



Review article

Dawn of antioxidants and immune modulators to stop HIV-progression and boost the immune system in HIV/AIDS patients: An updated comprehensive and critical review



Gurinder Singh, Roopa S. Pai*

Department of Pharmaceutics, Faculty of Pharmacy, Al-Ameen College of Pharmacy, Bangalore, India

ARTICLE INFO

Article history:

Received 22 October 2014

Received in revised form 5 December 2014

Accepted 8 December 2014

Available online 24 December 2014

Keywords:

Resveratrol

HIV/AIDS

Murabutide

Setarud

Tucaresol

ABSTRACT

In the last two decades, human immunodeficiency virus (HIV), the retrovirus responsible for the acquired immunodeficiency syndrome (AIDS), is one of the leading causes of morbidity and mortality, worldwide. Providing the optimum management of HIV/AIDS is a major challenge in the 21st century. Since, HIV-infected persons have an extended lifespan due to the development of effective antiretroviral therapies, malnutrition is becoming central factors of long-term survivors. The nutrition status of AIDS patients has a significant influence on the maintenance and optimal effectiveness of the immune system. Micronutrient therapy in combination with allopathic treatments can extend and improve the quality and quantity of life in individuals infected with HIV/AIDS. HIV infection is thought to lead to augmented oxidative stress which may in turn lead to faster development of HIV disease. Hence, antioxidants might have a significant role in the treatment of HIV/AIDS. An additional approach to treating HIV infection is fortifying the immune response of infected people. Immune modulators help to activate and boost the normal immune function. The present review first describes the boon of antioxidants (especially Vitamin A) and immune modulators (cytolin, resveratrol, murabutide, setarud, tucaresol, AVR118, Immunitin (HE2000), reticulose, and interleukin-7) in the treatment of HIV/AIDS. Then, providing a comparatively succinct outline on updated patents study on antioxidants and immune modulators to treat HIV/AIDS will be discussed.

© 2014 Institute of Pharmacology, Polish Academy of Sciences. Published by Elsevier Sp. z o.o. All rights reserved.

Contents

Introduction	601
Scope of the review	601
Antioxidants in HIV/AIDS	601
Immune modulators in HIV/AIDS	602
Tucaresol	602
Setarud	602
Resveratrol	602
Murabutide	602
Cytolin	602
AVR118	602
Immunitin (HE2000)	603
Reticulase	603
Interleukin-7	603

* Corresponding author.

E-mail addresses: gurindersingh181@gmail.com (G. Singh), roopaspai@yahoo.com (R.S. Pai).

Patents status on antioxidants and immune modulators for the treatment of HIV/AIDS.....	604
Future perspectives and conclusion	604
Conflict of interest	604
Acknowledgements	604
References	604

Introduction

HIV is the major cause of AIDS which still remains a substantial cause of mortality globally [1]. In the last quarter of a century, it was anticipated that the total number of people infected by HIV accounted for around 33 million, while an extra 25 million more have already died since the first reported cases in 1981 tracked by the discovery of HIV as the reason of the disease in 1983 [2,3]. In 2013, more than 35.3 million persons were infected with HIV across the globe *vis-à-vis* last decade [4]. Thus, HIV signifies one of the undefeatable problems of the 21st century and has caused socioeconomic damage worldwide [5].

Comparatively early in the HIV pandemic, a function for nutritional factors in the pathogenesis of HIV disease was assumed, based on the known effects of certain nutrient deficiencies on immune function [6–9]. In the developing world, treatments for opportunistic infections are unavailable, and low budget treatments are desperately needed. Nutritional supplements are inexpensive enough to be potentially constructive treatments of HIV disease in a developing country. Several lines of data suggest that dietary intake of antioxidants in particular may sluggish the progression of HIV disease. HIV patients are thought to experience oxidative stress [10]. Tissue levels of antioxidants including glutathione, ascorbic acid, tocopherols, carotenoids, and selenium have been revealed to be depleted in HIV persons, and there are some proofs that the action of antioxidant enzymes such as superoxide dismutase and glutathione peroxidase may be reduced as well. Oxidative stress may lead to evolution of HIV disease due to devastation of immune function, enhancement of HIV replication, or augmentation of apoptosis [10,11]. Results from *in vitro*, animal, and human studies signify that oxidative stress is connected to impaired immune function [12]. In a broad range of conditions and disease states characterized by increased oxidative stress, antioxidants have been revealed to boost immune function in human intervention studies [13].

Another approach to treat HIV infection is strengthening the immune response of people who are infected. Some clinical reports have proposed that some immune modulators such as resveratrol [14], tucaresol [15], setarud [16–18], murabutide [19–21], and cytolin [22], AVR118 [23,24], Immunitin (HE2000) [25], reticulose [26] and interleukin-7 [27] might be a potential candidates for the prevention and/or treatment of HIV/AIDS and synergistically enhances the anti-HIV-1 activity [15].

Scope of the review

This review paper provides an updated bird's-eye view account on the recent advances of antioxidants and immune modulators are under investigation to stop HIV-progression and boost the immune system in HIV/AIDS patients.

Antioxidants in HIV/AIDS

The anti-retroviral therapy has extended as well as enhanced the quality of life of HIV-infected patients. However, access to such treatment remains a major concern in most parts of the world, particularly in the developing countries. For this reason, there is an invariable need to find economical interventions to complement

the role of anti-retroviral therapy in prevention and slowing the HIV disease progression. Nutritional interventions, particularly vitamin supplementation, have the potential to be an inexpensive method for being such an involvement by desirable quality of their modulation of the immune system [28]. Vitamins appear to have substantial clinical significance in HIV infection. Research and observational studies have exposed that certain vitamins are normally deficient in HIV-infected patients [29,30]. Vitamin deficiency shows to be related to altered immune status in the HIV infected patients [31]. As such they are essential co-factors in optimal functioning of the immune systems. Illnesses in AIDS patients usually include fever, diarrhea, weight loss and opportunistic infections due to severe immune dysfunction. The gastrointestinal tract (GIT) is a major target for AIDS-related diseases with diarrhea, oral and esophageal candidiasis, dysphagia, and odynophagia being common manifestations [32]. These complications contribute to malnutrition and can also predispose the patient to malabsorption and sepsis. This results in further immune dysfunction, thereby escalating the risk of opportunistic diseases and progression to AIDS [32].

The effects of murine and human retrovirus infection on vitamin status are analyzed as co-factors in the development of severe immune dysfunction, AIDS. The properties of immune enhancing antioxidative vitamins, vitamin A, B6, B12, C, E, and B-carotene, which are usually low in AIDS patients, are appraised relative to the development of immunodeficiency during retrovirus infection. Vitamin A, E, and B12 deficiency hasten the development of AIDS with low T cells, whereas their normalization retarded the development of immune dysfunction [33]. A particular combination of multivitamins along with selenium slows HIV disease progression among those who are treatment naive and have a CD4 count above 350. Taking both the multivitamins and selenium lowered the risk of CD4s falling below 350 [34].

Micronutrients in general, including vitamin A, play crucial roles in keeping immune function [35,36]. Vitamin A is important for sight, immunity, growth and development, and red blood cell production [37]. It plays an essential role in the expansion and differentiation of white blood cells (WBC), such as lymphocytes, which are crucial for immune response. The body's first line of defence against infection is provided by the skin and mucosa, the reliability of which is preserved by vitamin A [36]. Mostly in developing countries, levels of micronutrient are low in HIV-infected adults, where diets are often poor. Deficiency of micronutrient has an impact on immune function. Low levels of vitamin A in the blood are related with fast HIV disease progression and death [38]. For this reason, there has been much interest in micronutrient supplementation and its promising function in enhancing immune function, thwarting HIV transmission and delaying HIV progression. Most studies have found that low levels of vitamin A are associated with augmented risk of transmission of HIV from mother to child [28]. Supplementation of multivitamin in HIV pregnant mothers has been revealed to lessen the occurrence of adverse pregnancy results such as fetal loss and low birth weight. Further, multivitamin supplementation lessens the rate of HIV disease progression amongst patients in early stage of disease, as a result delaying the need for anti-retroviral therapy [28]. In brief, there is no proof to suggest vitamin A supplementation of HIV-infected pregnant women; but, vitamin A supplementation of

Download English Version:

<https://daneshyari.com/en/article/2011903>

Download Persian Version:

<https://daneshyari.com/article/2011903>

[Daneshyari.com](https://daneshyari.com)