Immune Killer T Research

Please see articles & each reference.

TITLE : [ANTI-VIRUS RESEARCH OF TRITERPENOIDS IN LICORICE]

Abstract

Licorice is a leguminous plant of glycyrrhiza. It is a traditional Chinese herbal medicine. Triterpenoid is one of the mainly active components of licorice. In recent years, the broad-spectrum antiviral activity of many triterpenoids in licorice was confirmed, and these findings have become a hot spot of antiviral immunity. The triterpenoids of licorice has the potential to become a novel broad-spectrum antiviral medicine and will be widely used in the clinical treatment. This review provided a summary of the recent anti-virus research progress on several triterpenoids in licorice, such as glycyrrhizic acid, glycyrrhizin, glycyrrhetinic acid and its derivatives. The antiviral roles of triterpenoids in licorice against herpes virus, HIV, hepatitis virus, SARS coronavirus and influenza virus were briefly summarized.

Source: Bing Du Xue Bao. 2013 Nov;29(6):673-9.

TITLE :EFFECT OF MUSHROOM AGARICUS BLAZEI ON IMMUNE RESPONSE AND DEVELOPMENT OF EXPERIMENTAL CEREBRAL MALARIA

Background: Cerebral malaria (CM) is debilitating and sometimes fatal. Disease severity has been associated with poor treatment access, therapeutic complexity and drug resistance and, thus, alternative therapies are increasingly necessary. In this study, the effect of the administration of Agaricus blazei, a mushroom of Brazilian origin in a model of CM caused by Plasmodium berghei, strain ANKA, was investigated in mice.

Results: Mice treated with A. blazei aqueous extract or fraction C, that shows antioxidant activity, displayed lower parasitaemia, increased survival, reduced weight loss and protection against the development of CM. The administration of A. blazei resulted in reduced levels of TNF, IL-1β and IL-6 production when compared to untreated P. berghei-infected mice. Agaricus blazei (aqueous extract or fraction C) treated infected mice displayed reduction of brain lesions. Although chloroquine treatment reduced parasitaemia, there was increased production of proinflammatory cytokines and damage in the CNS not observed with A. blazei treatment. Moreover, the in vitro pretreatment of infected erythrocytes followed by in vivo infection resulted in lower parasitaemia, increased survival, and little evidence of clinical signs of disease.

Conclusions: This study strongly suggests that the administration of A. blazei (aqueous extract or fraction C) was effective in improving the consequences of CM in mice and may provide novel therapeutic strategies.

Val, C.H., Brant, F., Miranda, A.S. et al. Effect of mushroom Agaricus blazei on immune response and development of experimental cerebral malaria. Malar J 14, 311 (2015). https://doi.org/10.1186/s12936-015-0832-y

TITLE :LOW-MOLECULAR-WEIGHT POLYSACCHARIDES FROM AGARICUS BLAZEI MURRILL MODULATE THE TH1 RESPONSE IN CANCER IMMUNITY

Abstract

To assess the effect of low-molecular-weight polysaccharides from Agaricus blazei Murrill (ABP-AW1) as an immunoadjuvant therapy for type 1 T-helper (Th1) responses in tumorigenesis, C57BL/6 mice were inoculated subcutaneously with ovalbumin (E.G7-OVA). After 3, 10 and 17 days, the mice were immunized with PBS, OVA alone, or OVA and ABP-AW1, at low (50 µg), intermediate (100 µg) or high (200 µg) doses. Tumor growth was examined and compared among the groups, as were the following parameters: Splenocyte viability/ proliferation, peripheral blood CD4+/CD8+ T cell ratio, serum OVA-specific IgG1 and IgG2b, secretion of interleukin (IL)-2 and interferon (IFN)-γ, and IFN-γ production on a single cell level from cultured splenocytes. Tumor growth in mice treated with OVA and ABP-AW1 (100 or 200 µg) was significantly slower, compared with in the other groups at the same time-points. OVA with 100 or 200 µg ABP-AW1 was associated with a higher number of total splenocytes, a higher ratio of peripheral blood CD4+/CD8+ T-lymphocytes, higher serum levels of OVA-specific Th1-type antibody IgG2b and greater secretion of the Th1 cytokines IL-1 and IFN-γ from splenocytes. ABP-AW1 is a promising immunoadjuvant therapy candidate, due to its ability to boost the Th1 immune response when co-administered with a cancer vaccine intended to inhibit cancer progression.

Jiang L, Yu Z, Lin Y, et al. Low-molecular-weight polysaccharides from Agaricus blazei Murrill modulate the Th1 response in cancer immunity. Oncol Lett. 2018;15(3): 3429–3436. doi:10.3892/ol.2018.7794

TITLE :ANTITUMOR ACTIVITY OF ORALLY ADMINISTERED MAITAKE A-GLUCAN BY STIMULATING ANTITUMOR IMMUNE RESPONSE IN MURINE TUMOR

Abstract

Maitake a-glucan, YM-2A, isolated from Grifola frondosa, has been characterized as a highly a-1,6-branched a-1,4 glucan. YM-2A has been shown to possess an anti-virus effect in mice; however, it does not directly inhibit growth of the virus in vitro, indicating that the anti-virus effect of YM-2A might be associated with modulation of the host immune system. In this study, we found that oral administration of YM-2A could inhibit tumor growth and improve survival rate in two distinct mouse models of colon-26 carcinoma and B16 melanoma. Orally administered YM-2A enhanced antitumor immune response by increasing INF-γ-expressing CD4+ and CD8+ cells in the spleen and INF-γ-expressing CD8+ cells in tumor-draining lymph nodes. In vitro study showed that YM-2A directly activated splenic CD11b+ myeloid cells, peritoneal macrophages and bone marrow-derived dendritic cells, but did not affect splenic CD11b- lymphocytes or colon-26 tumor cells. YM-2A is more slowly digested by pancreatic a-amylase than are amylopectin and rabbit liver glycogen, and orally administered YM-2A enhanced the expression of MHC class II and CD86 on dendritic cells and the expression of MHC class II on macrophages in Peyer's patches. Furthermore, in vitro stimulation of YM-2A increased the expression of pro-inflammatory cytokines in Peyer's patch CD11c+ cells. These results suggest that orally administered YM-2A can activate dendritic cells and macrophages in Peyer's patches, inducing systemic antitumor T-cell response. Thus, YM-2A might be a candidate for an oral therapeutic agent in cancer immunotherapy.

Masuda Y, Nakayama Y, Tanaka A, Naito K, Konishi M. Antitumor activity of orally administered maitake a-glucan by stimulating antitumor immune response in murine tumor. PLoS One. 2017;12(3):e0173621. Published 2017 Mar 9. doi:10.1371/journal.pone.0173621

TITLE :ANTIGENOTOXIC AND ANTIOXIDANT POTENTIAL OF MEDICINAL MUSHROOMS (IMMUNE ASSIST) AGAINST DNA DAMAGE INDUCED BY FREE RADICALS-AN IN VITRO STUDY

Abstract

Immune Assist (IA) is produced from extract of six species of medical mushrooms: Agaricus blazei - Cordyceps sinensis - Grifola frondosa - Ganoderma lucidum - Coriolus versicolor - Lentinula edodes. The genoprotective potential of IA was evaluated for the first time. Significant antigenotoxic effects were detected in human peripheral blood cells against H2O2 induced DNA damage, in the pretreatment and in the posttreatment. The most efficient concentration of IA in pretreatment was 500 μg/mL, while in posttreatment it was the concentration of 250 μg/mL. Kinetics of attenuation of H2O2 induced DNA damage in posttreatment with the optimal concentration of IA showed significant decrease in the number of damaged cells at all time periods (15-60 min), reaching the greatest reduction after 15 and 45 min. Remarkable ·OH scavenging properties and moderate reducing power, together with the modest DPPH scavenging activity, could be responsible for the great attenuation of DNA damage after 15 min of exposure to IA, while reduction of DNA damage after 45 min could be the result in additional stimulation of the cell's repair machinery. Our results suggest that IA displayed antigenotoxic and antioxidant properties. A broader investigation of its profile in biological systems is needed.

Živković L, Bajić V, Bruić M, et al. Antigenotoxic and antioxidant potential of medicinal mushrooms (Immune Assist) against DNA damage induced by free radicals-an in vitro study. Mutat Res. 2019;845:403078. doi:10.1016/j.mrgentox.2019.06.008

TITLE :IMPACT OF INGESTION OF RICE BRAN AND SHITAKE MUSHROOM EXTRACT ON LYMPHOCYTE FUNCTION AND CYTOKINE PRODUCTION IN HEALTHY RATS

Abstract

This article provides a controlled evaluation of the ability of dietary supplementation with a commercially available rice bran extract modified with shitake mushroom extract (MGN-3) to support the immune function by assessing the ability of immunocytes to proliferate and produce cytokines in response to a mitogenic challenge. Twenty-four male Lewis rats were fed a control diet (Maypo sweetened oatmeal) or Maypo containing the recommended daily dose of MGN-3 for 2 weeks. This treatment modestly enhanced mitogen enhanced proliferation of splenocytes and interferon-gamma (IFN-g) production, and significantly increased proliferation of splenocytes to the superantigen toxic shock syndrome toxin-1 (TSST-1) as well as natural killer (NK) cell activity and production of interleukin-2 (IL-2) by stimulated lymphocytes. These data support the contention that ingestion of MGN-3 can support immune cell function. These data add to a growing body of data showing that ingestion of MGN-3 improves the ability of immune cells to proliferate the lyse tumor cells, suggesting that it may have utility as a dietary aid to support the immune system.

Giese S, Sabell GR, Coussons-Read M. Impact of ingestion of rice bran and shitake mushroom extract on lymphocyte function and cytokine production in healthy rats. J Diet Suppl. 2008;5(1):47–61. doi:10.1080/19390210802329196

TITLE :A MULTIHERBAL FORMULATION INFLUENCING IMMUNE RESPONSE IN VITRO

Abstract

Aim: Aim of this study was to evaluate the effects of phytocomplexes of Uncaria, Shiitake and Ribes in terms of viability and inflammatory response on immune cell-derived cultures.

Results: Cell viability was not affected by extracts, except subtle variations observed only at higher doses (>250 µg/mL). The extract mixture was well tolerated, with no effects on cell viability up to doses of 500 µg/mL. Pre-treatment of macrophages with subtoxic doses of the extracts reduced the basal release of oxidative markers and enhanced the cell response to exogenous oxidant stimulation, as revealed by ROS and PGE2 release reduction. The same treatment on macrophage resulted in a selective modulation of the immune response, as shown by an increase of IL-6 mRNA and, partially, IL-8 mRNA, while a reduction was observed for TNFα mRNA.

Conclusion: Data confirm that extracts and their formulations can act as regulator of the immune system with mechanisms involving the oxidative stress and the release of selected proinflammatory cytokines.

Menghini L, Leporini L, Scanu N, et al. A multiherbal formulation influencing immune response in vitro. Minerva Med. 2012;103(1):13–21.

TITLE :THE EFFECT OF OLIVE LEAF EXTRACT ON UPPER RESPIRATORY ILLNESS IN HIGH SCHOOL ATHLETES: A RANDOMIZED CONTROL TRIAL

Abstract

Upper respiratory illness (URI) has a major impact on both training and competition in an athletic setting. High school athletes are a sub-category who have reported higher illness rates than professional and sub-elite high school athletes of the same sport. Olive leaf extract (OLE) is an over-the-counter supplement that contains polyphenols, notably oleuropein and hydroxytyrosol, that have antiviral, antibacterial, anti-inflammatory and antioxidant properties that may reduce URI rates. Thirty-two high school students who play sport for the elite team at their school were recruited to a randomised controlled trial and allocated to a daily placebo or OLE (extent equivalent to 20 g of olive leaf, containing 100 mg oleuropein) supplementation for nine weeks during their competitive season. Twice weekly measures of wellbeing, training load and respiratory illness (sporting upper respiratory illness (SUPPRESS) questionnaire) were recorded at trainings, meetings or games. There was no significant difference in illness incidence (odds ratio (OR): 1.02 (95% confidence interval (CI) 0.21⁻4.44)), but there was a significant 28% reduction in sick days (OR: 0.72 (95% CI 0.56⁻0.93) p-value = 0.02) when supplemented with OLE. The dietary intakes of the athletes were sub-optimal with regard to immune support. OLE supplementation over a season did not significantly reduce URI incidence, but did decrease duration in high school athletes, potentially aiding return to play.

Somerville V, Moore R, Braakhuis A. The Effect of Olive Leaf Extract on Upper Respiratory Illness in High School Athletes: A Randomised Control Trial. Nutrients. 2019;11(2):358. Published 2019 Feb 9. doi:10.3390/nu11020358

TITLE :OLIVE LEAF EXTRACTS ACT AS MODULATORS OF THE HUMAN IMMUNE RESPONSE

Abstract

Background: Olive tree leaves have been used in the Mediterranean area as traditional medicine in virtue of their healthy effects. Olive leaf extracts (OLEs) contain higher amounts of polyphenols than those detected in the extra virgin olive oil and fruit. Several lines of evidence support the cardioprotective, anti-oxidant and anti-inflammatory activities exerted by OLEs.

Results: Both extracts, but especially extract A, increased absolute numbers of CD8+ and natural killer (NK) cells. In addition, an increased production of interferon (IFN)-γ by both extracts as an expression of T helper (h)1 activation was observed. Finally, both extracts enhanced NO release.

Conclusion: OLEs, and mostly extract A, are able to in vitro modify healthy human immune response by increasing IFN-γ production which seems to be associated to the higher absolute numbers of CD8+ and NK cells and this may suggest a reinforcement of the anti-tumor activity. Furthermore, increased levels of NO may indicate the potential cardioprotective effects exerted by OLEs in virtue of their vasodilation dependent activity. Finally, OLEs are able to maintain the equilibrium between T regulatory cells and Th17 cells as evidenced by unmodified levels of interleukin (IL)-IL-10 and IL-17, respectively. In the light of these results, OLEs are potential therapeutic compounds for the treatment of chronic inflammatory disease, also preventing cardiovascular event outcome.

Magrone T, Spagnoletta A, Salvatore R, et al. Olive Leaf Extracts Act as Modulators of the Human Immune Response. Endocr Metab Immune Disord Drug Targets. 2018;18(1):85–93. doi:10.2174/1871530317666171116110537

TITLE :MULTIPLE MODULATORY ACTIVITIES OF ANDROGRAPHIS PANICULATA ON IMMUNE RESPONSES AND XENOGRAFT GROWTH IN ESOPHAGEAL CANCER PRECLINICAL MODELS

Abstract

Background: Esophageal cancer (EC) is a malignant gastrointestinal cancer with high morbidity worldwide and is the fourth leading cause of cancer-related deaths in China. Even though surgery and/or chemotherapy/chemoradiation might achieve good therapeutic response, recurrence rate is high due to cancer metastasis. Hence, the use of alternative adjuvant treatments, such as herbal medicines, for metastatic EC remains a great desire of the patients. Our previous studies have demonstrated the anti-metastatic efficacy of hot water extract of Andrographis paniculata (APW) in human esophageal cancer cells and tumor-bearing nude mice.

Conclusion: APW was shown to possess anti-tumor, anti-metastatic and immunomodulatory activities in esophageal cancer cell-based and animal models, including immunocompromised mice model and clinically relevant PDX model. Our findings illustrated the potential multi-targeted efficacies of APW in esophageal cancer management.

Yue GG, Li L, Lee JK, et al. Multiple modulatory activities of Andrographis paniculata on immune responses and xenograft growth in esophageal cancer preclinical models. Phytomedicine. 2019;60:152886. doi:10.1016/j.phymed.2019.152886

TITLE: CRITICAL CARE MANAGEMENT OF ADULTS WITH COMMUNITY-ACQUIRED SEVERE RESPIRATORY VIRAL INFECTION

Abstract

With the expanding use of molecular assays, viral pathogens are increasingly recognized among critically ill adult patients with community-acquired severe respiratory illness; studies have detected respiratory viral infections (RVIs) in 17-53% of such patients. In addition, novel pathogens including zoonotic coronaviruses like the agents causing Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS) and the 2019 novel coronavirus (2019 nCoV) are still being identified. Patients with severe RVIs requiring ICU care present typically with hypoxemic respiratory failure. Oseltamivir is the most widely used neuraminidase inhibitor for treatment of influenza; data suggest that early use is associated with reduced mortality in critically ill patients with influenza. At present, there are no antiviral therapies of proven efficacy for other severe RVIs. Several adjunctive pharmacologic interventions have been studied for their immunomodulatory effects, including macrolides, corticosteroids, cyclooxygenase-2 inhibitors, sirolimus, statins, anti-influenza immune plasma, and vitamin C, but none is recommended at present in severe RVIs. Evidence-based supportive care is the mainstay for management of severe respiratory viral infection. Non-invasive ventilation in patients with severe RVI causing acute hypoxemic respiratory failure and pneumonia is associated with a high likelihood of transition to invasive ventilation. Limited existing knowledge highlights the need for data regarding supportive care and adjunctive pharmacologic therapy that is specific for critically ill patients with severe RVI. There is a need for more pragmatic and efficient designs to test different therapeutics both individually and in combination.

Arabi YM, Fowler R, Hayden FG. Critical care management of adults with community-acquired severe respiratory viral infection. Intensive Care Med. 2020;46(2):315–328. doi:10.1007/s00134-020-05943-5

TITLE: PLATELET-TO-LYMPHOCYTE RATIO IS ASSOCIATED WITH PROGNOSIS IN PATIENTS WITH CORONAVIRUS DISEASE-19

Abstract

Since December 2019, novel coronavirus infected pneumonia emerged in Wuhan city and rapidly spread throughout China. In severe novel coronavirus pneumonia cases, the number of platelets, their dynamic changes during the treatment, platelet-to-lymphocyte ratio (PLR) were a concern. We sought to describe the platelet feature of these cases. Single-center case series of the 30 hospitalized patients with confirmed coronavirus disease (COVID)-19 in Huizhou municipal central hospital from January 2020 to February 2020 were retrospectively analyzed. Demographic, clinical, blood routine results, other laboratory results, and treatment data were collected and analyzed. Outcomes of severe patients and nonsevere patients were compared. Univariate analysis showed that: age, platelet peaks, and PLR at peak platelet were the influencing factors in severe patients, multivariate analysis showed that the PLR value at peak platelet during treatment was an independent influencing factor in severe patients. The average hospitalization day of patients with platelet peaks during treatment was longer than those without platelet peaks ($P < .05$). The average age of patients with platelet peaks during treatment was older than those without platelet peaks ($P < .05$). The patients with significantly elevated platelets during treatment had longer average hospitalization days. And the higher PLR of patients during treatment had longer average hospitalization days. Single-center case series of the 30 hospitalized patients with confirmed COVID-19 in Huizhou Municipal Central Hospital, presumed that the number of platelets and their dynamic changes during the treatment may have a suggestion on the severity and prognosis of the disease. The patient with markedly elevated platelets and longer average hospitalization days may be related to the cytokine storm. The PLR of patients means the degree of cytokine storm, which might provide a new indicator in the monitoring in patients with COVID-19.

Qu R, Ling Y, Zhang YH, et al. Platelet-to-lymphocyte ratio is associated with prognosis in patients with coronavirus disease-19 [published online ahead of print, 2020 Mar 17]. J Med Virol. 2020;10.1002/jmv.25767. doi:10.1002/jmv.25767

TITLE: ESTIMATING THE ASYMPTOMATIC PROPORTION OF CORONAVIRUS DISEASE 2019 (COVID-19) CASES ON BOARD THE DIAMOND PRINCESS CRUISE SHIP, YOKOHAMA, JAPAN, 2020

Abstract

On 5 February 2020, in Yokohama, Japan, a cruise ship hosting 3,711 people underwent a 2-week quarantine after a former passenger was found with COVID-19 post-disembarking. As at 20 February, 634 persons on board tested positive for the causative virus. We conducted statistical modelling to derive the delay-adjusted asymptomatic proportion of infections, along with the infections' timeline. The estimated asymptomatic proportion was 17.9% (95% credible interval (CrI): 15.5-20.2%). Most infections occurred before the quarantine start

Mizumoto K, Kagaya K, Zarebski A, Chowell G. Estimating the asymptomatic proportion of coronavirus disease 2019 (COVID-19) cases on board the Diamond Princess cruise ship, Yokohama, Japan, 2020. Euro Surveill. 2020;25(10):2000180. doi:10.2807/1560-7917.ES.2020.25.10.2000180

TITLE: GUIDE TO THE FORENSIC PATHOLOGY PRACTICE ON DEATH CASES RELATED TO CORONA VIRUS DISEASE 2019 （COVID-19）

Abstract

Autopsy is of great significance to the elucidation of the pathological changes, pathogeneses and causes of death of corona virus disease 2019 （COVID-19） and can provide theoretical basis for more scientific and accurate prevention and control of the outbreak. Based on related laws and regulations, such as the Law of the People's Republic of China on Prevention and Control of Infectious Diseases, the clinical manifestations and epidemiological characteristics of COVID-19, and the related guidelines on the prevention and control of the outbreak, combined with the practical work of forensic pathology examination, the Guide to the Forensic Pathology Practice on Death Cases Related to Corona Virus Disease 2019 （COVID-19） （Trial Draft） has been developed. This guide includes information on the background investigation of the cases, autopsy room requirements, personal prevention and protections, external examinations, autopsy, auxiliary examinations, and so on. This guide can be used as a reference by forensic and pathological examination institutions, as well as examination staff.

Mao DM, Zhou N, Zheng D, et al. Guide to the Forensic Pathology Practice on Death Cases Related to Corona Virus Disease 2019 （COVID-19） （Trial Draft. Fa Yi Xue Za Zhi. 2020;36(1):6–5. doi:10.12116/j.issn.1004-5619.2020.01.003

TITLE: REVIEW AND PROSPECT OF PATHOLOGICAL FEATURES OF CORONA VIRUS DISEASE

Abstract

Since 2003, coronavirus has caused multiple major public health events that resulted in global epidemics, such as severe acute respiratory syndrome （SARS）, Middle East respiratory syndrome （MERS） and corona virus disease 2019 （COVID-19）. Especially since COVID-19 outbroke in Wuhan, Hubei, in December 2019, coronavirus has had a significant impact on people's health and lives. But so far, the pathological diagnosis of COVID-19 has been relatively deficient： it is still confined to the pathological findings of punctured organs, and the majority of medical workers have poor awareness of its pathological characteristics. The COVID-19, as same as SARS and MERS, is caused by coronaviruses and can cause viral pneumonia. They have certain similarities. This article comprehensively reviews the pathological features observed in the autopsies of the aforementioned three diseases, in order to provide reference to the analysis of pathological changes of COVID-19.

Wang HJ, Du SH, Yue X, Chen CX. Review and Prospect of Pathological Features of Corona Virus Disease. Fa Yi Xue Za Zhi. 2020;36(1):16–20. doi:10.12116/j.issn.1004-5619.2020.01.004

TITLE: THE EFFECT OF ASCORBIC ACID ON INFECTION CHICK-EMBRYO CILIATED TRACHEAL ORGAN CULTURES BY CORONAVIRUS

Abstract

Chick embryo tracheal organ cultures showed increased resistance to infection by a coronavirus after exposure to ascorbate, while chick respiratory epithelium and allantois-on-shell preparations showed no increase in resistance to infection by an influenza virus or a paramyxovirus.

Atherton JG, Kratzing CC, Fisher A. The effect of ascorbic acid on infection chick-embryo ciliated tracheal organ cultures by coronavirus. Arch Virol. 1978;56(3):195–199. doi:10.1007/BF01317848

TITLE: VITAMIN C AND SARS CORONAVIRUS

Sir,

Recently, a new coronavirus was identified as the cause of the severe acute respiratory syndrome (SARS).[1] In the absence of a specific treatment for SARS, the possibility that vitamin C may show non-specific effects on severe viral respiratory tract infections should be considered. There are numerous reports indicating that vitamin C may affect the immune system,[2,3] for example the function of phagocytes, transformation of T lymphocytes and production of interferon. In particular, vitamin C increased the resistance of chick embryo tracheal organ cultures to infection caused by an avian coronavirus.[4] Studies in animals found that vitamin C modifies susceptibility to various bacterial and viral infections,[3] for example protecting broiler chicks against an avian coronavirus.[5] Placebo-controlled trials have shown quite consistently that the duration and severity of common cold episodes are reduced in the vitamin C groups,[3] indicating that viral respiratory infections in humans are affected by vitamin C levels. There is also evidence indicating that vitamin C may affect pneumonia.[3] In particular, three controlled trials with human subjects reported a significantly lower incidence of pneumonia in vitamin C-supplemented groups,[6] suggesting that vitamin C may affect susceptibility to lower respiratory tract infections under certain conditions. The possibility that vitamin C affects severe viral respiratory tract infections would seem to warrant further study, especially in light of the recent SARS epidemic.

Hemilä H. Vitamin C and SARS coronavirus. J Antimicrob Chemother. 2003;52(6): 1049–1050. doi:10.1093/jac/dkh002

TITLE: IMMUNE-ENHANCING ROLE OF VITAMIN C AND ZINC AND EFFECT ON CLINICAL CONDITIONS

Abstract

Vitamin C concentrations in the plasma and leukocytes rapidly decline during infections and stress. Supplementation of vitamin C was found to improve components of the human immune system such as antimicrobial and natural killer cell activities, lymphocyte proliferation, chemotaxis, and delayed-type hypersensitivity. Vitamin C contributes to maintaining the redox integrity of cells and thereby protects them against reactive oxygen species generated during the respiratory burst and in the inflammatory response. Likewise, zinc undernutrition or deficiency was shown to impair cellular mediators of innate immunity such as phagocytosis, natural killer cell activity, and the generation of oxidative burst. Therefore, both nutrients play important roles in immune function and the modulation of host resistance to infectious agents, reducing the risk, severity, and duration of infectious diseases. This is of special importance in populations in which insufficient intake of these nutrients is prevalent. In the developing world, this is the case in low- and middle-income countries, but also in subpopulations in industrialized countries, e.g. in the elderly. A large number of randomized controlled intervention trials with intakes of up to 1 g of vitamin C and up to 30 mg of zinc are available. These trials document that adequate intakes of vitamin C and zinc ameliorate symptoms and shorten the duration of respiratory tract infections including the common cold. Furthermore, vitamin C and zinc reduce the incidence and improve the outcome of pneumonia, malaria, and diarrhea infections, especially in children in developing countries.

Wintergerst ES, Maggini S, Hornig DH. Immune-enhancing role of vitamin C and zinc and effect on clinical conditions. Ann Nutr Metab. 2006;50(2):85–94. doi: 10.1159/000090495

TITLE: VITAMIN C AND IMMUNE FUNCTION

Abstract

Vitamin C is an essential micronutrient for humans, with pleiotropic functions related to its ability to donate electrons. It is a potent antioxidant and a cofactor for a family of biosynthetic and gene regulatory enzymes. Vitamin C contributes to immune defense by supporting various cellular functions of both the innate and adaptive immune system. Vitamin C supports epithelial barrier function against pathogens and promotes the oxidant scavenging activity of the skin, thereby potentially protecting against environmental oxidative stress. Vitamin C accumulates in phagocytic cells, such as neutrophils, and can enhance chemotaxis, phagocytosis, generation of reactive oxygen species, and ultimately microbial killing. It is also needed for apoptosis and clearance of the spent neutrophils from sites of infection by macrophages, thereby decreasing necrosis/NETosis and potential tissue damage. The role of vitamin C in lymphocytes is less clear, but it has been shown to enhance differentiation and proliferation of B- and T-cells, likely due to its gene regulating effects. Vitamin C deficiency results in impaired immunity and higher susceptibility to infections. In turn, infections significantly impact on vitamin C levels due to enhanced inflammation and metabolic requirements. Furthermore, supplementation with vitamin C appears to be able to both prevent and treat respiratory and systemic infections. Prophylactic prevention of infection requires dietary vitamin C intakes that provide at least adequate, if not saturating plasma levels (i.e., 100-200 mg/day), which optimize cell and tissue levels. In contrast, treatment of established infections requires significantly higher (gram) doses of the vitamin to compensate for the increased inflammatory response and metabolic demand.

Carr AC, Maggini S. Vitamin C and Immune Function. Nutrients. 2017;9(11):1211. Published 2017 Nov 3. doi:10.3390/nu9111211

TITLE: ZINC AND IMMUNITY: AN ESSENTIAL INTERRELATION

Abstract

The significance of the essential trace element zinc for immune function has been known for several decades. Zinc deficiency affects immune cells, resulting in altered host defense, increased risk of inflammation, and even death. The micronutrient zinc is important for maintenance and development of immune cells of both the innate and adaptive immune system. A disrupted zinc homeostasis affects these cells, leading to impaired formation, activation, and maturation of lymphocytes, disturbed intercellular communication via cytokines, and weakened innate host defense via phagocytosis and oxidative burst. This review outlines the connection between zinc and immunity by giving a survey on the major roles of zinc in immune cell function, and their potential consequences in vivo.

Maares M, Haase H. Zinc and immunity: An essential interrelation. Arch Biochem Biophys. 2016;611:58–65. doi:10.1016/j.abb.2016.03.022

TITLE: ZINC AS A GATEKEEPER OF IMMUNE FUNCTION

Abstract

After the discovery of zinc deficiency in the 1960s, it soon became clear that zinc is essential for the function of the immune system. Zinc ions are involved in regulating intracellular signaling pathways in innate and adaptive immune cells. Zinc homeostasis is largely controlled via the expression and action of zinc "importers" (ZIP 1-14), zinc "exporters" (ZnT 1-10), and zinc-binding proteins. Anti-inflammatory and anti-oxidant properties of zinc have long been documented, however, underlying mechanisms are still not entirely clear. Here, we report molecular mechanisms underlying the development of a pro-inflammatory phenotype during zinc deficiency. Furthermore, we describe links between altered zinc homeostasis and disease development. Consequently, the benefits of zinc supplementation for a malfunctioning immune system become clear. This article will focus on underlying mechanisms responsible for the regulation of cellular signaling by alterations in zinc homeostasis. Effects of fast zinc flux, intermediate "zinc waves", and late homeostatic zinc signals will be discriminated. Description of zinc homeostasis-related effects on the activation of key signaling molecules, as well as on epigenetic modifications, are included to emphasize the role of zinc as a gatekeeper of immune function.

Wessels I, Maywald M, Rink L. Zinc as a Gatekeeper of Immune Function. Nutrients. 2017;9(12):1286. Published 2017 Nov 25. doi:10.3390/nu9121286

TITLE: FUTURE PERSPECTIVES IN ADDRESSING THE GLOBAL ISSUE OF VITAMIN D DEFICIENCY

Abstract

Vitamin D is a fundamentally critical nutrient that the human body requires to function properly. It plays an important role in musculoskeletal health due to its involvement in the regulation of calcium and phosphorus. Having a low level of vitamin D in the body may be detrimental for a wide range of health outcomes, including risk of osteoporotic and stress fractures, risk of CVD and some cancers, and lowering of the capability of the immune system. Vitamin D is an unusual nutrient; it is not a vitamin, in the true sense of the word but a pro-hormone. The main source of vitamin D is UV exposure, not dietary intake. Interestingly, there are two forms of vitamin D, vitamin D2 and vitamin D3, both of which are metabolised into 25-hydroxyvitamin D (25(OH)D) in the liver, the biomarker of vitamin D status. Vitamin D deficiency is a global public health problem, especially amongst older people and ethnic minority groups. The newest publication from the UK Government's Public Health England Department recommends that vitamin D intake should be 10 µg daily and this recommendation compares well (albeit lower) with other guidelines such as the Institute of Medicine recommendation of 15 µg for those aged 1-70 years and 20 µg for those 70 years or over. Few countries, however, have a specific vitamin D policy to prevent deficiency in populations. Finland leads the way, demonstrating impressive results in reducing population-level vitamin D deficiency through mandatory food fortification programmes. Collaboration between academia, government and industry, including countries from varying latitudes, is essential to identify long-term solutions to the global issue of vitamin D deficiency. This paper provides a narrative review of the evidence related to the role of vitamin D deficiency in health outcomes, outlines controversies regarding setting levels of adequacy, identifies the prevalence of vitamin D deficiency across the globe, and identifies population-level strategies adopted by countries to prevent vitamin D deficiency.

Mendes MM, Charlton K, Thakur S, Ribeiro H, Lanham-New SA. Future perspectives in addressing the global issue of vitamin D deficiency. Proc Nutr Soc. 2020;79(2): 246–251. doi:10.1017/S0029665119001538