Evidence for the Use of Local Honey for the Relief of Pollen Allergies*

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Consumers want to know if honey helps with allergies

Not an hour goes by, at the farmer's market, before a customer asks if we have ever heard that "local honey helps people with their allergies." The response, for the past 10 years, has always been "Yes – we hear that a lot and customers swear by it, however, there is little direct evidence to support the claim." That disclaimer was growing old, so a review of the literature seemed in order. As a result of reading many papers, this skeptic is more confident that some honeys do contain enough hyper-allergenic pollen to be of therapeutic value. What follows is an argument that draws from multiple sources and disciplines to affirm honey's ability to reduce allergies.

Why don't we have an answer?

The evidence on this subject does not provide an authoritative answer because very few studies have tested local honey directly, and of those, none have led to a compelling conclusion. Nevertheless, indirect evidence suggests that local honey, containing hyper-allergenic pollens, has therapeutic value for those suffering from local pollen allergies. This is not to say that there is a complete dearth of information, but it appears that empirical data is lacking. Thus, we are left with a popular belief, a substantial amount of anecdotal evidence, a few conflicting questionnaire-based clinical studies, and theoretical considerations suggesting that local honey relieves symptoms of pollinosis.

Short of making absolute claims, an argument can be made that raw local honey is "likely" to reduce symptoms of seasonal allergies if the honey contains the same pollen (or cross-reactive pollen) which caused the allergies in question. Before making the above argument, however, let's discuss what one would expect from an empirical study and then contrast that to an often-cited study where local honey was tested, in a clinical setting, and deemed ineffective for the relief of local pollen allergies.

Clinical study design criteria

Ideally, studies rely on quantified, objective data instead of subjective questionnaire-based trials. For example, a large cohort (matched volunteers) should be recruited based on their objectively confirmed seasonal pollen allergies. Among others, scratch tests, subdermal skin tests, T-cell assays, and antibody assays can be used together to ascertain a subject's immune status. Along with such tests, there should also be a confirmed correlation by air sampling that subjects are allergic to specific pollen/s during the time-frame that said pollen is abundant.

Of course, this study would be worthless if the honey wasn't tested for specific pollens that correlated with the aero-allergens (airborne allergens) under investigation. In other words, to test the hypothesis that in-

Bee harvesting from knapweed. Photo credit: Bill Wakefield. (www.flickr.com/people/billnbenj)

* Editor's note: Since some people may be highly allergic to certain pollens, we advise caution when first eating pollen or unfiltered honey containing pollen.

gestion of honey, containing local pollens, can help reduce symptoms of pollinosis, one would need subjects with unequivocally demonstrated allergies to the same pollen/s contained in the ingested honey. In addition, patient's allergies would be monitored with quantitative assays during the study. If such a study has ever been conducted, it is a well-kept secret. Instead, we are left with questionable, questionnaire-based trials.

A paper should be read before it is praised

The one study that pops up in internet searches with key words "'local honey' & allergies" is a 2002 Annals of Allergy, Asthma, and Immunology article, authored by T.V. Rajan.[1] This paper is critical to this discussion because it appears to be the basis of the countervailing argument found extensively on the internet. The majority of web sites that disparage local honey's ability to relieve hay fever symptoms, will reference the Rajan paper as proof that the popular belief is, in fact, myth. As an example, one link **(The Health of it all: Honey and Allergies),** refutes the therapeutic connection and asserts an implied argument based on authority, "... there is a beautifully designed study performed by Dr. T.V. Rajan at the University of Connecticut...."[2],

Another article, titled **"Fact or Fiction? Eating Local Honey Cures Allergies"**, claims "the answer is no" and again cites Rajan.[3] Sadly, it appears nobody is reading Rajan's paper, but only reiterating the paper's conclusion. Rajan's conclusion: "This study does not confirm the widely held belief that honey relieves symptoms of allergic rhinoconjunctivitis." I actually agree with the author, since the study was so poorly designed and executed that no conclusions could be drawn, whatsoever. After reading the paper, I was utterly amazed that it passed the peer review process. The author himself indicated that he needed a minimum of nine subjects per group (three groups) to be statistically significant, stating "... we targeted at least nine participants per group for this study." It appears that the study was already underway before anyone realized that only 14 subjects had positive skin tests. Of those 14, only two actually complained of seasonal allergies that correlated with the expected season for specific pollen release. The author stated, "... we evaluated whether a given subject was experiencing symptoms during the period expected by his/her skin reactivity. For both these subjective analyses, two individuals (LC and TVR) matched the subjective reporting of symptoms with skin reactivity." Anyone looking at the data should have noticed that the cohort didn't appear to have a reduction in allergies during the "very low pollen" period, suggesting they were not allergic to seasonal pollens (Rajan, figures 1-4). In reality, only one test subject and, perhaps, one placebo subject, qualified to be in this study.

Wouldn't it be better to start over again if one ended up with only two qualified participants after admitting that 27 were required (three groups of nine patients)? It's hard to know whether to laugh or get upset. Think of all the people influenced by this paper who believed that it was based on empirical data when, in fact, it was simply an anecdotal observation.

In addition to having only two subjects, the honey used for the study was never tested for pollen. This would be equivalent to testing a new antihistamine against placebo and then admitting that the antihistamine tablet may have lacked antihistamine. In the final analysis, we have a highly publicized paper showing that untested honey didn't help one individual subject with his allergies.

The second paper is also inconclusive

A more recent study, by Saarinen, et al., was much better, but it still suffered from the ills of questionnaire-based research.[4] The paper met some of the criteria mentioned earlier for making an objective study, with a skin prick test, air sampling, and honey analysis included. As for numbers, this study had more than one subject; in fact, 50 volunteers completed the study, with 72% of the original 61 recruits testing positive for Birch pollen allergies by a skin prick test. Also, they included air sampling for seasonal pollens and correlated them to patient symptoms. The Saarinen study also tested the honeys for Birch, Alder, and Willow pollen. Unfortunately, bee-collected birch pollen was added to the test honey at concentrations greater than those normally found in an average honey sample.

The author concluded that both local honeys (with and without birch pollen) gave similar levels of allergy relief. That conclusion is difficult to explain without inferring placebo effect. It should be noted, however, that the birch pollen honey (BPH) outperformed the regular local honey (RH) in every symptom category; it just wasn't statistically significant. One exception was "the number of days not needing allergy medication," where the BPH was significantly better than the RH ($p<0.05$). Again, a quantitative assay would have been preferred over questionnaires. In the Saarinen paper, local honey appeared to give considerable allergy relief, compared to no honey, while Rajan's patient found no such relief from untested honey. Neither result is compelling.

Pollen seems to work

Since objective data is lacking in the application of local honey for allergy relief, perhaps a better case can be made for local pollen administered without honey. There are a number of studies where pollen was shown to relieve symptoms of pollinosis. [5,6] If pollen can be shown to protect allergy sufferers, then an extrapolation to local honey would require that the honey contain enough hyper-allergenic pollen to elicit a similar level of relief as pure pollen.

It is common knowledge, among beekeepers, that bees collect windborne (anemophilous) pollens: "Anemophilous taxa such as *Salix* spp. (willow) *Quercus* spp. (oak), *Celtis* spp. (hackberry), many species of grasses (*Poaceae*), and wind pollinated types of composites (*Asteraceae*) are all important pollen sources for foraging honeybees." It is not enough, however, to say that bees collect anemophilous pollen without demonstrating that the pollen is represented in the honey as well. So any argument suggesting that honey has enough of the right kinds and amounts of pollen would have to make the case that therapeutic levels of hyper-allergenic species make their way into the honey.

Pollen in the hive

Estimates indicate that the amount of pollen collected by an average hive is somewhere between 44 pounds and 125 pounds each year.[7] Put into perspective, it has been estimated that the maximum exposure of a person to the common pollen allergens in ragweed does not exceed 1ug (millionth of

Bee harvesting from ragweed. ***Photo credit: Anna Hess.*** **(www.waldeneffect.org)**

a gram) per year.[8] Also, studies in mellisopalynology have revealed that different honeys from around the world average between 20,000 and 100,000 grains of pollen per 10 grams of honey.[7, 15] In general terms, we can say that there are considerable amounts of pollen in a beehive and tens of thousands of grains are contained in an average teaspoon of unfiltered honey (about 8 grams).

Two questions remain. First, how much of that pollen is hyper-allergenic? Second, may an allergy sufferer reasonably expect relief from that amount of specific pollen? As a rough estimate, let's use an average of 60,000 pollen grains per 10 grams of honey (or 48,000 grains per teaspoon). According to one source, pollen from maize weighs about 0.247ug per grain.[9] Taking that mass (based on maize) into account, the average honey contains about 12mgs (milligram = 1 thousandth of a gram) of pollen per teaspoon. We still need to estimate the percentage of 12mgs which is hyper-allergenic and determine if it is enough to be therapeutic.

Allergy-inducing pollens are abundant in honey

Honey bees have been studied for centuries, but very little attention has been paid to the physical interaction of bees with anemophilous flowers. Giovanetti states, "We are aware of no direct observational record of honey bees dealing with flowers of anemophilous characteristics."[10] The author then describes the physical interactions of bees with the anemophilous flowers of *F. ornus* and *C. sativa* and indicates that "honey bees actively collect pollen on *F. ornus* and *C. sativa*, even nectar on the latter."

Fraxinus ornus (Manna Ash) and *Castanae sativa* (Sweet Chestnut) were also studied by Aronne and others in a quantitative analysis where pollen percentages were tabulated.[11] Other windborne pollen allergens, including *Quercus ilex* (Holley Oak), *Salix* (Willow), and *Olea* (Olive) were also included in the study. In all cases, representative honeys were found containing pollen in four discreet categories of less than 3%, 3-15%, 16-45%, and greater than 45%. This means that some samples contained over 45% anemophilous pollen for each of the aforementioned types. Multiplying these percentages by the estimated average of 12 milligrams of total pollen translates into 0-360ug, 360ug-1.8mg, 1.92mg to 5.4mg, and greater than 5.4mgs of allergenic pollen per teaspoon of honey, respectively.

Both of the above papers indicated that anemophilous pollens are much more common than once held and that their concentrations are also much higher than previously expected. Some have suggested that this is impossible because bees use their proventriculi to filter pollen out of the nectar before placing it in the honey combs. Research by Todd and Vansell demonstrated that ripened honey, removed from capped comb, still contained upwards of 25,000 pollen grains per milliliter, post-proventricular filtration.[7] This should dispel the myth that pollen is only an incidental contaminant of honey.

Rough estimates supported by severe allergies

The above estimates are admittedly rough because pollen grains vary considerably as do seasonal and geographic influences on pollen production. However, if we consider that maize pollen is much larger than a very small pollen grain from a Compositae like mugwort, the math would still place the values within a therapeutic range. Evidence of this comes from severe allergic reactions from honey containing mugwort pollen.[12,13] The logic here is that an immune response by individuals, reacting to mugwort pollen in honey, indicates that there was enough pollen in the honey to be recognized by the host immune system. Luckily, for most of us, ingestion normally leads to a reduction of symptoms rather than severe allergies.

Optimal dose of grass pollen protein is only 15ug

If one considers that a therapeutic preparation of grass pollen protein (Grazax-R) was found to have an optimal sublingual (under the tongue) dose of 15ug per day, it is not a stretch to speculate that milligram quantities of pollen, found in honey, may be protective as well.[5] Using the maize example above, 15ugs of pollen is equivalent to 60 pollen grains. If the average teaspoon of honey has about 48,000 grains of pollen, it seems reasonable to expect at least 60 grains to be hyper-allergenic. This is not to say that all local honey has enough pollen to be helpful, but it is 'likely' that a random spoonful would contain enough allergen to be within the therapeutic range.

Cross-reactive pollen proteins need to be considered

It is also important to note several papers have been published indicating that pollens can be cross-reactive which means that they share protein structures that are common inducers of allergies.[5,10,14] This suggests that some honeys may contain more than one pollen species which act together to induce tolerance. For example, birch is cross-reactive with chestnut, while ash is cross-reactive with olive. The list of cross-reactive pollens is quite large. Thus, if one compared local honey to another honey, both may reduce allergy symptoms if they contain cross-reactive allergens from different plant species. Future clinical trials should include testing of volunteers for serum antibodies against the proteins found in both the test and control honeys, to eliminate cross-reactivity as a source of error.

SUMMARY

Consumption of Local honey is likely to reduce seasonal allergy symptoms

- Honeybee colonies collect 44 to 125 pounds of pollen per year.[7] Bees bring pollen into the hive on their pollen baskets and in nectar. Some of the pollen is removed from the nectar, by the bees, but enough remains to average around 20,000 to 100,000 grains per 10 grams of honey.[15]

12 ounces of pollen collected in one week by a strong colony. ***Photo credit: Alyssa Foster.***

- Windborne pollen is collected by honey bees and is present in high enough concentrations to cause allergic reactions in some individuals. [7,10, 11, 12,13] Several windborne pollens, identified as aeroallergens, were abundant in honey.[11]
- Grass pollen protein has been used optimally at 15ug doses.[5]
- It is common for honeys to contain hyper-allergenic pollens at concentrations above 15ug/teaspoon. Since local honey probably contains pollen in the "low dose" category (less than 5mg of allergen), it should be administered on a continuous basis.[16]
- In addition, consumption is best initiated prior to seasonal allergy symptoms by a couple of months.[5] Therefore, the old recommendation of taking a daily spoonful (teaspoon to tablespoon) of honey throughout the year is probably good advice.

Footnotes

[1] **T.V. Rajan, et al, "Effect of ingestion of honey on symptoms of rhinoconjunctivitis," Annals of Allergy, Asthma, & Immunology, 2002, 88:198-203.**

[2] **Timothy S. Harlan, "The Health of it all: Honey and Allergies," 2011.**

[3] **Anjali Prasertong, "Fact or Fiction? Eating Local Honey Cures Allergies," The Kitchn, 2011.**

[4] **K. Saarinen, et al, "Birch Pollen Honey for Birch Pollen Allergy – A Randomized Controlled Pilot Study," International Archives of Allergy and Immunology, 2010, 155:160-166.**

[5] **Moises Calderon and Tove Brandt, "Treatment of grass pollen allergy: focus on a standardized grass allergen extract – Grazax," Therapeutics and Clinical Risk Management, 2008, 1255-1260.**

[6] **S. Radulovic, et al, "Systematic reviews of sublingual immunotherapy," Paediatric Allergy, London, 2011.**

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[9] **W.F. Sheridan, "Maize for Biological Research," Plant Molecular Biology Association, 1982, 279-293.**

[10] **Manuela Giovanetti and Giovanna Aronne, "Honey bee interest in flowers with anemophilous characteristics: first notes on handling time and routine on *Fraxinus ornus* and *Castanea sativa*," Bulletin of Insectology, 2011, 64: 77-82.**

[11] **G. Aronne and V. De Micco, "Traditional melissopalynology integrated by multivariate analysis and sampling methods to improve botanical and geographical characterization of honeys," Plant Biosystems, 144(4): 833-840, 2010.**

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[13] **C. Lombardi, et al, "Allergic reactions to honey and royal jelly and their relationship with sensitization to compositae," Allergol Immunopathol, Dept. of Internal Medicine Sat'Orsola Hospital, Brescia, Italy, 1998, 26(6):288-290.**

[14] **C. Fernandez, et al, "Analysis of cross-reactivity between sunflower pollen and other pollens of the Compositae family," J Allergy Clin Immunol, 1993, Spain, 92(5): 660-667.**

[15] **Crane, Eva, ed., *Honey: A Comprehensive Survey,* Russak & Co., Inc., New York, 1975, 255.**

[16] **Morteau. Oliver, *Oral Tolerance*, Landes Bioscience, Texas, Kluwer Academic/Plenum Publishers, New York, 2004, 18.**