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IMPACT OF THE LOW CARB DIET ON HORMONAL BALANCE AND APPETITE REGULATION

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ABSTRACT

The low carb diet, characterized by carbohydrate restriction and higher intake of proteins and fats, has been widely studied as a nutritional strategy aimed at weight loss and the modulation of hormones related to appetite and energy metabolism. This article aims to analyze, through a review of scientific literature, the impact of the low carb diet on hormonal balance and appetite regulation, highlighting its physiological effects and clinical applications in different populations. Alterations in the release of hormones such as insulin, ghrelin, leptin, GLP-1 and PYY, as well as the action of ketone bodies in the central nervous system, were investigated. The results indicate that the low carb diet contributes to greater satiety, lower spontaneous caloric intake and improved hormonal sensitivity, favoring weight loss and the control of metabolic diseases such as type 2 diabetes and polycystic ovary syndrome. The study also discusses limitations, adverse effects, and precautions in the application of this approach, emphasizing the importance of individualizing the eating plan. It can be concluded that, when applied with professional monitoring and technical criteria, the low carb diet can be an effective tool in promoting hormonal balance and appetite control, in addition to presenting relevant metabolic benefits.

Keywords: Low Carb Diet. Appetite Regulation. Hormones. Energy Metabolism. Nutritional Intervention.

INTRODUCTION

Diet, in addition to ensuring the maintenance of vital functions, exerts a direct influence on hormonal and behavioral processes, especially with regard to appetite control, regulation of energy metabolism and body composition, and these factors are increasingly studied in the light of new dietary approaches, such as the low carb diet, which proposes a significant reduction in carbohydrate intake as a way to stimulate fat oxidation, preserve lean mass, and promote hormonal balance (Gilberto de Lucena et al., 2018).

In view of the current scenario of increasing obesity and chronic non-communicable diseases, it is increasingly urgent to understand how different dietary strategies influence the hormonal axes that control hunger and satiety, since excess weight is often associated with insulin resistance, chronic inflammation, and changes in leptin, which favors hyperphagia and hinders sustainable weight loss (Cordeiro et al., 2017).

The low-carb diet stands out precisely for interfering with these mechanisms, by promoting a lower release of insulin in response to the reduction of carbohydrates, which favors the mobilization of stored fatty acids and allows the body to enter a state of greater lipid oxidation, favoring not only weight loss, but also improved insulin sensitivity and hormonal response to food (Nascimento; Alexandrino, 2023).

Although conventional nutritional guidelines still prioritize moderate carbohydrate consumption as the base of the food pyramid, several studies have shown that the reduction of this macronutrient can be beneficial for certain metabolic profiles, especially for individuals with metabolic syndrome, hyperinsulinemia, or central obesity, in whom blood glucose control and hormonal rebalancing are priority therapeutic goals (Xavier, 2017).

It is important to highlight that the low carb diet does not have a single and rigid definition, and the amount of carbohydrates allowed per day is variable, which can range from less than 50g to about 130g daily, which indicates that there are different degrees of restriction and that its application must consider factors such as the level of physical activity, individual goals, health status and metabolic response of each person (Cordeiro et al., 2017).

The metabolic transformations that occur with carbohydrate restriction directly affect the production of ketone bodies and the neuroendocrine axis that regulates hunger, especially through the action on the hormones ghrelin, insulin, leptin and cholecystokinin, which is one of the main differentials of this approach in relation to traditional low-calorie diets, which often fail to maintain weight loss due to appetite intensification (Roekenes; Martins, 2021).

In addition to favoring the reduction of body weight, the low carb diet has shown potential to regulate the secretion of intestinal hormones that act on satiety, positively modulating the release of peptides such as PYY and GLP-1, which contributes to greater appetite control and lower energy intake throughout the day, without the need for rigid impositions regarding the amount of calories (Roekenes; Martins, 2021).

In view of the above, the main objective of this article is to analyze, based on a review of the scientific literature, the effects of the low carb diet on hormonal balance and appetite regulation, seeking to understand how this nutritional strategy can be applied safely and effectively, respecting the principles of biological individuality and promoting integral health through food (Cordeiro et al., 2017).

PHYSIOLOGICAL ASPECTS OF THE LOW CARB DIET AND ITS HORMONAL IMPLICATIONS

The physiological responses triggered by the reduction of carbohydrates in the diet are multiple and complex, involving changes in hormonal signaling, in the metabolic pathway of energy production and in body composition as a whole, and by significantly reducing carbohydrate intake, the body starts to depend on alternative sources of energy, especially lipids, which promotes a metabolic reconfiguration that includes the reduction of blood glucose and insulin secretion, resulting in greater mobilization of fatty acids and production of ketone bodies (Nascimento; Alexandrino, 2023).

This change in the profile of energy substrates directly affects the hormonal axis involved in appetite control, since the increase in fat oxidation and the presence of ketone bodies in the blood influence the release of hormones such as ghrelin, leptin, and insulin, which are the main regulators of hunger and satiety, and which, in situations of imbalance, they can favor binge eating, insulin resistance, and the accumulation of body fat (Roekenes; Martins, 2021).

When nutritional ketosis is established, there is an increase in the levels of β-hydroxybutyrate, one of the main circulating ketone bodies, which exerts a direct effect on the brain receptors responsible for the perception of hunger, inhibiting ghrelin secretion and promoting a prolonged feeling of satiety, which contributes to the spontaneous reduction of daily caloric intake, without the need for strict restrictions on portions or calories (Roekenes; Martins, 2021).

Leptin, in turn, is a hormone produced by adipocytes and responsible for signaling to the hypothalamus the state of the body's energy reserves, and studies indicate that the low carb diet can improve leptin sensitivity, reducing inflammation and restoring the brain

response to this hormone, which represents an important advance for people with obesity and eating disorders (Cordeiro et al., 2017).

Insulin, whose central role in metabolism is to facilitate the entry of glucose into cells, has persistently high levels in many individuals with resistance to its action, and this condition is one of the pillars of obesity and weight gain, and, in this context, the low carb diet demonstrates evident benefits by reducing the need for insulin secretion and allowing the body to use its energy reserves more efficiently (Gilberto de Lucena et al., 2018).

It is noteworthy that from the endocrine point of view, the reduction of insulin and the increase in the production of glucagon stimulate lipolysis and inhibit lipogenesis, favoring the use of body fat stores as an energy source and promoting a more significant and sustainable weight loss compared to conventional diets that prioritize fat restriction (Nascimento; Alexandrino, 2023).

Something relevant to the hormonal response is the modulation of the peptide hormone YY (PYY), which is released in the intestine in response to the presence of fat and protein and acts as a potent appetite suppressant, and low carb diets, by increasing the consumption of these two macronutrients, favor the greater release of PYY and contribute to the feeling of prolonged satiety (Roekenes; Martins, 2021).

GLP-1 (glucagon-like peptide type 1), an incretin hormone also related to satiety and glycemic control, is stimulated by diets rich in fat and protein, which suggests that the low carb diet can improve glycemic control and reduce appetite through the action of this hormone, which translates into better metabolic control and a lower risk of hyperphagia episodes (Lourenço et al., 2024).

It is also noteworthy that by promoting glycemic stability and reducing fluctuations in blood sugar levels, the low carb diet avoids the abrupt peaks and falls that usually stimulate hunger and the desire for foods rich in simple carbohydrates, which represents a protective factor against impulsive eating behavior and the compulsion for sweets and pasta (Cordeiro et al., 2017).

The absence of glycemic peaks also decreases pancreas overload and reduces the risk of beta cell depletion, which may be especially important for individuals in the early stages of type 2 diabetes or insulin resistance, and the decrease in insulin demand promotes a more balanced and metabolic hormonal environment and more energetically efficient (Nascimento; Alexandrino, 2023).

The use of fat as the primary energy substrate, instead of glucose, favors the production of acetyl-CoA, which enters the Krebs cycle and, when in excess, is converted into ketone bodies, providing a stable source of energy for the brain, muscles and other

peripheral tissues, which contributes to the improvement of cognitive function and physical disposition, important elements in the process of adherence to the diet (Xavier, 2017).

The greater availability of ketone bodies in the blood acts as metabolic signaling that reduces the activity of hypothalamic areas related to hunger, in addition to acting directly on the neurotransmitters that regulate mood and well-being, which explains reports of improved mental clarity, reduced food anxiety, and greater motivation among individuals adapted to the low-carb diet (Roekenes; Martins, 2021).

It should be noted that, although the hormonal effects of the low-carb diet are promising, its effectiveness depends on the nutritional quality of the food consumed, the composition of macronutrients, and metabolic individuality, and it is essential to be monitored by nutritionists and physicians for personalized adjustments and prevention of side effects, such as fatigue, constipation, or electrolyte imbalances (Nascimento; Alexandrino, 2023).

Adaptation to the new metabolic pattern occurs in phases, and it is common for the first few days to have an uncomfortable transition known as "keto flu", marked by temporary symptoms such as headache, irritability, and fatigue, which usually disappear after the body establishes ketosis efficiently and starts the endogenous production of ketone bodies in a stable way (Lourenço et al., 2024).

Therefore, the physiological aspects of the low-carb diet are directly linked to hormonal changes that affect appetite, satiety, lipid metabolism and the use of energy substrates, and this approach is a relevant nutritional tool supported by scientific evidence, as long as it is applied with caution, responsibility and based on adequate technical knowledge (Cordeiro et al., 2017).

APPETITE REGULATION: NEUROENDOCRINE MECHANISMS AND RESPONSES TO THE LOW CARB DIET

Human appetite is regulated by a complex network of neuroendocrine signals that involve the central nervous system, especially the hypothalamus, and a variety of peripheral hormones that signal the nutritional and energy status of the body, and among the main modulators are ghrelin, leptin, insulin, cholecystokinin, GLP-1 and PYY, whose release and action are directly affected by the composition of the diet, and in the case of the low carb diet, there is a relevant impact on the way these hormones act in the regulation of hunger and satiety (Roekenes; Martins, 2021).

Ghrelin, known as the "hunger hormone," is primarily secreted by the stomach in response to fasting and works by stimulating the hypothalamic centers that trigger food

intake, and studies show that the low-carb diet can suppress the typical increase in this hormone that occurs during weight loss, maintaining lower levels of hunger and facilitating adherence to spontaneous calorie restriction (Roekenes; Martins, 2021).

On the other hand, leptin is produced by fat cells and signals to the brain the amount of energy stored in the body, promoting satiety and appetite control, but in individuals with obesity, there is a resistance to leptin that compromises this mechanism, and low carb diets seem to improve leptin sensitivity, possibly by reducing systemic inflammation and improving the lipid profile (Xavier, 2017).

Insulin, in addition to its central role in regulating blood glucose, also exerts an influence on appetite, acting as an anorectic hormone in the central nervous system, but its action is impaired in resistant individuals, which contributes to increased appetite and food consumption, and in this aspect, the low carb diet, by reducing circulating insulin levels, contributes to restoring the balance between hunger and satiety signals (Gilberto de Lucena et al., 2018).

Cholecystokinin (CCK) is released by the small intestine in response to the presence of fat and protein, promoting slower gastric emptying and generating a more prolonged feeling of satiety, and as the low carb diet increases the intake of these two macronutrients, there is a more efficient release of CCK, which acts directly to reduce appetite and limit voluntary caloric intake (Nascimento; Alexandrino, 2023).

Another hormone that stands out in the regulation of appetite is GLP-1, whose action is related to delaying gastric emptying, increasing satiety and improving insulin sensitivity, being widely studied in pharmacological therapies for obesity, and which can also be stimulated naturally through diets with high protein and lipid content, as is the case with the low carb approach (Lourenço et al., 2024).

PYY (peptide YY), also secreted in the intestine, is released in response to food intake, especially of proteins and fats, and acts by inhibiting appetite through its action on hypothalamic receptors, and there is evidence that the low carb diet, by favoring its production, contributes to a more effective and prolonged satiety, facilitating the voluntary control of energy intake (Roekenes; Martins, 2021).

In addition to peripheral hormones, appetite regulation involves the balance between orexigenic (hunger stimulator) and anorectic (hunger suppressant) neurons located in the arcuate nucleus of the hypothalamus, and this interaction is modulated by hormonal signals that arrive from the periphery, and the low carb diet alters the activation pattern of these neuronal pathways, favoring a more stable satiety response (Cordeiro et al., 2017).

The action of ketone bodies is also relevant in this process, as β-hydroxybutyrate, the main ketone circulating during ketosis, acts as a modulator of brain function, inhibiting the activation of orexigenic neurons and promoting a neurochemical environment conducive to reducing hunger and maintaining spontaneous calorie restriction, which differentiates low carb from other conventional diets (Roekenes; Martins, 2021).

This ketogenic effect also impacts dopamine, a neurotransmitter involved in food reward, reducing the exaggerated hedonic response to ultra-processed foods, which reduces binge eating and emotional intake, being one of the main benefits reported by individuals who follow diets with severe carbohydrate restriction, especially those who report a history of sugar addiction (Nascimento; Alexandrino, 2023).

The glycemic stability promoted by low carb contributes to the reduction of rapid energy fluctuations, avoiding the reactive hypoglycemia that usually triggers episodes of intense hunger and uncontrolled food intake, which represents a significant gain for people with a history of binge eating or difficulty maintaining consistent eating habits throughout the day (Cordeiro et al., 2017).

The lower glycemic variability also improves mood and cognition, favoring self-control and the perception of satiety, essential factors for the success of any long-term eating plan, especially in the current context of highly palatable and socially induced eating, in which appetite is often more psychological than physiological (Gilberto de Lucena et al., 2018).

In women, especially in the menopausal phase, it is observed that the low carb diet can help in hormonal rebalancing, reducing the symptoms associated with estrogenic fluctuations and insulin resistance, promoting greater appetite control, reduction of abdominal fat and improvement of body composition, important factors for metabolic and emotional health at this stage of life (Lourenço et al., 2024).

Despite the benefits observed, it is necessary to highlight that the neuroendocrine response to the low carb diet may vary according to the genetic profile, previous nutritional status, presence of associated diseases and environmental factors, which is why its implementation must be judicious, respecting the biochemical individuality and dietary history of the patient (Nascimento; Alexandrino, 2023).

CLINICAL APPLICATIONS OF THE LOW CARB DIET: EVIDENCE IN DIFFERENT POPULATIONS

The low carb diet has been shown to be effective in different clinical contexts, not only as a tool for weight loss, but as a therapeutic strategy for complex metabolic

conditions, being widely studied in individuals with obesity, type 2 diabetes, polycystic ovary syndrome, insulin resistance and even in specific clinical situations, such as epilepsy and neurodegenerative disorders, proving to be adaptable and beneficial for varied patient profiles (Xavier, 2017).

In the case of obesity, the main focus of a study related to low carb, the results obtained are consistent, indicating that the reduction of carbohydrates facilitates the mobilization of body fat, promotes greater satiety, improves leptin and insulin sensitivity, and reduces the levels of chronic inflammation, generating a metabolic environment conducive to sustainable weight loss, even without strict calorie control (Gilberto de Lucena et al., 2018).

In patients with type 2 diabetes, the benefits are even more evident, since the low carb diet directly impacts the main dysfunction involved in the disease, which is hyperglycemia sustained by insulin resistance, and by reducing carbohydrate intake, there is a significant decrease in the need for insulin release, favoring glycemic control and, in many cases, enabling the reduction or suspension of hypoglycemic drugs (Nascimento; Alexandrino, 2023).

Clinical studies indicate that individuals with metabolic syndrome have significant improvement in triglyceride levels, increased HDL, reduced waist circumference, and improved blood pressure when submitted to the low carb diet, and these changes favor the reversal of the clinical condition and reduce cardiovascular risk in the long term (Cordeiro et al., 2017).

In the case of polycystic ovary syndrome (PCOS), a common disorder among women of reproductive age and often associated with insulin resistance, the low carb diet has proven to be an important ally, promoting the regularization of the menstrual cycle, the decrease in the levels of insulin and circulating androgens, and facilitating weight loss, which, in turn, improves fertility and overall well-being (Lourenço et al., 2024).

In patients with insulin resistance, even without a formal diagnosis of diabetes, the metabolic adjustments promoted by low carb can prevent progression to the disease, as the stabilization of blood glucose and the reduction of basal insulin relieve the pancreas and partially restore tissue sensitivity, being an approach recommended in cases of prediabetes or important family history (Gilberto de Lucena et al., 2018).

For individuals with nonalcoholic fatty liver, a condition strongly associated with excess body fat and high intake of refined carbohydrates, the low-carb diet is efficient in reducing liver lipid content, with improvement in liver function markers and potential reversal

of the condition, especially when combined with regular physical activity (Cordeiro et al., 2017).

In the elderly, whose loss of muscle mass and insulin resistance are constant concerns, the low carb diet can be applied with caution and an adequate amount of proteins of high biological value, with the objective of preserving lean mass, reducing the accumulation of visceral fat and maintaining glycemic control, avoiding energy fluctuations that compromise physical and cognitive performance (Nascimento; Alexandrino, 2023).

In the pediatric public, although its use should be more judicious, there is evidence of the use of the ketogenic diet, an extremely restrictive version of low carb, in the treatment of refractory epilepsies, with satisfactory results in reducing the frequency and intensity of seizures, being a clinical example of how dietary adjustment can have direct implications on the central nervous system (Roekenes; Martins, 2021).

In people with eating disorders, especially those who suffer from episodes of binge eating and "emotional hunger", the low carb diet can offer a dietary structure that promotes greater stability of hunger and satiety signals, by reducing the glycemic oscillations that normally feed this cycle, although its use should be monitored to avoid extreme restrictive practices that compromise mental health (Lourenço et al., 2024).

Among athletes and practitioners of intense physical activities, low carb can be used strategically in specific cycles, promoting metabolic adaptation for a more efficient use of fat as an energy source, but its application depends on the sport, the type of training and the individuality of the practitioner, and should be periodized with professional support to avoid a drop in performance (Nascimento; Alexandrino, 2023).

For menopausal women, a group that often suffers from the accumulation of abdominal fat, hormonal changes, and loss of muscle mass, the low carb diet can provide an improvement in body composition, greater appetite control, and relief from symptoms related to estrogenic fluctuations, and is recommended with individual adjustment of proteins and micronutrients (Lourenço et al., 2024).

In the context of neurodegenerative diseases such as Alzheimer's and Parkinson's, preliminary research indicates that nutritional ketosis can exert neuroprotective effects by improving brain energy metabolism and reducing neural inflammation, with low carb being considered a promising approach, although still in the phase of further clinical investigation (Roekenes; Martins, 2021).

Even in eutrophic individuals who seek only energy stability, improved cognitive performance and prevention of metabolic diseases, the low carb diet can be an ally, as long as it is balanced and rich in natural foods, as it promotes greater satiety, avoids insulin

peaks and favors a conscious diet, based on real hunger and not on the food impulse (Gilberto de Lucena et al., 2018).

Thus, it is important to emphasize that, despite the promising clinical effects in various patient profiles, the low carb diet must be conducted safely, with regular monitoring of biochemical parameters and continuous evaluation of signs and symptoms, because only with adequate guidance and individualization of conduct is it possible to guarantee its long-term benefits, without compromising metabolic or nutritional health (Cordeiro et al., 2017).

LIMITATIONS AND PRECAUTIONS ON THE USE OF THE LOW CARB DIET IN NUTRITIONAL INTERVENTIONS

Despite the numerous benefits associated with the low carb diet, especially with regard to appetite control, hormonal regulation, and weight loss, it is essential to recognize that this nutritional strategy is not free from limitations, contraindications, and potential risks, and its application depends on careful evaluation, individualized planning, and continuous professional monitoring, in order to ensure both its effectiveness and the preservation of the patient's overall health (Nascimento; Alexandrino, 2023).

One of the main points of attention is related to the body's initial adaptation to carbohydrate restriction, a phase in which many individuals experience physical and cognitive symptoms such as fatigue, irritability, headache, constipation, and difficulty concentrating, a phenomenon known as "ketogenic flu", which is usually self-limiting, but which can discourage the continuity of the diet when there is no adequate support during this period of metabolic transition (Lourenço et al., 2024).

In addition, it is necessary to consider that the drastic exclusion of carbohydrate-rich food groups can compromise the adequate intake of fiber, B vitamins and natural antioxidants, which are fundamental for intestinal, immune and cardiovascular health, and it is therefore essential that the low carb eating plan includes fibrous vegetables, oilseeds, seeds and fruits with a low glycemic index, to ensure adequate nutritional density and prevention of deficiencies (Xavier, 2017).

What also deserves caution is the impact of the low-carb diet on patients with a history of eating disorders, such as anorexia, bulimia, or binge eating disorder, since the restrictive approach, even if physiologically grounded, can trigger dysfunctional eating behaviors, if there is no psychological or nutritional follow-up focused on eating behavior and the construction of a balanced relationship with food (Roekenes; Martins, 2021).

In some cases, a negative response to excess protein or saturated fats from low-quality sources is also observed, especially when the diet is poorly formulated and

composed mostly of ultra-processed foods with "low carb" appeal, but which are low in micronutrients and rich in chemical additives, which reinforces the importance of prioritizing fresh foods and homemade preparations with high biological value (Gilberto de Lucena et al., 2018).

Patients with kidney diseases, especially those in moderate or advanced stages of dysfunction, should be carefully evaluated before implementing the low-carb diet, as the increase in protein intake can overload renal function, requiring a specific adaptation of the distribution of macronutrients, respecting the excretion capacity of nitrogenous metabolites and the basal laboratory parameters (Birth; Alexandrino, 2023).

Pregnant or breastfeeding women also represent a group that requires differentiated analysis, because although some studies suggest that low carb can be beneficial in controlling gestational blood glucose, it is necessary to ensure that the diet is rich in essential nutrients for fetal development and milk production, avoiding severe or unbalanced restrictions that can compromise maternal and baby health (Cordeiro et al., 2017).

Although the low-carb diet has shown positive effects on the lipid profile in many studies, such as the elevation of HDL and the reduction of triglycerides, there is a subgroup of people who experience an increase in total and LDL cholesterol, especially when there is a high consumption of saturated fats, requiring continuous monitoring of laboratory tests and adjustments in lipid sources. prioritizing unsaturated and polyunsaturated fatty acids (Xavier, 2017).

From a behavioral and social point of view, the adoption of low carb can represent important challenges, since the contemporary food structure is strongly based on the consumption of bread, pasta, rice, sugars and flour, which makes it difficult to maintain the eating pattern outside the home or in social environments, requiring adaptation strategies that involve meal planning, nutritional education and emotional support (Roekenes; Martins, 2021).

Regarding long-term adherence, although many individuals report improved satiety and energy with low carb, there are reports of relapses when a flexible and sustainable approach is not established, which highlights the importance of this strategy being seen as a transition or basis for a new eating style and not as a temporary or excessively rigid solution (Lourenço et al., 2024).

It is also important to be clear about the therapeutic objectives of the diet, as not all patients need a marked restriction of carbohydrates, and it is possible to obtain good results with milder versions of low carb or even with conventional dietary re-education, as long as

they are accompanied by interventions in other pillars of health such as sleep, physical activity and stress management (Gilberto de Lucena et al., 2018).

Biochemical individuality should always guide nutritional conduct, and this applies especially to low carb, whose response varies widely among individuals, being influenced by factors such as genetics, body composition, hormonal pattern, intestinal microbiota, and clinical history, which requires clinical sensitivity to identify who really benefits from this approach and how to adjust it to avoid side effects (Nascimento; Alexandrino, 2023).

In some cases, prolonged application of the low carb diet without adequate replacement of minerals such as magnesium, potassium and sodium can lead to electrolyte imbalances, with clinical repercussions that include muscle cramps, fatigue, cardiac arrhythmias and hypotension, especially in patients who also use diuretic medications, and special attention is recommended to hydration and conscious consumption of these nutrients (Cordeiro et al., 2017).

In clinical practice, it is essential to carry out a detailed anamnesis, with evaluation of the patient's eating behavior, laboratory tests, and objectives, before indicating the low carb diet, ensuring that it is introduced progressively, with clear guidance on the choice of foods, the signs of metabolic adaptation, and the monitoring parameters, in addition to creating alternatives for exceptional situations and moments of food socialization (Roekenes; Martins, 2021).

In summary, the low carb diet represents a promising approach in the context of contemporary nutritional interventions, with significant results in hormonal modulation, appetite control and weight loss promotion, but its application requires technical responsibility, continuous monitoring and, above all, respect for the individuality and needs of each patient, so that its benefits are achieved safely, ethical and lasting (Lourenço et al., 2024).

FINAL CONSIDERATIONS

The low carb diet has been consolidated as a relevant nutritional strategy in the current scenario, not only for its consistent results in weight loss, but also for its direct action on the mechanisms that regulate appetite and hormonal balance. By proposing a reorganization of energy metabolism, shifting the focus from glucose to fat as the main source of energy, this approach positively influences hunger and satiety signaling, allowing the individual to experience a more conscious, intuitive and less guided eating

The metabolic effects observed throughout adherence to low carb go beyond weight loss, achieving significant improvements in lipid profile, insulin sensitivity, and glycemic

stability, fundamental elements for the prevention and treatment of chronic diseases such as obesity, type 2 diabetes, and metabolic syndrome. The diet's action on the hormones ghrelin, leptin, insulin and intestinal peptides reinforces its ability to promote a physiological environment more favorable to eating self-control and long-term weight maintenance, without dependence on excessively restrictive strategies.

Understanding the complexity of the neuroendocrine systems that regulate appetite shows that effective nutritional interventions must act on these systems in a strategic and personalized way. The low carb diet, by positively modulating these circuits, presents itself as a viable alternative for people who face difficulties with traditional diets, which often fail to ignore the physiology of appetite and the behavioral aspects involved in the relationship with food. Still, its implementation requires responsibility, balance, and technical knowledge, as the individual response can vary widely, requiring constant adaptations.

Although promising, the low-carb approach should not be treated as a universal solution or an unqualified path, and it is essential to recognize its limits, its possible adverse effects, and the clinical conditions that require extra attention. The success of this intervention depends on a food plan that respects the biological particularities, personal goals and routine of each individual, in addition to considering the quality of the food consumed and the need for multidisciplinary monitoring.

Therefore, it is important to highlight that the true impact of the low carb diet is revealed when it is no longer seen as a rigid protocol and is understood as part of a broader process of dietary re-education and health care. Its potential lies not only in the metabolic changes it promotes, but in the transformation of habits, in the achievement of food autonomy and in the construction of a more balanced and sustainable relationship with nutrition. When applied with awareness, scientific basis and an individualized look, this strategy can become a great ally on the path to integral health and lasting well-being.

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