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Mini Review

Cancer Immunotherapy: Managing Amino Acids during Forced Aetopy

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Abstract

Cancer patients of all ages experience great satisfaction with initial positive results from first-line therapy. Adjuvant therapy helps decrease the risk of cancer recurring or metastasizing. This review discusses forced atopy as cancer immunotherapy and explores managing select amino acids to starve metastatic cells during forced atopy (many allergies).

Introduction

A common goal in oncology is a treatment protocol that minimizes risk and maximizes success. The overall survival rate of children with solid tumor metastasis (Stage IV) has shown little improvement in that the extent of the relocation of metastatic cells, and their progression, is not well understood. To better understand the limits of metastasis, an alternative treatment strategy is proposed; based on maladaptive immunity. A skin cream having natural and recombinant allergens, and associated with immunologic adjuvants, is vectored into the cancer patient by topical dermal absorption. After that, humoral immunity increases the expression of cross-reactive immunoglobulin-E (IgE) primed effector cells, designed to decrease the incidence and prevalence of endogenous proteins that support the metastatic environment.[1]

Cancer recurrence or metastasis after first-line therapies is life-threatening. In metastasis, metastatic cells from a primary tumor spread throughout the body, forming secondary tumors that aggressively grow and often cause death. Approximately 90% of cancer deaths are due to metastasis.[2]

The management of dietary amino acids during forced atopy may be a vital treatment protocol. Some micronutrients and foodstuff components have specific roles in the development and maintenance of an effective immune systemthroughout the life course or in reducing chronic inflammation. For example, the amino acid arginine is essential for the generation of nitric oxide by macrophages, and the micronutrients vitamin A and zinc regulate cell division are vital for a successful proliferative response within the immune system.[3] Atopy increases the use of amino acids to provide building blocks for the biosynthesis of effector cells and immunoglobulins.[4] Amino acid competition between immune cells and cancer cells can influence their growth, survival, and function. A fierce competition likely exists between cells in the tumor microenvironment, as demand for resources in this niche is high. There is evidence for the metabolic interplay between cancer cells and immune cells.[5]

During forced atopy, an understanding of dietary amino acid competition between cancer cells and immune cells may lead to improvements in starving cancer. The amino acid arginine can enhance the immune response against cancer, allowing an expanded population of immune cells to consume glutamine.[6] In continuation, increased glutamine utilization by immune cells may affect glutamine availability for metastatic cells, inhibiting a metastatic cell's ability to convert glutamine into biomass.[7] This review explores the management of select amino acids to starve metastatic cells during forced atopy.

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Discussion

Nutrition therapy helps cancer patients keep healthy body weight, maintain strength, keep body tissue healthy, and decrease side effects both during and after treatment. Nutrition is a process in which food is taken in and used by the body for growth, to keep the body healthy, and to replace tissue. Good nutrition is vital for good health. Eating the right kinds of foods before, during, and after cancer treatment can help the patient feel better and stay stronger. A healthy diet includes eating and drinking enough of the foods and liquids that have vital nutrients (vitamins, minerals, protein, carbohydrates, fat, and water) the body needs.[8]

Nutrition as adjuvant therapy supports the immune system and lowers the risk of cancer reoccurrence or metastasis. Can forced atopy, while managing select dietary amino acids, inhibit tumor growth, and prolong survival? Hyper-allergenic skin creams interfere with processes that disrupt metastatic cells through immune-metabolic interference. Forced atopy as cancer immunotherapy increases chronic inflammation. Cancer suppression during forced atopy is suspected with IgEantibodies in that they are biologically active despite low concentration in the bloodstream, approximately one-thousandth of a percent. IgE bind to high-affinity receptors on the surface of effector cells (e.g., mast cells, basophils, and eosinophils) to provide IgE-primed effector cells, extremely sensitive to allergens, producing chronic inflammatory reactions.[9] Starving cancer is a formidable task. The complex interplay of amino acids between cancer cells and immune cells is often not clearly understood. Research indicates that amino acids in diet could starve cancer.[10]

Glutamine

The cancer effect of managing dietary glutamine during forced atopy is unclear. In cancer research, there is evidence of an essential role for glutamine in tumors and that a variety of factors, including tissue type, the underlying cancer genetics, the tumor microenvironment, and other variables such as diet and host physiology collectively influence the role of glutamine in cancer.[11] Cancer cells can engage in glutamine metabolism that exceeds the requirement for protein and nucleotide synthesis.[12] Immune system research shows that glutamine is essential for the activation of cells involved in both innate and adaptive immunity. Prolonged or chronic states of severe inflammation require large quantities of dietary glutamine.[13] Glutamine is by far the most abundant free amino acid in plasma and tissues in humans. Plasma concentrations vary between 400 and 600 μmol/l and tissue concentrations between 2 and 20 mmol/l intracellular water.[14] Forced atopy is a cancer immunotherapy that may produce prolonged or chronic states of severe inflammation. Dietary sources of glutamine include protein-rich foods like beef, chicken, fish, seafood, dairy products, eggs, vegetables like beans, beets, cabbage, spinach, carrots, parsley, vegetable juices, wheat, papaya, Brussel sprouts, celery, kale, and fermented foods like miso.

Arginine

The cancer effect of increasing dietary arginine during forced atopy is unclear. Cancer research shows that arginine de novo synthesis is not enough to compensate for high nutritional needs, forcing them to rely on an extracellular supply of arginine.[15] Immune system research shows that L-arginine boosts adaptive immunity by influencing t-cell proliferation, differentiation, and survival. Helper t-cells are considered vital for almost all adaptive immune responses.[16] Helper t-cells assist in the activation of b-cells that can differentiate into plasma cells that produce immunoglobulin-E antibodies.[17] The usual range of L-arginine plasma levels is 81.6±7.3 mmol/L in young men and 113.7 ± 19.8 μmol/L in men, as compared with 72.4±6.7 μmol/L in young women and 88.0 ± 7.8 μmol/L in women.[18] Many foods are natural sources of arginine like nuts (like walnuts, hazelnuts, pecans, peanuts, almonds, cashews, pine nuts, and Brazil nuts), seeds (like watermelon, pumpkin, sesame, sunflower), oats, corn, cereals, buckwheat, brown rice, and chocolate. Animal sources of arginine include meat, dairy products, and eggs.[19]

Serine

The cancer effect of increasing dietary serine during forced atopy is unclear. Cancer research shows that dietary restriction of serine may have antitumor effects.[20] Immune system research shows that serine metabolism is vital for optimal T-cell proliferation by fueling one-carbon metabolism and nucleotide biosynthesis.[21] Dietary sources of L-serine include soy products, sweet potatoes, eggs, meat, and some edible seaweed.[22]

Methionine

The cancer effect of managing dietary methionine during forced atopy is unclear. Cancer research shows that methionine restriction inhibits cancer cell growth. Methionine is vital for cancer cell growth and metabolism.[23] Methionine deprivation suppresses triple-negative breast cancer metastasis *in vitro* and *in vivo*.[24] Immune system research shows that T-helper cells import the amino acid methionine to synthesize new proteins and to provide the methyl groups needed for the methylation of RNA and DNA that drives T-cell proliferation and differentiation.[25] The recommended daily intake for methionine is 10.4 mg per kilogram of body weight or 4.5 mg per pound. Foods having high levels of methionine include ground turkey, beef (skirt steak), tuna, lean pork chops, firm tofu, milk, low-fat ricotta cheese, brazil nuts, white beans, and whole grains like quinoa[26]

Alanine and carnosine

The cancer effect of managing dietary alanine during forced atopy is unclear. Alanine is a substrate for the hepatic synthesis of glucose, a significant energy substrate for leucocytes.[27] Cancer research shows that pancreatic stellate cells, which form the stromal compartment of pancreatic cancers, secrete large amounts of alanine to support the metabolic activity of cancer cells.[28] Immune system research shows beta-alanine exerts immunoregulatory effects by activating both T and B-cells.[29] Foods that have high levels of alanine include meat, fish, and poultry.[30] The cancer effect of increasing dietary carnosine during forced atopy may be beneficial. Carnosine (beta-alanyl-L-histidine) is a dipeptide molecule made up of the amino acids beta-alanine and histidine; muscle and brain tissue have high concentrations. Cancer research shows that L-carnosine can restrict the behavior of ovarian cancer cells, related to

the cancerous phenotype of senescent human peritoneal mesothelial cells.[31] Immune system research shows that carnosine exerts immunoregulatory effects by activating both T and B cells.[32] Foods having high levels of carnosine include meat, fish, and poultry. A vegetarian or vegan diet provides little or no carnosine in comparison to the amounts found in a meat diet.[33]

Tryptophan

The cancer effect of limiting dietary tryptophan during forced atopy may be beneficial. Cancer research shows that tumors increase their consumption of tryptophan to evade immune control.[34] Immune system research shows that tryptophan metabolites along the kynurenine pathway induce immunosuppression involving apoptosis of effector immune cells, which tumors use to escape an immune response.[35] The intake of tryptophan for many individuals is approximately 900 to 1000 mg daily. The recommended daily allowance for adults is estimated to be between 250 mg/day to 425 mg/day, which translates to a dietary intake of 3.5 to 6.0 mg/kg of body weight per day.[36] Tryptophan is present in most protein-based foods or dietary proteins. It is particularly plentiful in chocolate, oats, dried dates, milk, yogurt, cottage cheese, red meat, eggs, fish, poultry, sesame, chickpeas, almonds, sunflower seeds, pumpkin seeds, buckwheat, spirulina, and peanuts.[37]

Glutamic acid

The cancer effect of limiting dietary glutamic acid during forced atopy may be beneficial. Cancer research shows glutamic acid and the sodium salt of glutamic acid (i.e., glutamate) modulate cancer cell development, proliferation, and metastasis through regulating cell signaling pathways. Glutamate activates glutamate receptors on cancer cells and results in malignant growth.[38] Immune system research shows that glutamic acid may inhibit cross-reactivity of IgE-primed effector cells reducing the efficacy of forced atopy as cancer immunotherapy. Scientists showed that pre-absorption of serum with glutamic acid resulted in inhibition of IgE reactivity to both inhalable and food allergens, indicating that the carboxyl group of these amino acids is vital in IgE-epitope interactions.[39] Foods high in glutamic acid include meats, poultry, fish, eggs, wheat, beans, seeds, tomatoes, cheese, mushrooms, wheat gluten, and dairy products.[40]

Monosodium glutamate (MSG)

The cancer effect of limiting dietary monosodium glutamate during forced atopy may be beneficial. Monosodium glutamate (MSG) is the sodium salt of glutamic acid. Cancer research indicates there is no conclusive evidence linking the consumption of MSG to a cause of cancer or an increased risk of cancer. Immune system research shows that exposure to increasing MSG concentrations (1–100 mM) showed a dose-dependent effect on B-cell viability. Glutamate induced apoptosis in both memory and naive B-cell populations is affected by metabotropic glutamate receptor (mGluR) 7 receptors.[41] MSG is a flavor enhancer, used for over 100 years, and is found naturally in tomatoes and cheese.

Asparagine

The cancer effect of managing dietary asparagine during forced atopy is unclear. Cancer research shows that asparagine availability promotes the formation of lung metastasis in breast cancer by promoting epithelial-to-mesenchymal transition.[42] Asparagine can promote the survival of cancer cells in response to glutamine withdrawal.[43] Immune system research shows that exogenous asparagine, a nonessential amino acid, is vital for naive T-cells to synthesize new proteins following TCR engagement, which is consistent with the notion that nutrient availability is essential for proper T-cell activation.[44] Foods rich in asparagine include dairy, whey, beef, poultry, eggs, fish, seafood, asparagus, potatoes, legumes, nuts, seeds, soy, and whole grains. Foods low in asparagine include most fruits and vegetables.

Conclusion

Starving cancer is a formidable task. The adjuvant therapy described herein discusses managing select amino acids to starve metastatic cells during forced atopy. Research efforts should continue to explore the complex interplay of dietary amino acids, cancer cells, and immune cells to improve cancer treatment outcomes for children and adults.

Author disclosure

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Conflicts of interest

Michael J. Dochniak is co-founder and CTO of Alleam, LLC. Minnesota, USA.

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