pp. 709–713). Cell Press.

According to the literature, the biological processes of ageing are the main risk factors for many chronic diseases that affect us with advancing age. This process is characterized by progressive tissue degeneration, which harms the structure and function of vital organs.

Ageing and chronic diseases are different concepts, but they are interconnected, and we cannot study and try to mitigate them alone. In other words, if, on the one hand, it is essential to know and deepen our knowledge regarding the processes and mechanisms related to ageing, it is also crucial to analyse the factors that are directly related to the onset of chronic diseases. With this line of thinking, we are more likely to stay healthy longer<sup>3</sup>.

Based on the literature, three ways to approach this future problem will be addressed (figure 3), all of which have the same principle: nutrition.

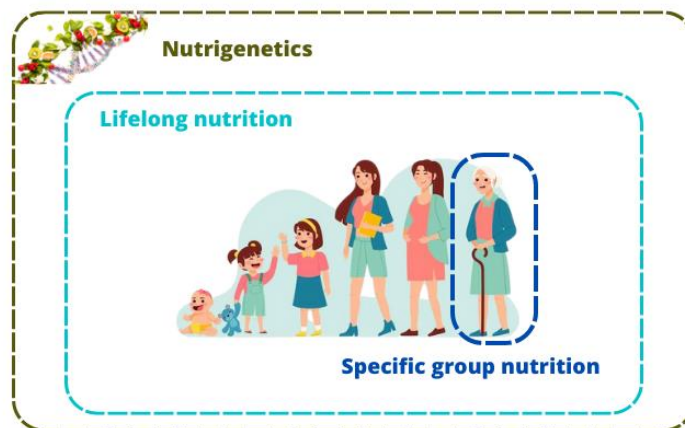


Figure 3. Nutritional approaches

<sup>3</sup> Marsman, D., Belsky, D. W., Gregori, D., Johnson, M. A., Low Dog, T., Meydani, S., Pigat, S., Sadana, R., Shao, A.,; Griffiths, J. C. (2018). Healthy ageing: The natural consequences of good nutrition—A conference report. *European Journal of Nutrition*(S2), S15–S34.

## 2 Specific group nutrition

Throughout life, the body changes, especially the way our body absorbs nutrients. From the age of 70, our organism is not the same as when we are children or adults. On the other hand, for this age group, it is essential to consider not only the nutritional aspects but also the textural and sensory characteristics of food products.

Thus, for the food industry, it is necessary to understand the nutritional needs of the elderly and the additional problems that come with age. It is essential to know the textural and sensory aspects of products and consider what happens to food and nutrients during oral processing and gastrointestinal digestion (figure 4)<sup>4</sup>.

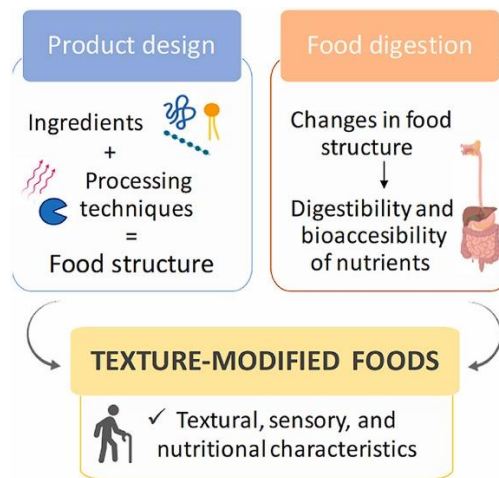


Figure 4. Product development critical phases<sup>4</sup>

Next, the aspects to be considered regarding the nutritional composition of foods for this age group will be identified. It is essential that, in general, the nutritional status of the population of the respective age group is analysed before any product development or product application on the market. In addition, it is crucial that after developing the product fortified with specific nutrients, the whole process in the body is studied so that it can be verified whether there is an increase in this nutritional element in the body that allows for improving the health of the individual<sup>5</sup>.

<sup>4</sup> Kaur, D., Rasane, P., Singh, J., Kaur, S., Kumar, V., Mahato, D. K., Dey, A., Dhawan, K., ; Kumar, S. (2019). Nutritional Interventions for Elderly and Considerations for the Development of Geriatric Foods. *Current Aging Science*,(1), 15–27.

<sup>5</sup> Kiefte-De Jong, J. C., Mathers, J. C.,; Franco, O. H. (2014). Nutrition and healthy ageing: The key ingredients. *Proceedings of the Nutrition Society*,(2), 249–259.



## 2.1 Protein

Protein is a crucial nutrient for stimulating muscle protein synthesis. In the case of the elderly, if the intake of this element is too low, it can lead to muscle loss and osteoporosis.

Protein intake facilitates increased lean muscle mass, increased strength and bone density. On the other hand, the balance of the protein content in an older person's body is crucial because an imbalance can cause a decrease in the efficiency of digestion, absorption and utilization of dietary proteins.

Foods: meat, fish, eggs, dairy products, almonds, lentils and peanuts

## 2.2 Iron

Iron is one of the crucial nutrients for the normal functioning of the body and our immune system. This element is vital throughout our lives, as it helps transport oxygen to cells and influences immunity and muscle function. If a person suffers from iron deficiency, lethargy and weakness (symptoms of anaemia) may occur.

Foods: meat, fish, beans, dried fruits, grains and cereals.

## 2.3 Salt

Salt is the primary source of sodium in our diet. On the one hand, sodium is necessary for the body's health, but at the same time, excessive consumption can lead to an increase in blood pressure (a risk factor for stroke and heart disease).

One of the factors that cause an increase in salt consumption in this age group is the decrease in taste. In this way, it becomes necessary for the food industry to replace salt with aromatic herbs, spices, and even foods that give flavour to meals.

## 2.4 Calcium

Calcium is associated with healthy bones, yet this element can regulate muscle contractions and ensure that blood clotting normalizes.

This nutrient is crucial for combating the onset of osteoporosis (a health condition that weakens bones over time).

Foods: dairy foods, green leafy vegetables, bread and fish.

## 2.5 B vitamins

B vitamins have essential bodily functions, such as contributing to healthy red blood cells, releasing energy from the foods we eat, normal nerve function and vision, healthy skin, and reducing tiredness. There are various sources of B vitamins in the diet: Folate, vitamin B6 and B12.

Foods:

- folate/folic acid: Some green vegetables, fortified grains and grain products
- vitamin B6: Fortified cereals, peanuts, pork, poultry, fish, milk and vegetables
- vitamin B12: Animal products (such as fish, meat, eggs, or dairy), fortified breakfast cereals and other fortified foods such as soya drink

## 2.6 D vitamin

Sufficient vitamin D can help keep bones, teeth and muscles healthy. Most of the time, people can receive enough vitamin D from sunlight outdoors. However, with increasing age, sometimes motor functions do not allow people to have opportunities to get enough sun to balance the amount of vitamin D in the body.

Foods: oily fish, red meat, liver and egg yolks.

### 3 Nutrigenetics

Several studies show that the "one size fits all" approach is no longer part of a healthy future and needs to change. Because not all individuals share the same dietary risks, and there is heterogeneity in the nutritional preferences of the current population<sup>6</sup>.

The term "nutrigenetics" is increasingly used in the scientific community, which corresponds to the study of bidirectional interactions between genes and diet. This new trend is already influencing not only the nutritional profile of foods but the entire food chain, from the field to the plate (figure 5)<sup>7</sup>.



Figure 5. Nutritional genomics in food chain<sup>7</sup>

Even so, this area is still at an early stage. Several scientific studies have demonstrated the complex interactions between genotype, diet, lifestyle and environmental factors. With the interaction of these factors, it is possible to provide a more personalized approach to nutritional recommendations across the lifespan.

We already know that nutrition can immediately affect metabolism and health, but there is also a long-term influence. An example is the impact of maternal nutrition during pregnancy and postnatal nutrition on ageing. Therefore, it is essential to consider that several nutrients are the source of epigenetic alterations and can regulate the positioning of these alterations.

<sup>6</sup> Alam, I., Ali, F., Zeb, F., Almajwal, A., Fatima, S.,; Wu, X. (2019). Relationship of nutrigenomics and aging: Involvement of DNA methylation. Journal of Nutrition and Intermediary Metabolism(Vol. 16). Elsevier Inc.

<sup>7</sup> Brown, L.,; van der Ouderaa, F. (2007). Nutritional genomics: Food industry applications from farm to fork. British Journal of Nutrition, (6)

Nutritional genomics results in new functional foods, where we can stand out some nutrients to apply the development of new products: folate, vitamin B12, niacin, vitamin E, retinol and calcium. However, for the industry to enter the area of producing personalized foods based on nutrigenetics, it will be necessary to create specialist teams in various areas of nutrition and health (figure 6)<sup>8</sup>.

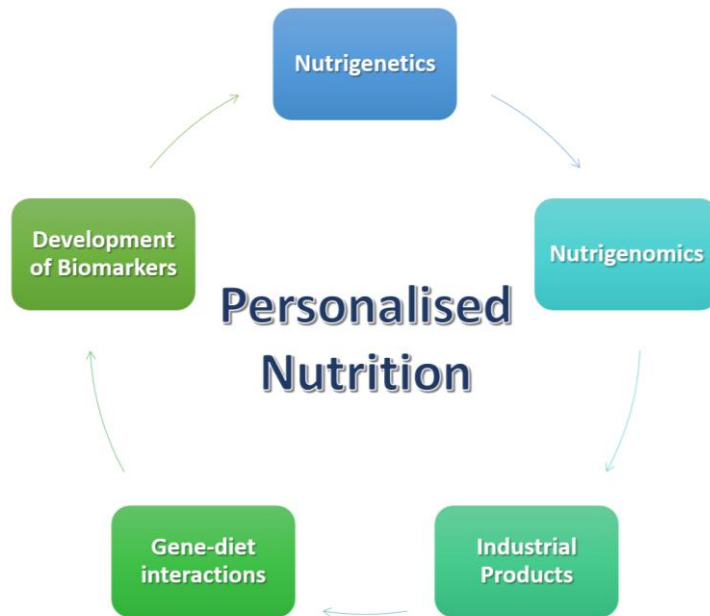


Figure 6. Factors influencing personalised nutrition<sup>8</sup>

With each passing day, there is an increase in the variety of products based on nutrigenetics. However, it is essential to highlight the importance of raising awareness among the population to change eating habits. This area is now starting to be more and more critical for the future of the people.

In conclusion, this new nutrigenomic approach will allow for healthy ageing of the population. But for this approach to be possible and successful, it is essential that the 4Helix collaboration exists and is promoted.

<sup>8</sup> Mohanty, S; Singhal, K. (2018). Functional foods as personalised nutrition: Definitions and genomic insights. Functional Food and Human Health (pp. 513–535). Springer Singapore.

## 4 Conclusion

To improve the population's health, all 4 Helix actors must be in tune and collaborate towards a common goal. To be healthy throughout our lives, it is crucial to understand that health is directly related to our food. It is essential that in the future, the food industry becomes involved in the area of food fortification and the area of functional foods. However, the development of new products must be based on the target population and the objectives.