



Revista da ASSOCIAÇÃO MÉDICA BRASILEIRA

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Commentaries

Food taboos in medicine: a hypothesis for pathophysiology regarding harmful food[☆]

Tabus alimentares em medicina: uma hipótese para fisiopatologia referente aos alimentos remosos

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Introduction

Human eating habits in the Amazon, especially in riparian communities, include a series of dietary restrictions (taboos) resulting, in part, from the cultural miscegenation (Native Brazilians, Africans, and Portuguese settlers) that occurred during the formation of this population.¹

Among these food taboos, the most important refers to foods considered “remosos” (harmful), an adjective attributable to foods that have “reima”, i.e., that affect the blood and cause itching.²

In the popular Amazon vocabulary, “remosos” foods are heavy foods derived from pork; seafood such as crab, shrimp, scaleless fish; and cascudos, such as the tamuata; birds such as ducks; and some wild animals such as lowland pacas and capybaras. These foods should not be eaten by people at risk, for example, postoperative patients and people with infections, inflammations, or injuries, because of the risk of increasing tissue damage, creating pus, and exacerbating the inflammatory process.^{3,4}

This recommendation, although not fully accepted by local physicians, is frequently made by some local doctors to postoperative patients. However, there are very few studies

evidencing the pathophysiology of the effect of these foods on healing and inflammatory processes.

Thus, the objective of this study was to promote a short review about the topic of foods considered “remoso” and to propose a theoretical hypothesis for this phenomenon based on fundamentals of immunology and of the Amazon ecosystem in order to scientifically help physicians to understand this phenomenon and treat patients from these regions.

Literature review

Amazon ecosystem

The Brazilian Amazon region has an ecosystem with unique characteristics associated with hot and humid weather, lush vegetation, high-volume rivers and creeks, in addition to geological areas consisting of dry land, floodplains, and plains.^{5,6}

This environment, formed by numerous rivers and high levels of rainfall, seasonally modifies the local geoenvironmental characteristics. These conditions create large plain and flooded forest areas during most of the year, in addition to

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causing soil erosion, transport, production, and sedimentation of the organic matter⁷ from the forest in rivers and plain areas.⁸

Thus, the Amazonian rivers and soil depend on the geochemical-sedimentary composition of organic compounds derived from the decomposition of forest elements, bacterial and fungal decomposers present in the soil, in addition to inorganic clay mineral compounds, and silica and iron colloids, present in the local rivers and creeks.^{7,8}

Bacteria are the oldest living environmental decomposers, colonizing the planet for over two billion years.^{9,10} They are able to colonize the most varied types of terrestrial and aquatic environments, and most of them present heterotrophic metabolism, which depends on the organic matter synthesized by other organisms.^{8,11}

The decomposing bacteria in the Amazon are of great importance to this ecosystem, as they influence the biogeochemical cycle and the local food web.^{8,11} As an example, cyanobacteria together with organic matter in decomposition and the sediments deposited in the rivers and soil of flooded areas are essential elements that allow the entrance of carbon into food webs and the formation and color of the soil and rivers in the region.^{7,12,13}

These bacteria also maintain close commensal relationships with several animals from Amazon aquatic and terrestrial environments that live in direct contact with them, whether due to their eating habits (fish, ducks, pigs) or their habitats (crabs, shrimps). Such bacteria usually have a pathogenic relationship with human beings.^{10,11}

General characteristics of “remosos” food

Pork and its by-products; crab and shrimp; scaleless fish and cascudos, such as the tamuata fish; ducks and teals; turtles; and some game animals such as paca and capybara are considered “remosos” foods from the Amazon region.¹⁴ What do such foods have in common that is considered harmful, even with such different characteristics?

According to literature data, the “remoso” characteristic of food is mainly associated with animals with a carnivorous diet, such as scaleless fish, or scavengers, such as cascudo fish, crabs, and shrimps, in addition to animals with mixed, general (fruit, palm seeds, small animals, and insects), and detritus-based diets from muddy areas, such as the collared peccary (wild pig), which is similar to the domestic pig, birds such as duck and teal, turtles, and the lowland paca.^{2,4,13,15}

Thus, these animals have in common a diet associated with the consumption of rotting food, which is usually associated with the presence of a great number of decomposers, such as bacteria.

The preparation of these foods can destroy these bacteria by thorough cooking, but this process does not destroy their toxins, which are usually resistant to cooking.

Pathophysiology (hypothesis)

Etymologically, “reima” or “reuma” originates from Greek, and means a liquid stream or the flow of an organic humor, while “remoso” is everything that causes “reima”.

According to literature data, the “remoso” aspect of food is related to situations of organic vulnerability, such as during menstruation, puerperium, bowel disorders, wounds, or expectoration. In these situations, “remosos” foods could aggravate these pathological states due to toxic substances present.^{2,4}

This process, from the immune system perspective, involves two functions of effector response: the innate and the adaptive immunity.¹⁶

The main effector mechanisms of innate immunity are associated with cells such as the macrophages, neutrophils, dendritic cells, and natural killer (NK) cells through actions related to phagocytosis, release of inflammatory mediators, activation of proteins of the complement system, synthesis of acute-phase proteins, cytokines, and chemokines.¹⁷

Such mechanisms are activated by specific stimuli and are represented by molecular structures such as lipopolysaccharides (LPS), mannose residues, and teichoic acids usually found on the surface of microorganisms when interacting with various cell receptors known as pattern recognition receptors (PRRs). PRRs give rise to pathogen-associated molecular patterns (PAMPs), which are related to interactions similar to the complementary antigen-antibody or antigen-T-cell receptor (TCR).^{16,17}

From this principle, then, it is understood that one of the possibilities established for the effect of “remosos” food on the organism with some tissue damage (menstruation, puerperium, bowel disorders, injuries, or expectoration) would be related to the activation of the innate immunity mechanism of the PAMPs, through molecular structures (LPS, mannose residues, and teichoic acids), inherent to the surface of microorganisms that are not eliminated after the cooking process.

Due to the primary tissue damage and immune mechanisms activated as an answer to this damage, the intake of “remosos” foods in such conditions would have the effect of exacerbating the acute inflammatory process, with persistence of the vascular and cell phases of the inflammatory process, increase of soluble substances (supplement and coagulation proteins, C-reactive protein, histamine, nitric oxide, prostaglandin, proinflammatory cytokines, among others), and persistence of the initial clinical signs (blushing, heat, edema, pain, and functional impairment).^{16,17}

It is also important to mention that in this initial acute inflammatory process, in which innate immune response elements are predominant (neutrophils and macrophages), the persistence of the noxious stimulus requires the organism to progressively change cell (mononuclear infiltrate — monocyte, macrophages and lymphocytes) and soluble elements that infiltrate the tissue, generating angiogenesis and fibrosis, changing the inflammatory response pattern from acute to chronic, and changing the immune response pattern from innate to adaptive.¹⁶⁻¹⁸

In these conditions, another hypothesis suggested for the effect of “remosos” foods on the organism, with exacerbation of the inflammatory response and tissue damage, is related to an immediate hypersensitivity reaction (type I) characterized by the presence of IgE triggered by the interaction between the allergen and the IgE, preformed and prefixed in surface

receptors of mast cells and basophils, with consequent release of histamine and synthesis of arachidonic acid by-products. This response may be systemic or restricted, with symptomatology associated with the presence of hives,¹⁸ a clinical reaction commonly reported by individuals with primary tissue damage, who show skin reactions after intake of “remosos” foods.²

However, several evidences have suggested that only some patients are susceptible to “remosos” foods in conditions of primary tissue damage. But which conditions are decisive for this susceptibility?

One of the hypotheses proposed for this condition is associated with the presence of populations of T-cells (CD4+CD25+FOXP3+) called regulators of the immune response. These cells, although representing only 5% to 10% of the total CD4+ T cells in peripheral blood, have been considered responsible for several situations of exacerbation and control of the immune response both in transplant patients, such as in graft-versus-host disease (GVHD), and in allergic processes and autoimmune diseases, among other conditions.^{18,19} Another possibility is associated with genetic factors related to the population’s genetic mixing.

Immunology and nutrition

Although the consumption of “remosos” foods, as previously described, may be a problem for the clinical recovery of some patients during the postoperative period, proper nutrition is necessary to help stabilize the immune system (immunomodulation) and enable the patient to be discharged.^{20,21}

Thus, specialized nutritional support has been demonstrated to improve survival of patients in several critical conditions, especially in cases of risk of sepsis during the intensive care period.²¹⁻²³

Nutritional deficiencies of protein, soluble vitamins (A, D, and E), B-complex vitamins, and vitamin C; in addition to minerals, such as selenium, iron, zinc, and copper have shown a direct relationship with the reduction in immune response^{20,23} and the increase in morbidity and mortality levels in comparison with infectious diseases.²²

However, the role of the immunomodulating diet in critically ill patients is still controversial and requires further study. Nevertheless, the discontinuation of “remosos” foods may be adopted as a recovery measure during the postoperative period.

Final considerations

The effect of “remosos” foods on an injured tissue (cicatrização and/or inflammation) still requires studies that scientifically confirm their pathophysiology. However, based on this short review and proposal for a pathophysiological mechanism, it is evident that this topic is more complex, and not a simple cultural taboo. The existence of “remosos” foods and the potential susceptibility of some people in the Amazon region to these foods is important data for the medical assistance provided to these patients and for future researches aiming

at designing kits for the evaluation of allergens and, also, understanding the effect of regulatory T-cells on the immunomodulation combined with diet.

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