

Honey bee pollen in allergic rhinitis healing

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SUMMARY

The most common atopic disease of the upper respiratory tract is allergic rhinitis. It is defined as a chronic inflammatory condition of nasal mucosa due to the effects of one or more allergens and is usually a long-term problem. Under those conditions, it is desirable to avoid excessive and irrational application of chemical drugs and to consider the use of supplemental medicaments. The purpose of our study was to test the efficiency of apitherapy in allergic rhinitis healing by the application of honey bee pollen. Apitherapy is a branch of alternative medicine that uses honey bee products. Honey bee pollen can act as an allergen and cause new allergy attacks for those who suffer from allergic rhinitis. Conversely, we hoped to prove that smaller ingestion of honey bee pollen on a daily basis would desensitize participants to pollen and thus reduce the severity of allergic rhinitis. We conducted this research with 46 individuals between 22 and 47 years old, treated for allergic rhinitis. The patients filled in a questionnaire, with a visual analogous scale linked with the individual feeling of sneezing and other symptoms of rhinitis before and after the therapy. There was a significant difference ($p=0.000$; $\alpha=0.05$) between symptoms of users before and after therapy conducted using honey bee pollen. After the pollen application, we recorded reduced symptoms with all participants and therefore the results support the main hypothesis. According to our research, the application of the honey bee pollen as therapy for allergic rhinitis is efficient and justified. Also, pollen therapy resulted in positive responses with participants suffering from other health issues.

INTRODUCTION

Allergic rhinitis is the most common allergic disease of the upper respiratory tract, affecting 10-30% of the world's population (1). Allergic rhinitis is defined as a symptomatic disorder of the nasal mucosa occurring after contact with allergens in the environment, resulting in an IgE-mediated inflammatory reaction that manifests in several symptoms and signs including nasal congestion, liquid secretion, sneezing, and itching of the nasal mucosa. Therefore, allergic rhinitis is a type I hypersensitivity, or anaphylactic reaction. After contact of the respiratory mucosa with inhaled allergens

(pollen of trees, grasses, and weeds, household dust, mites, feathers, animal hair, mold, etc.) in individuals with an atopic constitution, sensitization to allergens will occur. Individuals with atopy are genetically predisposed for excessive, severe reactions to usual allergens that involve abundant production of IgE antibodies (1).

Allergic rhinitis is commonly known as a pollen allergy. The most frequent symptoms include a runny or clogged nose, itchy, teary, or red eyes, as well as sneezing (2). Symptoms that may later, if the condition worsens, include red and inflamed throat, a cough, a clogged nose, and swollen eyelids (3). Although the symptoms are similar to the cold, the difference is that allergens rather than viruses cause rhinitis. Generally, the reaction of an individual's immune system causes allergies; if the immunity is over-reactive the body reacts in the form of allergy when the immune systems come into contact with harmless substances (4). Although it is not a life-threatening disease, allergic rhinitis represents a global health problem because it significantly disturbs the quality of life of patients in a way that seriously reduces focus and workability, and it is often connected with other diseases such as asthma (5).

Without professional consultancy, individuals often take some medicaments, available but not efficient against all types of rhinitis, and do not affect all patients the same way. They often expose themselves to different therapeutic procedures, medically justified or unjustified. The most effective medicaments are nasal sprays or corticosteroids which after long-term application can lead to drying of the nasal mucosa, another issue that can lead to nasal polyposis (6). Using a nasal saline rinse can help to thin and decrease the amount of mucus, although this is not sufficient for healing. In some cases, antihistamines are recommended, but they can result in undesirable reactions such as rash, headache, or sleepiness. In addition to drug therapy, allergic rhinitis can be treated by immunotherapy or allergic vaccination. By injecting increasing concentrations of the patient's allergens, immunotherapy can induce tolerance, which significantly reduces or eliminates the patient's adverse reaction when exposed to the allergens. The down-side of this type of therapy is that it lasts in continuity for at least 3 years (7). Patients who do not react positively to pharmacological therapy and do not wish to take drugs that cause undesirable side-effects opt-in for this therapy (Table 1).

As modern medicine looks for new ideas, apitherapy offers many solutions regarding the fight for global health

Table 1. Characteristic symptoms of allergic rhinitis
<i>Initial symptoms</i>
o Sneezing onsets, with liquid, and often abundant secretion from the nose
o Hindered breathing through the nose
o Nose itching
o Eyes itching and tears
o Reduced smell ability
<i>Disease complications</i>
o Throat pain
o Paranasal sinuses inflammation
o Ear inflammation
o Asthma
<i>Current treatments for allergic rhinitis</i>
o Antihistamines
o Decongestants
o Intranasal corticosteroids
o Eye drops
o Immunotherapy
o Sublingual immunotherapy (SLIT)

Table 1. Characteristic symptoms of allergic rhinitis. A patient has intermittent allergic rhinitis if symptoms occur less than 4 days a week or 4 weeks of the year. Persistent allergic rhinitis is labeled if symptoms occur more than 4 days per week and more than 4 weeks of the year. Symptoms are classified as mild when the quality of life is not affected. Symptoms are moderate to severe if patients have at least one of the following: sleep disturbance, impairment of daily activities, sports, or leisure, impairment of school or work, or troublesome symptoms (8).

and quality of life. Apitherapy involves the therapeutic use of honey bee products, including bee pollen, honey, propolis, royal jelly, beeswax, and venom, to treat a variety of ailments (9). Modern aspirations in the field of honey bee products are primarily focused on proving their importance in health protection. It can be freely said that the honey bees produce something that neither chemists, pharmacists, technologists nor any other scientist is able to easily create without help from honey bees.

Bees process nectar from the flowers through their organism (specifically honey stomach) and later in a beehive, producing an elixir rich in numerous nutritious and healing ingredients (10). Honey contains organic acids, amino acids, pollen, ether oils, flavonoids, vitamins, minerals, and other valuable components. Sugars produced by the bee honey are most abundant with fructose, followed by glucose and a much smaller fraction of saccharose. Honey contains vitamins B1, B2, B5, B6, C, D, E, and K, and minerals including sodium, potassium, calcium, phosphorus, magnesium, iron, zinc, iodine, copper, chromium, and selenium (11). The most famous healing feature of honey is a reduction of influenza and cold symptoms, as well as other diseases of the respiratory tract such as bronchitis, throat, and sinus inflammation (11). Honey is effective in aiding wound healing because honey works as an antiseptic, while also neutralizing poisons from a bite or sting. Compresses with honey help with and alleviate skin problems such as cracked skin, rash, or itching. Honey is of great help with different digestive problems, such as constipation, gastritis, or ulcers. In addition to its medicinal properties, honey's effect doubles by adding medicinal herbs.

Scientists confirm its antibacterial, antiseptic, and anti-oxidative characteristics (12). Numerous clinical studies have examined the honey effects on cough and they showed it was equally effective as the most often applied citrus (12) (13). Honey bee products (beebread, bee poison, pollen, propolis, and honey) play crucial roles in prophylaxis and treatment of many human diseases. These products contain amino acids, proteins, carbohydrates, balsams, ferments, and microelements for which have been shown to possess antimicrobial, antiviral, antiparasitic, anti-inflammatory, antioxidant, antimutagenic and antitumor effects (14)(15). Recent studies confirmed that enzymes from pollen have an exceptional anti-oxidative effect. Although there is no firm evidence, some studies have suggested that honey bee pollen may even have positive effects in treating cancer, cardiovascular diseases, and diabetes (16).

The honey bee pollen contains almost all healthy nutritive matters necessary for the growth, development, and health of the human organism. In some developed countries, such as Germany and Belgium, it is officially confirmed as a medicament (17). Honey is of greatest quality when honey bees have access to the pollen originating from different herbal species because chemically balanced food is of key importance for a bee colony's development. The greatest influences on the content of certain substances in the pollen are its botanical and geographical origin (18). The pollen varies in its color from light yellow to black. The grains are different shapes, sizes, and weights depending on from where the herbal species the bees collected the powder (19). In stores, bee pollen is available as natural granules. It can also be mixed with other foods like granola, yogurt, or smoothies. Pollen granules generally have a bitter taste, although people with regular intake, adapt to the taste. This diet has to be conducted a few months before the season starts to get any response in the prevention of allergy.

Based on previous studies on honey bee products and the potential to positively affect symptoms of allergic rhinitis, we hypothesized that because pollen comes from plants one may be allergic to, pollen might be able to protect one's immune system from reacting to airborne allergen exposure from those same plants, perhaps by the process of desensitization. Specifically, we hypothesized that gradual intake of increasing concentration of pollen should induce tolerance to allergens by accommodating the organism to newly taken microelements.

RESULTS

The question we explored was whether honey bee pollen helps in the treatment of allergic rhinitis. In order to test this, we conducted research with 46 individuals treated due to allergic rhinitis. Before we began our study, we formed a template with study information. Each participant in our study was provided with a copy of this template, which they reviewed and signed before the study began. We recruited a total of 32 women and 14 men as participants and all

participants were 22-47 years old. The patients filled in the questionnaire before and after the therapy. All participants, within the apitherapy of 45 days, took the pollen produced in the honey bee farmstead (the owner of the farmstead is Mirko Vlahovic, in Crni vrh Berane, entered in the beehive register with the Veterinary Administration of Montenegro by Decision number 060-323113-036-295/2 dated 05/09/2013). The goal of our research was to show that the use of pollen alleviates problems caused by allergic rhinitis.

We divided participants according to the severity of their allergy symptoms (Figure 1). 27 participants had several symptoms that reduced the quality of their life and workability, including sneezing, teary eyes, abundant secretion from the nose, and impeded breathing.

We conducted research in winter, due to fewer allergens present. In spring, when allergies become more severe, we reassessed the change in symptoms to estimate the efficiency of pollen therapy. We instructed participants to maintain a diary and track changes in their symptoms through all 45 days of the therapy, as they gradually increased pollen intake. After therapy ended, we waited 15 more days (where participants continued their diary) into the spring, to analyze the data and see the results. In the spring, participants with seasonal allergies felt that their symptoms were less severe as a result of the treatment. We also noticed a reduction in symptoms in participants who were locals to the place where we collected the pollen for therapies.

Sneezing evaluation and other complications before and after the pollen application showed a statistically significant reduction of symptoms after the therapy ($p < 0.05$). After the therapy, all participants evaluated their complications, and only 1 participant had several symptoms (Figure 2). Pollen therapy had a positive effect on all of the participants. 20 participants did not have any symptoms, 25 participants had to sneeze several times per day, and only 1 participant had sneezing that was frequent but did not disturb daily activities. None of the participants had symptoms that disturbed daily activities.

After we finalized the experiment, the results supported our hypothesis that preventive and controlled intake of honey bee pollen reduces the incidence and severity of allergic rhinitis.

DISCUSSION

According to our research, the application of the honey bee pollen in allergic rhinitis therapy is efficient and justified. Therapy produced a positive response without any undesired effect in participants suffering from other diseases. Our study is in agreement with previous research that supported the efficacy of honey and pollen products in the therapy of pollen allergies with individuals with and without atopic problems or asthma (20).

With the application of pollen and the addition of honey, we recorded notable improvement and ease of complications in the participants who had long-lasting symptoms of rhinitis.

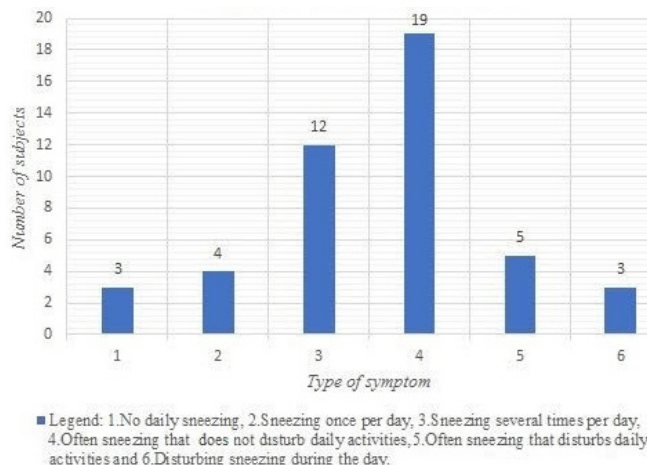


Figure 1. Distribution of participants according to symptoms before the pollen application. Before the application of pollen therapy, the majority of participants (31) experienced a mild symptom of allergic rhinitis: frequent sneezing throughout the day that did not disturb daily activities. Some of our participants (8) experienced a severe symptom of allergic rhinitis: sneezing that disturbs daily activities.

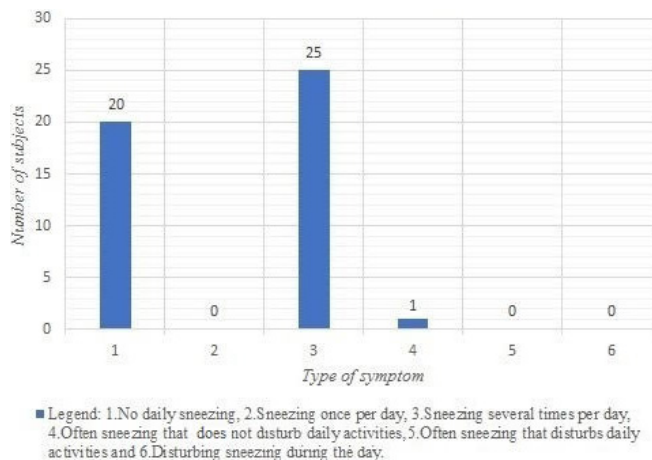


Figure 2. Distribution of participants according to symptoms after the pollen application. After the application of pollen therapy, we notice a significant rise in the number of participants that had no daily sneezing. Some participants still have a mild symptom of allergic rhinitis, but there are no participants with a severe symptom of allergic rhinitis: sneezing that disturbs daily activities.

In our study, participants did not describe undesired effects or allergic reactions, and, as especially important, participants did not report a deterioration of existing problems during the application of the honey bee pollen.

Rhinitis is most commonly a consequence of allergic reactions and it corresponds to the natural flow of the nasal mucosa inflammation. The trend of the use of Over the Counter drugs is increasing. The development of the pharmaceutical industry, through long-term prognosis, shows that honey bee products, as a raw material for medicinal remedies, are of special significance. These products are easily available, therapeutically effective, and possess multisided biologically

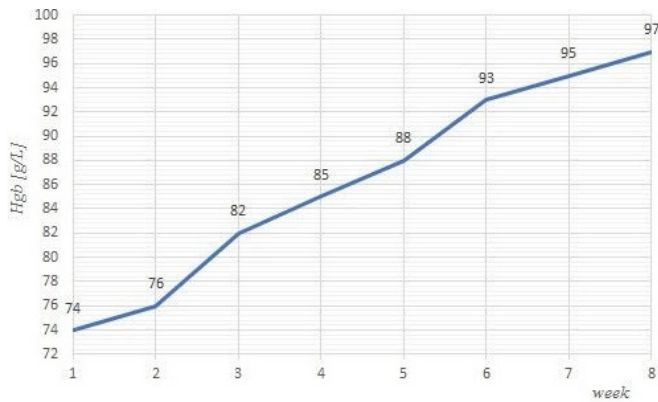


Figure 3. Hemoglobin levels in subject #XX during the course of pollen treatment. Patient #XX was diagnosed with anemia eight years prior to this study. Throughout the course of pollen treatment, this participant underwent weekly blood testing to monitor hemoglobin levels, shown here. A steady increase in hemoglobin levels was observed during this time frame.

active components (21).

Patients suffering from acute and chronic diseases often cannot use antibiotics or antitussive drugs (drugs used to prevent or relieve coughing). Antibiotics have no effect on viral inflammations of the respiratory tract and there is limited evidence for the effectiveness of antibiotics and antitussives on asthma (22). As the specter of the treatment for these problems is reduced, it would be useful to consider apitherapy which, according to studies, reduces cough frequency and severity (23).

One of the most important results in this study is the participants' evaluation of sneezing frequency before and after the application of pollen therapy. We recorded statistically significant improvement in symptoms of our participants by the numeric score tests and these results provided the objective insight into the effectiveness of pollen therapy. We also obtained significant confirmation about fewer symptoms

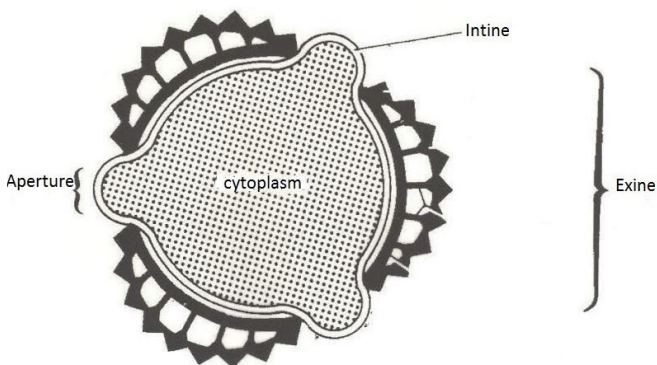


Figure 4. Pollen grain. Intine or inside layer is a thin and continuous layer made of cellulose or hemicellulose and pectin; Exine or outer layer is a highly decay-resistant chemical called sporopollenin; Apertures are areas on the walls of a pollen grain, where the wall is thinner and/or softer; Cytoplasm is the central part source of nuclei responsible for fertilization (19).

after pollen therapy from patients suffering from asthma and atopic problems.

Several participants experienced an improvement in symptoms of diseases (such as gastritis, arteriosclerosis, prostatic hyperplasia...) during the honey bee pollen treatment. Pollen treatment may lead to a systematic reduction of inflammations, but we are not able to confirm this as a direct cause without more detailed, hypothesis-driven research and experiments.

I would especially like to highlight the case of one of the participants, Patient #XX, who suffers from chronic anemia with a very weak immune status. Eight years prior to participation in this study, this participant was diagnosed with dysfunction of the thyroid gland and anemia. Although this participant took the required medicine, hemoglobin levels never exceeded 85g/L. Several years later, as a result of infectious endocarditis of the aorta's valve, this participant had a brain hemorrhage with left-side paralysis. Two months after the brain hemorrhage, the patient received an artificial valve, and, as a result of long-term treatment, developed enterocolitis. Being familiar with my research and in agreement with their doctor, this patient decided to participate in this study. In addition to pollen therapy that all participants received, Patient #XX took 10 drops of propolis 3 times a day.

We noted several good factors in this case. This participant's complete blood count (CBC) improved, cholesterol level decreased, the symptoms of enterocolitis were significantly reduced, anticoagulant therapy was reduced to a minimum, and the general state of the participant's health was much better. Of course, throughout the study, this participant maintained their regular therapy, a combination of medications needed to treat existing conditions. Therapy in the form of iron, which this participant took for months before propolis, did not show a significant improvement in complete blood count. Only after the start of the treatment with the pollen, Patient #XX's hemoglobin levels significantly improved, monitored via laboratory blood tests once a week (Figure 3).

The pollen is one of the rare natural products that cannot be produced artificially in the laboratory due to its complex composition, and it contains substances mandatory for normal functioning and growth and development of the human body: proteins, fats, carbon hydrates, vitamins, minerals, enzymes, and hormones. It is richer in albumins than any other animal source, and it contains a higher content of the amino acids than the same quantity of beef, eggs, or cheese. Due to the high content of lecithin, the amino acids from pollen have favorable effects on body weight regulation, and it corrects biochemical disorders in the metabolism resulting in body weight correction.

We believe that our research points out that medicine for common diseases can be found in nature and that natural products such as pollen should be considered as an alternative to modern medicine. Although our research was limited by the lack of an untreated control or placebo group, we believe



Figure 5. Honey bee pollen – dry. Fresh pollen typically contains 10% to 12% water, while the moisture content of dried pollen is around four percent. Pure bee pollen for human consumption comes in granules.

that it provides detailed and sufficient evidence that the honey bee pollen helps in treating allergic rhinitis. Results from this experiment give us guidance for numerous health issues that can be treated with honey bee pollen. In the future, we hope to further examine the relationship between pollen therapy and the treatment of other inflammatory diseases such as gastritis and arteriosclerosis.

MATERIALS AND METHODS

Before consuming, the pollen was dissolved in the water for several hours to make the grains swell. After this, the membrane cracks and releases useful substances. The human digestive system is not able to break this membrane; therefore, the pollen intake has no purpose unless it is dissolved in the water (Figure 4) (Figure 5).

All participants, including family members of the author, were familiarized with the treatment mode by the beekeeper, and then they have signed their consent to participate in the examination. All participants started with ¼ teaspoon (2g) per day and gradually worked their way up to 2 teaspoons (15g) at the end of the sixth week. Intake was gradually increased by a few grains every other day so that the maximal dose of 2 teaspoons was reached in 15 days. The maximal dose was then consumed for 30 consecutive days. All participants consumed the same amount of pollen. Participants usually took their dose with breakfast.

Participants filled in the questionnaire and on the visual analogous scale determined the level of symptoms and difficulties according to their individual as follows: 1 - No daily sneezing, 2 - Sneezing once per day, 3 - Sneezing several times per day, 4 - Often sneezing that does not disturb daily activities, 5 - Often sneezing that disturbs daily activities and 6 - Disturbing sneezing during the day. After the pollen application, participants filled in the questionnaire and on the same visual analogous scale determined the level of

Test	Value	Critical value	p-value
Anova	F=38.9	F = 3.958	0.000
Chi-squared	X ² = 139.47	X ² = 11.07	0.000
Matched pairs T-test	t = 2.02	t = 1.679	0.000

Table 2. Overview of statistical tests. The data collected was analyzed using a single factor (total symptoms score) ANOVA and Chi-squared test. T-test was used to determine the significance of differences between the total symptoms scores before (3.6) and after (2.2) pollen treatment. For all comparisons, p-value < 0.05 was considered statistically significant.

symptoms and difficulties according to their estimate. The questionnaire was compiled for this research and included visual analogous scales for estimation of sneezing and other complications, before and after the pollen application, including questions about the kind and intensity of sneezing, the quality of life, and allergic rhinitis.

All of the tests were done with the significance level of 5% and the null hypothesis (H0) was that the use of pollen does not reduce the problems caused by allergic rhinitis (Table 2). Based on test results, we reject H0 and conclude that intake of pollen reduces problems caused by allergic rhinitis.

The results of the questionnaire were analyzed using ANOVA, Chi-squared, and T-test. All tests were done using Microsoft Excel.

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