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Research Article

"NEURITIN": An Inbuilt Weapon Against Hypersensitivity Reactions-A Systematic Review

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Abstract

Background: Neuritin, also known as CPG-15 is a protein that plays a crucial role in neural development and synaptic plasticity. Apart from this neurological function, Neuritin has been recognised for its potential role in various immunological functions. Recent researches have proven that regulatory T cells, (a subset of T lymphocytes) involved in immune regulation, are associated with Neuritin production and could potentially modulate numerous immune responses. Based on few clinical studies, the production of Neuritin in the body with the help of foxP3 signaling pathway could act as a potential weapon against anaphylactic (IgG) and atopy (IgE) related Hypersensitivity reactions.

Aim: To determine the significance of targeting Neuritin protein in order to treat conditions like Allergy and Autoimmunity.

Research question: Will targeting Neuritin protein bring a new wave in combating Hypersensitivity reactions?

Materials and Methodology: With the Medline, Cochrane and Medknow database taken as reference, 16 articles that have undergone Randomized Control Trial was selected for the study after having met the criterion for Systematic Review.

Results: Statistical analysis confirms significance, supporting the null hypothesis that targeting Neuritin protein effectively treats Hypersensitivity and Autoimmune diseases.

Keywords: Neuritin; Hypersensitivity; Autoimmunity; Targeted Therapy; Follicular B Cell; Treg Cells; Teff Cells; IgE Mediated Allergies

Introduction

Neuritin, also referred to as candidate plasticity gene 15(cpg15), is a protein that holds a crucial role in neural development and synaptic plasticity. Researchers have identified it as the body's natural defence mechanism against allergic reactions [1,2]. Its primary function involves preventing Hypersensitivity by hindering the excessive production of Immunoglobulin E (IgE), the key factor responsible for triggering allergic responses [1]. Studies propose that neuritin might serve as a promising target for therapeutic interventions in diseases affecting both the peripheral and central nervous systems. Additionally, it shows potential applications in conditions associated with Hypersensitivity and Autoimmunity [2,3].

Aim of the Study

To determine the significance of targeting Neuritin protein in order to treat conditions like Hypersensitivity and Autoimmune disorders.

Research question

Will targeting Neuritin protein bring a new wave in combatting Hypersensitivity reactions?

- **Null hypothesis:** Targeting Neuritin will treat Hypersensitivity and Autoimmune diseases.
- **Alternate hypothesis:** Targeting Neuritin will not treat Hypersensitivity and Autoimmune diseases.

Materials and Methodology

Several research endeavours and studies have been undertaken in this regard till date. With the Cochrane collaboration taken as reference along with other scientific stations like Medline and Medknow, 27 research/study articles were selected having undergone a definite Randomised Controlled Trial (RCT). Amongst these, a total of 16 articles underwent screening and were ultimately selected for inclusion in our study, adhering to the predetermined inclusion and exclusion criterion outlined below.

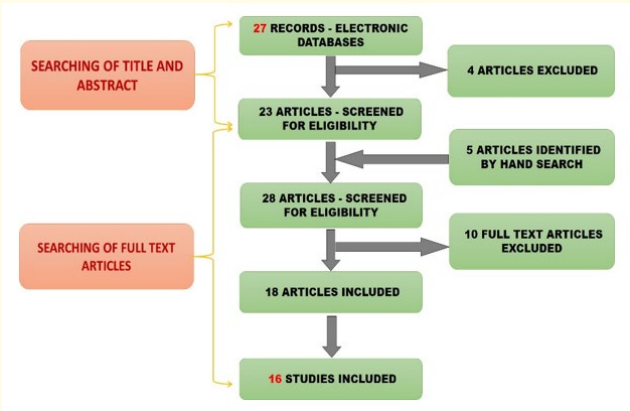

Figure a

Result

The result, obtained after statistical analysis, has shown significant alignment with the null hypothesis, indicating that targeting the Neuritin protein is definitely effective in the treatment of Hypersensitivity and Autoimmune diseases.

Discussion

Hypersensitivity is an exaggerated immune response to an external substance, while Autoimmune diseases occur when the immune system mistakenly attacks the body's own tissues and cells. Both involve immune system dysregulation but differ in their targets-the former reacts to external triggers, while the latter attacks the body itself [5,6].

Understanding the pathophysiology in detail, Hypersensitivity arises from a two-step process. The first exposure primes the immune system. Antigen-presenting cells capture and present allergen fragments to T and B cells. Activated B cells churn out allergen-specific antibodies (IgE in type I) that bind to mast cells. Upon re-exposure, allergen binds these IgE antibodies, triggering mast cell degranulation. Released mediators like histamine cause the hallmark symptoms of Hypersensitivity by increasing blood vessel permeability, constricting airways, and promoting inflammation. Chronic reactions can lead to a generally heightened immune response, potentially increasing susceptibility to other Allergies and Autoimmune diseases [5,6].

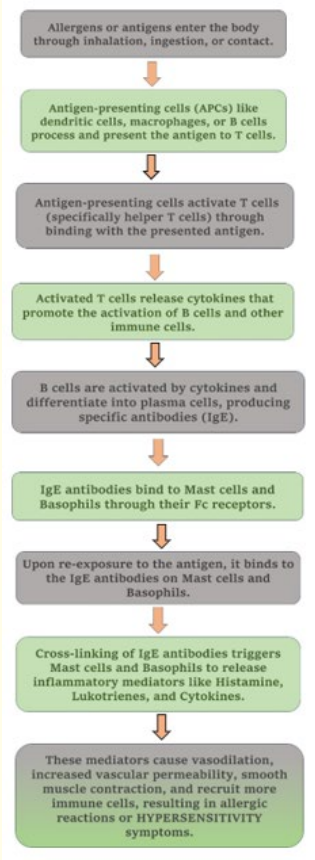

Figure b

Neuritin, also known as CPG15, has been studied for its potential role in various immune and neurological functions. Neuritin is produced by immune cells, especially by a special class of cells called follicular regulatory T (Tfr) cells. Treg cells are known to play a crucial role in immune tolerance and regulation, including the suppression of excessive immune responses. The release of neuritin by Treg cells could potentially modulate neural functions and immune responses [3,4].

Neuritin acts as a natural defence against allergic reactions and Autoimmune conditions by suppressing the formation of harmful antibodies that attack the body's own tissues or respond to harmless substances [3,4].

Neuritin acts as a brake on the immune system

This protein helps prevent B cells in germinal centres from becoming plasma cells, which are antibody factories. By limiting plasma cell formation, neuritin reduces the production of excessive IgE antibodies, a type linked to allergies. This also helps curb the development of autoantibodies, harmful antibodies that mistakenly target the body's own tissues [7,8].

Figure c

In case Hypersensitivity reactions, when Neuritin is absent, the immune system goes into overdrive upon encountering allergens. T cells become activated, releasing inflammatory chemicals (cytokines) that ramp up the immune response. This triggers B cells to transform into antibody factories (plasma cells), churning out IgE antibodies specifically against the allergen. These high levels of IgE set the stage for allergic reactions [9].

In the presence of Neuritin, Neuritin protein works inside B cells to dampen signals that would normally trigger a full-blown allergic response. By interfering with these internal pathways, neuritin keeps B cells from multiplying excessively and churning out large amounts of IgE antibodies. This reduction in IgE levels helps prevent the allergic reactions associated with hypersensitivity [9,10].

In our body, the balance of the immune system is typically maintained by a dynamic interplay between regulatory T (Treg) cells and effector T (Teff) cells, each serving contrasting roles. Teff cells coordinate immune responses against pathogens and eliminate infected cells through cytotoxic mechanisms. Additionally, they differentiate into various subsets of helper T cells, promoting heightened antibody responses [9,11].

In contrast, Treg cells act as regulators by dampening excessive immune activation, primarily through the suppression of Teff cells, thereby upholding immune tolerance [11,12].

In the context of autoimmunity, this delicate equilibrium is disrupted. This disruption can manifest through either reduced Treg cell numbers or impaired Treg cell function, resulting in diminished neuritin production and contributing to the development of autoimmune diseases [13-16].

In a transgenic mouse study, mice with normal levels of Neuritin remained in good health. Conversely, mice lacking this protein exhibited exaggerated allergic responses and increased production of autoantibodies. However, when these Neuritin-deficient mice were administered soluble Neuritin, they demonstrated improved response. Notably, mice lacking Neuritin experienced fatalities due to Anaphylaxis [17-19].

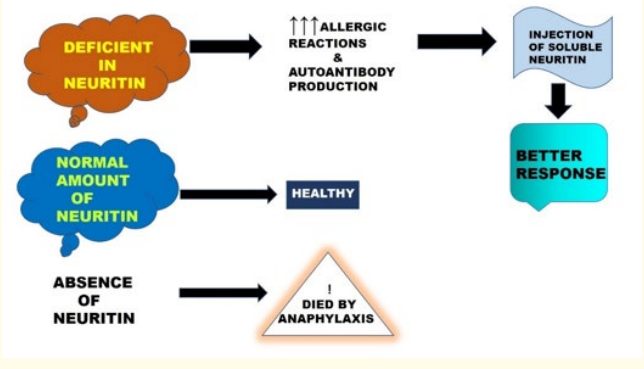

Figure d

Conclusion

Based on the statistical analysis of the study's results, it is evident that targeting the Neuritin protein holds significant promise in combating Hypersensitivity and Autoimmune diseases. The findings support the Null hypothesis, indicating that interventions aimed at modulating Neuritin levels can effectively mitigate allergic responses and autoantibody production. The observed improvements in response to soluble neuritin administration further underscore the therapeutic potential of this approach. Thus, highlighting the importance of Neuritin in maintaining immune balance and suggest its potential as a target for therapeutic interventions in hypersensitivity and autoimmune conditions.

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