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Short Communication

The macronutrients' interplay

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The macronutrient distribution percentages that determine the carbohydrates, the protein and the fat proportions in our plate is very well known to anyone seeking healthy eating behavior. Each of the three macronutrients has a major role in our body whether in energy production or as a building block. There is an interplay between them allowing the metabolites of one to enter the metabolic cycle dominated by the other [1].

In terms of contribution to the total daily caloric intake, fats donate more per unit weight which gives it a superior position over carbohydrates and proteins. This point is concerned with the quantity, but we recently learned to look for the fat quality to ensure proper health. The benefits of omega−6 for myocardial infarction patients [2] and the fact that olive oil offers cardiovascular-protective effects by improving endothelial function as well as markers of inflammation [3], further prove this point.

Regarding proteins, they gain their good reputation from the fact that they are needed for proper growth and muscle power. Quality also matters here and the choice of high biological value proteins is always advised. This advice has many clinical applications. For instance, Nassar [4] pointed out that current threats to protein quality can explain the observed negative height trends.

As for carbohydrates, they were always pictured as the black sheep of the family. For long, we perceived them as the cause of all ill health especially when excess weight gain is the issue. Later, we learned that carbohydrates contain many beneficial components, some of which are ironically the major constituents of many weight loss programs nowadays [5,6]. One shining star from the beneficial carbohydrates is the whole-grain which is a rich source of dietary fiber and bioactive compounds [7]. Whole grain consumption is protective against several chronic diseases such as cardiovascular diseases, type 2 diabetes, and some forms of cancer [8].

During illnesses, or merely by choice, one can summon any of the three macronutrients to take over the job of the others. All together complete the big nourishment picture, but one can substitute another in its share in the daily calories and can help fill in the other functions as well.

One of the best applied examples of this macronutrient interplay is the ketogenic diet (KD). The way how carbohydrates and proteins step backwards and only timidly contribute to the daily caloric needs allowing fats to lead the parade, is amazing. The brain is led to use the ketone bodies as a replacement energy source; now that the carbohydrates are no more in abundance. These changes infer the KD benefits in seizure control [9] and has gone further beyond that to help in mitochondrial disorders [10] and stroke [11]. There is also a promising and rather expanding future for the use of KD in other disease situations. Additionally, KD can be a useful tool in treatment of obesity by helping to control hunger and improving fat oxidative metabolism [12]. Moreover, there is strong evidence of beneficial effects of low calorie KD over the conventional low calorie diet in obese diabetic subjects [13,14].

Contrary to this fat predominance seen in the KD, fat can be the villain in other disease situations and hence the necessity for its restriction emerges. This leaves the carbohydrates in charge in most of the energy demanding activities or acute illnesses. Inborn errors of fatty acid metabolism are the best example of these conditions; where patients are instructed how and when to use carbohydrates and which form is best for them [15].

One more example of the macronutrients' interplay is the protein retreat in cases of inborn errors of amino acid metabolism. One might think that without the regular natural protein portion assigned to my plate, the balance can't be restored and the whole growth castle will collapse. Alternatively, in these drastic measures, the other two macronutrients cover the energy gap. This cavalry action together with the little natural protein allowance ensure that patients can safely maintain their proper body functions as is the case with patients with having cycle defects [16]. Sometimes manipulating protein quality can lead to changes in the amount of calories shared by the other two macronutrients which is clear in the dietary management of phenylketonuria (PKU) patients. Although not a low-protein diet, the PKU diet tends to contain more carbohydrate and less total fat (20–25% energy) compared to a typical omnivore diet which provides 30–35% energy from fat [17].

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In conclusion, patients can survive certain changes in macronutrients' distribution determined by the nature of their diseases. More nutrition prescriptions are written daily for metabolic disorders further proving the suggested macronutrients' interaction. Growth and proper development can be maintained in such delicate situations when the clinical nutrition artists start painting the picture with the permissible colors.

Conflicts of interest

The author declares that there are no conflicts of interest.

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