



Therapeutic of Controlled Exposure to Selected Allergens - A Non-drug Measure

Nwachukwu Francis Chukwuedozie^{1*}, O. Mbakwe²
and Onwuegbule Martina Chinyere³

¹Department of Biochemistry and Forensic Science, Faculty of Science, Nigeria Police Academy, Nigeria.

²Department of Laboratory, General Hospital Kubwa, Abuja, Nigeria.

³Intensive Care Unit, Federal Medical Center, Owerri, Imo State, Nigeria.

Authors' contributions

This is a collaborative work between all authors. Author NFC conceived, designed the study, performed the statistical analysis, wrote the protocol, wrote the first draft of the manuscript and managed literature searches. Author OM read the first draft and made some inputs in the discussion. Author OMC led the clinical team in the field work. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/BJMMR/2016/27799

Editor(s):

(1) Alex Xiucheng Fan, Department of Biochemistry and Molecular Biology, University of Florida, USA.

(2) Nurhan Cucer, Erciyes University, Medical Biology Department, Turkey.

(3) Salomone Di Saverio, Emergency Surgery Unit, Department of General and Transplant Surgery, S. Orsola Malpighi University Hospital, Bologna, Italy.

Reviewers:

(1) Maged Refaat, Ain Shams University, Egypt.

(2) Renshan Sun, Medical University in Chongqing, China.

(3) Celso Eduardo Olivier, Instituto Alergoimuno de Americana, Brazil.

Complete Peer review History: <http://www.sciencedomain.org/review-history/16595>

Original Research Article

Received 20th June 2016

Accepted 1st September 2016

Published 18th October 2016

ABSTRACT

Allergies exemplify the cases in which normally unnecessary immune responses give rise to diseases. The research was aimed to explain some of the background on biochemical adaptation, in non drug treatment of allergic reactions through well-thought-out exposure on allergens. Allergic reactions viz: Insect sting allergy, allergic rhinitis, food allergy, drug allergy and allergic asthma were delved into and result presented in percentage reliability. The results of the six-year showed insect sting allergy, allergic asthma, and allergic rhinitis were 60, 33 and 39% respectively, while drug and food allergy were 30 and 38% respectively. The allergies follow similar pattern in all, involving inflammation, immunoglobulin E, histamine among others. The results depicted that

*Corresponding author: E-mail: tilong3788@yahoo.com;

controlled repetitive exposures caused desensitization and tolerance to the respective allergens. This method might have reduced the production of allergic participatory cells hence a new form of vaccination. This study described the outcome of the association between allergen exposure, sensitization and allergic diseases. This work is considered paramount when allergy symptoms are moderate to severe, occurs throughout the year, do not respond adequately to medications, and are triggered by an allergen not easily avoided.

Keywords: Allergic reaction; desensitization; tolerance; reliability; triggers.

1. INTRODUCTION

Allergic reaction is the body's way of responding to an invader when the body senses a foreign substance (antigen), in this process the immune system is triggered. The immune system normally protects the body from harmful agents such as bacteria and toxins. Its overreaction to harmless substances are refers to allergic reaction. The condition is caused through hypersensitivity of the immune system to something in the environment that usually causes little problem in most people [1]. These diseases include hay fever, food allergies, atopic dermatitis, and allergic asthma. Symptoms may include red eyes, an itchy rash, runny nose, shortness of breath, or swelling. Aside this, food intolerances and food poisoning are separate conditions [2].

There are no limitations to what is considered as allergens and they are common. It ranges from dust, pollen plant, sulfur drugs, food, insect bites, or bees sting, virus, bacterial to countless other things. Reaction may occur in one spot. Such as small localized skin rash, itchy eye, face humps or all over the body, as in rash such as hives. Most allergic reactions are minor, such as rashes from poison ivy, mosquito or other bug bite or sneezing from hay fever, plant pollens from grasses, trees, or ragweed; animal danders, which are tiny scales shed from the skin and hair of cats and other furred animals; arachnids and insects, such as house dust mites, bees, and wasps and drugs, such as penicillin. The most common food allergies are caused by crustacean shellfish, eggs, fish, milk, peanuts, soybeans, tree nuts, and wheat. The pattern of reaction depends on the individuals' immune system patterns response, which sometimes unpredictable. In rare case an allergic reaction can be life threatening. The rates of many allergic diseases are on the increase [3,4]. It is associated with decreased learning, performance and productivity at work and school, as well as a reduced quality of life. The negatives effects of allergic reaction on quality of life include fatigue,

laziness, irritability, memory deficits, excessive daytime somnolence, and depression with anger [5,6].

For reasons that are not clearly understood, quite a few children with allergies tend to outgrow them. Thirty percent of the people interviewed who had one form of allergic reaction or the other attested to an unexplained overcome. Again, we live in an environment that contains the triggers and according to hygiene hypothesis; the more we live in the neat environment, the more the corresponding increase in the triggers, in order words, the less busy the immune system are, the reactions to non harmless antigens hence increased allergic reactions [7,8]. In an allergic reaction, the immune system mistakenly interprets a harmless substance as a harmful one. With these aspects, a rummaging search into the immunological reaction may produce an outcome, leading to immunization against the trigger, in form of desensitization to the allergen through better understanding of the trigger.

The research advocates for a landmark solution to allergic reaction through a well planned control exposure to the allergen, to calm the immunological reactions on such a harmless substance. As people keep taking drugs, there may be possibility of drug dependency hence the drug dependency provoked this research. It was odd-on this non drug treatment, would succeed the drug treatment.

1.1 Aim and Objectives

This research is written with astonishing energy of mind and delicacy of perception. The aim of the research is the authoritative combination of details so as to provide the evidence for the existence of non drug treatment of allergic reactions. Its objective is to serve as an important step in the exigencies of contemporary health in its various ramifications. To make provisional non drug measures as allergic desensitizer, in the light, of increasing allergic disorders.

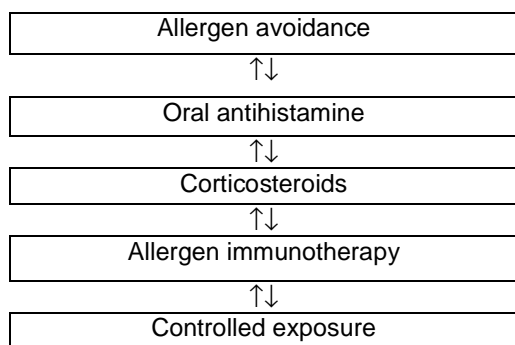


Fig. 1. Algorithmic chart for treatment of allergic reaction

2. METHODOLOGY

2.1 Subjects Selection and Study Area

The subjects were selected randomly on the bases of complaint of allergic reaction and fear of drug dependency. Counsels were given to the subjects and were told to report any serous reaction to the medical team and their Doctor. The study covered Amuzi community and observations were for a six-year period, in each selected persons on such allergic reactions.

2.2 Research Design and Expected Pattern of Work

The designation of the research was according to the different types of allergic reactions prevalent in the area. The research was through delved into the following allergic reaction types: Asthma allergic reaction, Insect sting allergy, allergic rhinitis, drug allergy and food allergy. The desensitization was achieved, by altering the abnormal immune responses that cause allergy through controlled exposure to the triggers. The expectations were that in the course of gradually exposure, the subjects with time might become tolerable to the triggers, resulting in desensitization and non significant allergic response. The desensitization leading to overcome (tolerance) might be due to

biochemical adaptations in immunological, inflammatory among other responses in the presence of the trigger(s).

2.2.1 Controlled exposure design

The subjects were grouped as in Table 1.

2.2.1.1 Allergic rhinitis, allergic asthma and insect sting allergy

The human subjects with history of immediate hypersensitivity response to rhinitis, asthma and insect sting were asked to leave the vicinity, whenever the symptoms or the attacks are noticed and later come back when normalized. In the allergens mentioned above, at the event of the appearance of symptoms signaling the onset of the attack, the individual(s) would be said to have hard exposure, irrespective of the allergies. Leaving the vicinity of attack, during the onset and coming back to the same vicinity after relief made it a natural exposure-control. And this process is repeated for each episode of attack. Additionally, in insect sting, subjects are advised to cover their body to limit exposures and stay indoors, if the sting is noticed. Since the insect bites were intentionally reduced as a result of indoor stay then it makes it controlled exposure.

2.2.1.2 Drug and food allergy drug

Drug and food desensitization were through a closely supervised graded-oral administration of the drug and food to the subjects with history of immediate hypersensitivity response (IgE-mediated and non-IgE-mediated) to that drug and food respectively. All these resulted to well-thought controlled exposure.

Desensitization as functions of no significant allergic reactions was recorded. The percentage reliability was calculated by the formula:

$$\frac{\text{Successful desensitisation}}{\text{Number of patients in a group}} \times 100$$

Table 1. Experimental protocols

Grouping of allergic reaction	Group 1	Group 2	Group 3	Group 4	Group 5
Types of allergic reaction	Insect sting allergy	Allergic asthma	Allergic rhinitis	Drug allergy	Food allergy
Numbers per group	15	6	18	10	8

3. RESULTS AND DISCUSSION

The results of the six-year of controlled exposure on selected allergic reactions were presented in the Tables 2 and 3. In each of the tables as presented, the observed successful desensitization to the allergen, leading to overcome (non significant allergic reaction) was recorded in percent as a function of reliability.

In the outcome of the controlled exposure on selected environmental allergic reactions: insect sting allergy, Allergic asthma and Allergic rhinitis were presented in Table 2. The Insect sting allergy recorded 60% of successful desensitization, after the controlled exposure to the allergen (Insect sting). The stings resulted in the sensation with the reflex to scratch [9]. Because the itching is compulsive [10], the individuals covering themselves at the time of noticeable stings, limits exposure to more of the allergens (stings). Insect stings can cause irritation and provoke allergic reaction, at the point of sting, possible through the content of their saliva. In some insects' stings, histamine, a chemical is released and this result in the allergic reactions that are responsible for the itching among others [11]. Toxic components of the venom, resulting from stings caused the irritating local reactions. The components of the venom may provoke histamine release. Underneath the lining of the skin, gut, lungs, nose and eyes are mast cells. Mast cells are filled with chemicals including histamine. When histamines are released into the skin, they cause itching and irritation. In some instance blood pressure can drop drastically to critically low levels [11]. By being exposed to small and harmless amounts of stings on repeated bases for fewer years, the body's response to the stings might be modified, hopefully lowering the risk of anaphylaxis from future stings to almost non significance [11]. This might be the plausible explanations on the desensitization, amounting to 60% reliability. The 60% success on the outcome of desensitization against the insect sting allergens showed good reliability of this method. The allergic rhinitis and allergic asthma recorded 39 and 33 percent success, after controlled exposures to the respective allergens, amounting to 39 and 30% reliability respectively. Rhinitis, the inflammation

of the nasal mucosa is a common disorder that affects up to 40% of the population in some countries [12]. Allergic rhinitis involves numerous inflammatory cells, including B-cells, eosinophils, macrophages and CD4-positive T- cells. The cascade starts when the inflammatory cell infiltrates nasal lining upon exposure to an inciting allergen. The T cells infiltrating the nasal mucosa releases cytokines that stimulate immunoglobulin E production by plasma cells. Immunoglobulin E production, in turn, triggers the release of mediators, such as histamine and leukotrienes, that are responsible for arteriolar dilation, increased vascular permeability, itching, rhinorrhea (runny nose), mucous secretion, and smooth muscle contraction [12,5]. The recurrent symptoms usually nasal congestion is caused by late-phase inflammatory response [13]. The 39% reliability of desensitization to the allergic reaction has similarity with the reports of Small et al. [12] in which, avoidance strategies effectively improve the symptoms of allergic rhinitis, and use of combined measures (Fig. 1). Although there was optimal result unlike the 39% recorded in the present research, the observed 39% overcome might be through the modification of response to the allergic reaction. The allergic asthma is characterized by variable and recurring symptoms, reversible airflow obstruction, and bronchospasm [14] and has no cure. The 33% recorded in the controlled exposure is in accordance with good preventive against the asthma allergy, by avoiding triggers [14]. According to the report of Platts et al. [15], rigorous and prolonged control of allergen exposure in asthmatic patients, revealed reduced bronchial hypersensitivity. Similar studies assessed changes of environment in which patients were moved to high altitude places where mite levels were low, in these case, sensitized patients also improved [15-18]. This current research bears relationships with these authors' reports. Globally, the rate of asthma is significantly increasing [19,20]. The evidence for the effectiveness of measures to prevent the development of asthma is weak [14], consequently 33% reliability recorded in the current research might be the pass mark. The controlled exposure may have resulted to tolerance.

Table 2. The outcome of environmental controlled exposure on selected allergen

Allergic reaction	Numbers of people	Frequency/incidence of exposure	Percentage success
Insect sting allergy	15	20	60
Allergic asthma	6	6	33
Allergic rhinitis	18	20	39

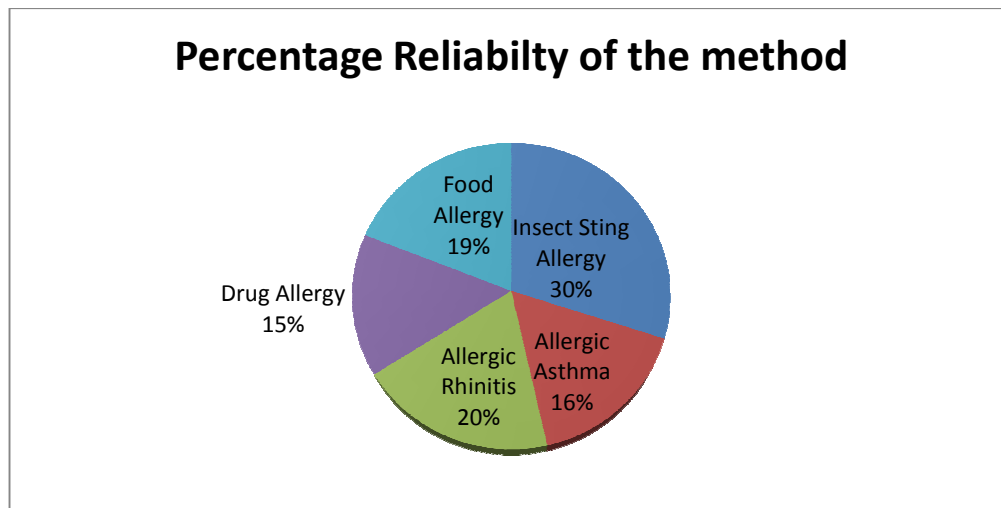


Fig. 2. The desensitization percentage in the reliability test

Table 3. The outcome of controlled exposure on drug and food allergen

Allergic reaction	Numbers of people	Frequency/Incidence of exposure	Percentage success
Drug allergy	10	8	30
Food allergy	8	10	38

The Table 3 depicted the results of drug and food allergy. The result of the control exposure on allergen (Table 3, above) showed 30 and 38 percent of successful desensitization for the drug allergy and food allergy respectively. In the drug allergy, the 30 percent desensitization amounted to 30% reliability of the method. Desensitization has being reported as occasionally used method for the treatment of drug allergen [21]. This is in line with results obtained in the present findings, in which 30 percent of successful desensitization was recorded. This 30% reliability in this method showed a better tolerance to the trigger. The erstwhile reports on food allergy showed that avoiding and having a plan, if exposure occurs is the focus of primary management [22]. The merits of allergen immunotherapy for food allergies are a matter of debate and researches are in progress. The 38% recorded in drug allergy, amounting to 38%, is in similarity with the reports of Alexander et al. [23] and Wong et al. [24], where drug desensitization has been carried out successfully for a number of IgE-mediated responses, including penicillins, cephalosporins, carbapenems, insulin and platins, as well as for non-IgE-mediated immediate hypersensitivity reactions including aspirin, non-steroidal anti-inflammatory drugs (NSAIDs), radio contrast media and vancomycin.

3.1 Discussion

The biological process of human constitute are crucial aspect of the determinants of allergic reaction with its peculiarity and their manipulation are primary focus of the non-drug therapeutics process.

The results of the present finding (Fig. 1) are in agreement in line with results obtained by several authors on resolution of allergy [25,26,27]. Just as immunotherapy is generally safe and effective for allergic rhinitis, allergic conjunctivitis, allergic forms of asthma, and stinging insects, so is the present method. How long this method can protect the body calls for further investigations. Desensitization by controlled exposure aimed to induce or restore tolerance to the allergen by reducing its tendency to induce Immunoglobulin E production.

It may be possible that controlled exposure diminishes mass cell and basophils as well as directs the immune response away from humoral immunity and toward cellular immunity, so as to encourage the body to produce less Immunoglobulin E antibodies. High immunoglobulin E concentration and absolute eosinophil count had been previously associated

with sensitization. The controlled exposure might result in the production of allergen specific antibodies known as 'blocking' antibodies. Blocking antibodies recognizes and bind to the allergen preventing it from binding to Immunoglobulin E and triggering an allergic reaction. This may be a new form of vaccination and this requires further investigation.

4. CONCLUSION

Desensitization, a diminished response to allergy, was the outcome of the present research, after repeated controlled exposure. Controlled exposure portrayed in this research, primarily assisted individual(s) to biochemically adapt and remain insensitive to the allergic stimuli. It comes about through rational tolerance. However there may be small risk of serious allergic reactions such as anaphylaxis, it is recommended that patients remain under medical supervision. They researchers also argued that protective measures such as mentioned, in light of other measures can be used but avoiding the trigger is the best option. Complete avoiding the triggers are in principle and hence not realistic. It is prudent to establish that desensitization would be life-saving and significantly will improve clinical outcome and quality of life in the patient.

CONSENT

All authors declare that written informed consent was obtained from the patient and their medical adviser for publication of this paper and accompanying images.

ETHICAL APPROVAL

We the authors of the manuscript titled 'Therapeutic of controlled exposure to selected allergens - a non-drug measure' hereby declare that all experiments have been examined and are in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

ACKNOWLEDGEMENTS

The authors wish to thank the volunteers who willingly consented to be used for these work. Once again thanks for accepting after being orally informed. The confidential information of individual(s) was respected.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. McConnell, Thomas H. The nature of disease: Pathology for the health professions. Baltimore, Mar.: Lippincott Williams & Wilkins. 2007;159.
2. Bahna SL. Cow's milk allergy versus cow milk intolerance. *Annals of allergy, asthma & immunology: Official Publication of the American College of Allergy, Asthma, & Immunology.* 2002;89(6 Suppl 1):56-60.
3. Simons FE. Anaphylaxis: Recent advances in assessment and treatment. *The Journal of Allergy and Clinical Immunology.* 2009; 124(4):625-36
4. Mösges R. The increasing prevalence of allergy: A challenge for the physician. *Clin Exp All Rev.* 2002;2:13-7.
5. Dykewicz MS, Hamilos DL. Rhinitis and sinusitis. *J Allergy Clin Immunol.* 2010; 125:S103-115.
6. Silva N, Carona C, Crespo C, Canavarró MC. Quality of life in pediatric asthma patients and their parents: A meta-analysis on 20 years of research. *Expert Review of Pharmacoeconomics & Outcomes Research.* 2015;15(3):499-519.
7. Folkerts G, Walzl G, Openshaw PJ. Do common childhood infections teach the immune system not to be allergic? *Immunol. Today.* 2000;21(3):118-20.
8. Edward W. The Hygiene Hypothesis; 2013. 2013-01-30. Retrieved. 2013-05-30
9. Andersen HH, Elberling J, Arendt-Nielsen I. Human surrogate models of histaminergic itch. *Acta. Dermatovenereologica.* 2015;95(7):771-7.
10. Ikoma A, Steinhoff M, Ständer S, Yosipovitch G, Schmelz M. The neurobiology of itch. *Nat. Rev. Neurosci.* 2006;7(7):535-47.
11. Med Broadcast Clinical Team. Insect Bites and Stings; 2016. (Assessed 2016; 03 06 2016) Available:<http://chealth.canoe.com/Condition/GetCondition/Ins>
12. Small P, Frenkiel S, Becker A, Boisvert P, Bouchard J, Carr S, et al. The Canadian Rhinitis Working Group: Rhinitis: A practical and comprehensive approach to assessment and therapy. *J Otolaryngol.* 2007;36(Suppl 1):S5-S27.
13. Bousquet J, Khaltaev N, Cruz AA, et al. Allergic Rhinitis and its Impact Asthma (ARIA) World Health Organization, GA(2)Len. *Allergen.* 2008;63(Suppl 86):8-160.

14. NHLBI Guideline. 2007;11-12.
15. Platts-Mills TA, Tovey ER, Mitchell EB, Moszoro H, Nock P, Wilkins SR. Reduction of bronchial hyperactivity during prolonged allergen avoidance. *Lancet*. 1982;2:675-8.
16. Vervloet D, Penaud A, Razzouk H, Senft M, Arnaud A, Boutin C. Altitude and house dust mites. *J Allergy Clin Immunol*. 1982; 69:290-296.
17. Boner AL, Peroni DG, Piacentini GL, Venge P. Influence of allergen avoidance at high altitude on serum markers of eosinophil activation in children with allergic asthma. *Clin Exp Allergy*. 1993; 23:1021-6.
18. Peroni DG, Boner AL, Vallone G, Antolini I, Warner JO. Effective allergen avoidance at high altitude reduces allergen-induced bronchial hyperresponsiveness. *Am J Respir Crit Care Med*. 1994;149:1442-6.
19. Global Burden of Disease Study 2013, Collaborators. Global, Regional, and National Incidence, Prevalence, and Years Lived with Disability for 301 Acute and Chronic Diseases and Injuries in 188 Countries, 1990-2013: A Systematic Analysis for the Global Burden of Disease Study 2013. *Lancet (London, England)*. 2015;386(9995):743-800.
20. Anandan C, Nurmatov U, van Schayck OC, Sheikh A. Is the prevalence of asthma declining? Systematic review of epidemiological studies. *Allergy*. 2010; 65(2):152-67.
21. Arroliga ME, Pien I. Penicillin allergy: consider trying penicillin again. *Cleve Clin J. Med*. 2003;70:313-318.
22. Sicherer SH, Sampson HA. Food allergy: Epidemiology, pathogenesis, diagnosis, and treatment. *J Allergy Clin Immunol*. 2014;133(2):291-307.
23. Alexander S, Hopewell S, Hunter S, Chouksey A. Rituximab and desensitization for a patient with severe factor IX deficiency, inhibitors, and history of anaphylaxis. *J Pediatr Hematol Oncol*. 2008;30:93-5.
24. JT, Ripple RE, MacLean JA, Marks DR, Bloch KJ. Vancomycin hypersensitivity: Synergism with narcotics and 'desensitization' by a rapid continuous intravenous protocol. *J Allergy Clin Immunol*. 1994;94(Pt 1):189-94.
25. Penagos M, Compalati E, Tarantini F, Baena-Cagnani R, Huerta J, Passalacqua G, et al. Efficacy of sublingual immunotherapy in the treatment of allergic rhinitis in pediatric patients 3 to 18 years of age: A meta-analysis of randomized, placebo-controlled, double-blind trials. *Annals of Allergy, Asthma & Immunology*. 2006;97(2):141-148.
26. Rank MA, Li JT. Allergen immunotherapy. *Mayo Clinic Proceedings*. 2007;82(9): 1119-23.
27. Canonica GW, Bousquet J, Casale T, Lockey RF, Baena-Cagnani CE, Pawankar R, et al. Sub-lingual immunotherapy: World Allergy Organization Position Paper 2009 *Allergy*. 2009;64(Suppl 91):1-59.

© 2016 Chukwuedozie et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<http://sciencedomain.org/review-history/16595>