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Opinion

Same Nutrients, Different Effects: The Importance of Individual and Nutritional Context

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Opinion

In recent decades there has been a growing interest in elucidating what is the most optimal way of feeding humans. Today there is overwhelming evidence of the potential effects that the nutrients present in food have on people's health and illness. Therefore, knowing the effect that these nutrients will have on the human body is essential to creating effective dietary recommendations that positively impact health. However, for a better understanding of how nutrients will act on each person's physiology; Broadly speaking, two variables must be taken into account. On the one hand, we find a very broad human context, which can determine what effect nutrients will have. On the other hand, we find a context concerning food, since in these there is a food matrix that will determine the absorption and/or digestion of its nutrients. Furthermore, in foods, there is a large amount of nutrient substances, antinutrients among others, that can exert a synergy between them. Therefore, it is of utmost importance to know both contexts so that nutrients can be incorporated optimally and ensure a better quality of life for people. Thanks to the use of novel nutrition research techniques, such as transcriptomics or metabolomics, the panorama has expanded to better understand these endogenous and exogenous variables. An example of this is the metabolization of caffeine, which is detoxified by cytochrome P450. It has been proven that the genetic variant in the *CYP1A2* gene can affect the elimination rate of this alkaloid. This is of utmost importance for people who have the AC and CC genotype of *CYP1A2* at rs762551 since they have a slow metabolism of caffeine leading to increased hypertension, albuminuria, and hyperfiltration in the kidney; may contribute to the manifestation and development of kidney disease in susceptible individuals [1]. The feeding schedule can vary the effect, particularly of glucose. Since it has been shown that the pancreas has a circadian rhythmicity. That is, your activity level varies in a 24-hour period; At night this organ tends to be slower and very active during the day, when we should normally eat food. Therefore, when carbohydrates are consumed at night, the pancreas responds poorly because it does not produce enough insulin, and the insulin it produces has a different effect than the insulin produced during the day.

This effect leads to poor digestion of food, and if there is poor digestion, consequently there will be worse absorption and metabolism of glucose in the body [2]. Another interesting case, but no longer concerning the characteristics of the food to change. For example, it has been proven that techniques such as stir-frying, very common in the Mediterranean diet, can improve the bioaccessibility and bioavailability of ingested bioactive compounds. This effect can be explained thanks to the fact that heat breaks the structure of the food, making the food matrix more accessible. In turn, olive oil, having a lipid nature as well as polyphenols and carotenoids, is capable of improving its absorption. In addition, it can be added that some antinutrient compounds such as phytic acid are inactivated with heat [3]. To expand on the previous idea, I will use the case of Branched-Chain Amino Acids (BCAAs) as an example. BCAAs are a group of essential nutrients that include isoleucine, leucine, and valine. In recent years, these amino acids have been in the spotlight, especially in metabolomic studies, where they were identified as potential mediators in the progression of insulin resistance. Since high levels of BCAAs have been found in the plasma of obese people and these higher levels have been correlated with insulin resistance. However, in a contradictory way, in other situations, it has been seen that the greater supply of BCAAs in food, and even their supplementation, improves glucose metabolism. In general, it has been seen that in the presence of catabolic disease states such as liver cirrhosis, and chronic kidney failure, a greater intake of BCAAs (along with the rest of the proteinogenic amino acids) results in an improvement in symptoms. Similarly, in strength or resistance physical exercise, an adequate supply of amino acids including BCAAs improves insulin parameters thanks to improved metabolism in skeletal muscle. On the other hand, in the obesogenic state, that is, an excessive accumulation of fat that can cause metabolic stress mediated by inflammation and metabolic stress in the cells, can lead to the catabolism of BCAAs in the liver, adipose tissue and mainly muscle tissue is compromised. As a consequence, a positive balance of BCAAs in plasma is created, which can affect glucose metabolism by contributing to insulin resistance [4]. To this panorama we can add the intestinal microbiota, since some bacterial species are capable of modulating circulating levels of BCAAs, causing them to increase or decrease in plasma [5].

It is well known that there are genetic variants that are determinants in some aspects of human biology. Certain polymorphisms, such as rs1440581 related to the catabolism of BCAAs, may contribute to changes in plasma levels [6]. The age of the individuals may also contribute to a detrimental effect, as high levels of BCAAs were found in young adult males, and such levels were not found in people of advanced age. In body composition, BCAAs are metabolized mainly in skeletal muscle, therefore, with a good amount of muscle mass there will be a better balance of these amino acids. Physical exercise is also another variable that helps the homeostasis of BCAAs. This effect may be due to both the direct stimulation of skeletal muscle, causing an improvement in the functionality of the mitochondria, and the elimination of products derived from aberrant catabolism of BCAAs [7]. For many years, many experiments in different areas related to human physiology have not taken into account the differences between sexes. Fortunately, that approach is now changing. In this case, differences have been seen between sexes in plasma concentrations of BCAAs after a dietary intervention. Concluding that men had a greater probability of suffering these effects [8]. The food group that contains BCAAs can also play an important role since disparate results have been seen between people with greater adherence to a certain food group than another [9]. Finally, we must remember that it is rare to eat foods alone, if not we have a combination of food groups that make up the food plate. In this sense, other nutrients such as dietary fat when accompanied by foods rich in BCAAs are capable of creating synergies, affecting the influence of plasma concentrations of these amino acids [10].



Conclusion

Thanks to emerging evidence, we now know more about how different variables can cause the same nutrients present in foods to have different effects depending on the individual context of each person. Taking this into account, to a certain extent divergent results are to be expected in nutrition studies, since as we have seen, we can find numerous differences that can modify the final effect of a nutrient. In other words, there is no universal conclusion when we talk about a perfect diet. Therefore, to improve dietary recommendations it is necessary to have a global vision of these aspects, in this way, improving the health of the population with personalized nutrition.

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