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Nutrition and its Important Role in Maintaining an Adequate Immunity during Chemotherapy

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Abstract

There is a high rate of cancer, particularly gynecological and breast cancers among American women. Chemotherapy is commonly used as a means of treating this disease, but it can cause a range of undesirable side effects. Studies have therefore been undertaken in an attempt to identify complementary forms of treatment which may reduce these side effects, and a number of compounds have produced promising results. Examples of these are the fatty acids omega-3, β-glucan, and glutamine, all of which have been shown to increase immunity to gynaecological cancer, and have brought about improvements in the general clinical state of patients undergoing oncological therapy. However, studies also need to be carried out to increase our understanding of the beneficial properties of particular types of nutritional substances, and of developing diagnostic methods which can detect alterations in the transport of amino-acids to cancerous cells, especially in relation to the metabolic function of glutamine, thus making it easier for medical practitioners to take decisions concerning relevant supplementary nutrition.

Keywords: Cancer; Chemotherapy; Metabolic function; Omega-3; β-glucan; Glutamine

Role of Nutrition in Cancer Chemotherapy

Each year, almost 90,000 American women are diagnosed with gynaecological tumours and submitted to oncological treatment, such as Chemotherapy (CT) [1]. This is a very aggressive way of combatting cancer, and can produce a wide range of side effects [2]. Studies have therefore been undertaken in an attempt to identify nutritional substances which can help reduce these side effects and complement the treatment of cancer [3,4]. In this brief review, we will refer to three classes of functional and nutraceutical substances which display high potential as supplementary forms of treatment of patients undergoing CT [5].

Eicosapentaenoical Acid (EPA) and Docous-Hexanoical Acid (DHA) are derivatives of the polyunsaturated acid omega-3, and have been shown to produce marked therapeutic improvements in a number of patients undergoing CT. These improvements include an increase in the effectiveness, and a reduction in the toxicity, of drugs prescribed [6,7], thereby producing a better response to CT. At the same time, there has been a considerable decrease in the side effects caused by such treatment, particularly in terms of improvement in appetite and body weight, survival rates and general quality of life, as well as a reduction in the time spent in hospital, and in the gravity of post-surgical infections [6,8,9].

It is extremely important to strengthen the immunological system during oncological treatment [10], since both the CT and the cancer itself can have a direct effect on it [1]. β-glucan is a polissacarid complex found in foodstuffs such as mushrooms [11] and oats [12], and is able to modulate immunity, thus maximising interactive potential, both by stimulating the survival of probiotic cultures, and through antitumoral activity [13-17]. In addition, probiotics constitute a group of functional substances closely related to the reduction of the side effects of CT, such as diarrhoea, while contributing to improvements in the immune system by helping to modulate the micro-biotics of the intestines [18-21].

Although glutamine is not an essential amino-acid, it contributes significantly to the survival of cells, and one of its functions is to participate in the synthesis of proteins and the biosynthesis of nucleotids, while at the same time signalling and activating mTOR. It is also vital to the proliferation and differentiation of cells [22-25]. It is often given as a nutritional supplement to oncological patients undergoing CT, especially in cases where mucositis or diarrhoea occur. In relation to mucositis, glutamine stimulates cicatrisation by strengthening the immune system, thereby aiding the recuperation of oral mucus. In the case of diarrhoea, glutamine is able to regenerate the villi by producing improvements in intestinal function [19-25].

As cancerous cells grow rapidly, they have a greater need for amino-acids [26]. Tumours can modify the regulation of the transporters in some amino-acids because of high demand, whilst at the same time improving levels of chemo-resistance [22-25,27,28]. This is particularly evident in the metabolic path of glutamine, and is related to increased proliferation of tumours and a consequent deterioration in the clinical condition of patients [26]. Some cancerous cells can selectively alter the intake of glutamine, thus reducing the effectiveness of any chemotherapeutical drugs administered [22,24,25]. In such cases, glutamine supplements do not produce the desired effect of strengthening patients' immunity, and this stimulates the growth of tumours [24]. As a result, it becomes difficult to decide whether or not to prescribe glutamine supplements for such patients.

In the light of the high rates of gynaecological cancer in certain populations, medical practitioners need to be able to adopt alternative treatments for oncological patients, in order to improve their prognosis and quality of life. As such, it is essential to carry out further studies

concerning the diet of these patients, with a view to identifying other nutritional substances which could be of benefit. It is also important that suitable diagnostic tests be developed, so that alterations in the transport of amino-acids to cancerous cells can be quickly and easily detected, thus making it easier to decide whether or not glutamine supplements should be administered.

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