



## Apitherapeutic means and patients' willingness to accept them

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### ABSTRACT

**Aim:** Studies show that patients' acceptance of bee products as a remedy for various illnesses is rather low. For example, honey is often perceived as being too sweet. Since there is good evidence that bee products are useful in some indications (e.g., honey for oral mucositis), it seems important to know the amount of bee products which were tolerated by most patients.

**Methods:** In a prospective study, we asked 220 patients which amounts of various bee products they would be willing to accept using a structured assessment sheet.

**Results:** If patients already consumed honey, they were more willing to accept more honey on a daily basis (62.7 g<sub>consumer</sub> vs. 36.6 g<sub>nonconsumer</sub>). Live bee sting therapy was much less accepted compared to treatment with bee venom injections or bee venom ointment. The mean maximum amounts of bee pollen or royal jelly which patients regarded to be acceptable were 14.1 g (pollen) and 32.4 g (royal jelly). Interestingly enough, it was shown that they would be willing to accept higher amounts of bee products if they were informed about the treatment by physicians. Information from friends, relatives, pharmacists, or a heilpraktiker (a special type of health practitioner in Germany) did not have such a positive influence.

**Conclusion:** Patients' compliance is an important issue also in the field of traditional and natural medicine. This study provides some insights to patients' willingness to accept bee remedies thus allowing a better planning of trials and a better patient consultation.

### ARTICLE HISTORY

Received December 28, 2019

Accepted February 22, 2020

Published March 12, 2020

### KEYWORDS

Apitherapy;  
compliance;  
honey

### Introduction

Apitherapy comprises the use of bee products for the treatment of diseases. Some apitherapists claim that almost all diseases can be cured by the various substances used in apitherapy, specifically honey, bee pollen, royal jelly, propolis, beeswax, and bee venom (<http://apitherapy.com/apitherapy-data-base/diseases/list-of-diseases-that-can-be-treated-through-apitherapy/>; accessed February 10th, 2018). More recently, other products of dead bees (podmore), apilarnil (drone homogenate), products of wax moths, the inhalation of beehive air or therapeutic sleep on a beehive have also been claimed to be healthy. Many of these bee products are chemically undefined. However, there are continuous efforts to characterize these bee products, e.g., apilarnil [1].

Several years ago, there was little evidence that bee products could be medically helpful at all; now, there is certain evidence that some medical conditions may be improved using bee products. These include honey for burns, bee venom for poststroke shoulder pain and rheumatoid arthritis, propolis for blister-like lesions around the mouth, skin, and genitalia caused by herpes viruses, and honey for oral mucositis induced by radiotherapy and/or chemotherapy [2–6]. Apitherapy's health claims also include the field of obstetrics and gynecology (see aforementioned link). But most of them are not supported by scientific evidence. However, some studies have shown that vulvovaginal infections can be treated with a honey–yogurt combination or propolis; combinations of royal jelly and honey may

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improve fertility; bee pollen may improve climacteric complaints; honey may improve episiotomy wound healing; honey and royal jelly may be used for the treatment of dysmenorrhea [7–13].

The use of bee products in any field of medicine, no matter whether it is in an apitherapeutic or an evidence-based setting, requires that the patients are willing to take the product or apply the method. As shown before, relevant numbers of patients discontinued clinical trials because they could not tolerate the sweet taste of honey or the taste of pollen, not to mention the bee stings leading to pain and subsequent swellings [8,14,15]. The problem also seems to be present when bee products are added to functional foods [16]. In an earlier study, we asked patients if they were willing to take a certain amount of a bee product for therapeutic purposes. With respect to honey, less than one-third of the people of the study group considered it very likely that they would take 50 grams of honey for a therapeutic purpose [17]. To complement this earlier research, we undertook a second study. The aim of this study was to investigate the doses of various bee products that patients would be willing to take on a long-term basis if such therapies would be reasonable in the field of obstetrics and gynecology.

## Patients and Methods

We designed an assessment form, the purpose of which was to focus on

- earlier and current use of bee products,
- the amounts of various bee products which were considered acceptable for therapeutic use on a regular basis, and
- as well as the perceived likelihood to use the bee product.

Participants were asked to rate the perceived likelihood on a 10-point scale from 1 (very unlikely) to 10 (very likely). The questionnaire may be obtained from the first author of this article. The assessment form was pretested for intelligibility by 10 members of the Obstetrics and Gynecology Department at the Ortenau Clinic Hospital in Offenburg, Germany.

Two-hundred twenty consecutive patients in private gynecological practice in Weilburg, Germany, were asked to complete the questionnaire assessment form. There were no criteria for inclusion and exclusion except for the ability to read and write in German. The questionnaire was distributed from April 2018 to May 2018. We restricted our analyses to females because they were more critical regarding apitherapy in comparison to men [3,17].

Statistics: PSPP software was used for the data management and statistical analyses. Descriptive statistics, Spearman's bivariate correlation (two-sided), cross-tabulation, and Pearson's  $\chi^2$  test were used for the statistical analysis and a probability of error less than 5% was regarded as significant.

Ethical vote: The study was approved on March 13th, 2019, by the ethics committee of the University of Gießen, Germany (Application number AZ 01/19).

## Results

All patients ( $n = 220$ ) returned the questionnaire (return rate 100%), one was returned blank and a few were returned with several questions left unanswered.

Because we focused on potential applications in the field of obstetrics and gynecology, all patients were female. The majority of patients were healthy and had come for a routine check-up. Most patients had attained an intermediate level of secondary education. Table 1 describes the demographic data of the patients who returned the form in detail.

**Table 1.** Characteristics of patients in this study.

Characteristic of participants	
<b>Age</b>	
Mean (SD)	39.7 (14.6)
(Range)	(18 – 81)
Gender [N (%)]	
Women	220 (100.0)
<b>Type of patient [N (%)]</b>	
Patient with acute disease	13 (6.0)
Patient with chronic disease	17 (7.7)
Healthy person for routine checkup	150 (68.2)
Patient for follow up visit	14 (6.4)
Cancer patient	3 (1.4)
Others	18 (8.2)
Missing	5 (2.3)
<b>School leaving certificate [N (%)]</b>	
None	1 (0.5)
Elementary school	2 (0.9)
Lower Secondary School - (Realschule)	32 (14.5)
Intermediate Secondary School - (Hauptschule)	101 (45.9)
Vocational diploma	32 (14.5)
Grammar school certificate/university entrance diploma	19 (8.6)
Tertiary education/University degree	19 (8.6)
Others	6 (2.7)
Missing	8 (3.6)

**Results on honey**

Almost two-thirds (64.2%) of all the patients did not consume honey on a daily basis. The average daily honey consumption of honey consumers (35.8%) was 12.5 g standard deviation (SD 8.9 g; median 10 g; range 1–60 g). When patients were asked which average daily honey dose that they would consider acceptable in the case of a disease which could be treated with honey, we found significant differences between honey consumers and nonhoney consumers (62.7 g vs. 36.6 g;  $F_{\text{ONEWAY ANOVA}} = 7.5$ ;  $df = 1$ ;  $p = 0.007$ ). The percentage of patients who would not accept the therapeutic use of honey (answer 0 grams) was 7.3%.

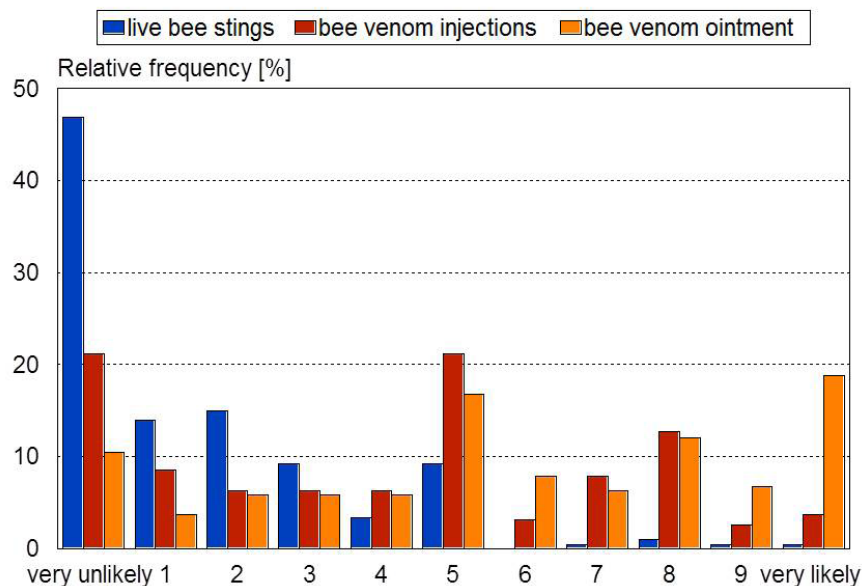
When asked if a certain type of honey could influence their willingness to eat more honey, 70.3% of the patients answered no and 29.7% yes. The highest preference was given to local honey ( $n = 13$ ) followed by blossom honey ( $n = 12$ ) and forest or woodland honey ( $n = 6$ ). The types of honey which were disliked most were imported honey ( $n = 14$ ) and forest or woodland honey ( $n = 10$ ).

Another promoted use of honey is a honey massage. About 94% of all patients had not experienced a honey massage. When asked whether they would consider a honey massage more pleasant in comparison to regular oil massage, the majority (78.0%) answered in the negative. Honey consumption had no influence on the experiences of a honey massage or the potential preference of a honey massage ( $F_{\text{ONEWAY ANOVA}}$ ).

**Results on bee venom**

Most patients had made the acquaintance of a bee's stinging apparatus (80.1%). However, we found that this had no influence on the patients' judgments on their willingness to accept various modalities of bee venom therapy. Patients clearly disliked the stings of live bees most. Here, their willingness to accept such a treatment was very unlikely (mean = 1.51; SD = 1.96; median = 1). Among patients who would consider bee sting therapy at all (141/220), the mean number of acceptable bee stings per week would be 2.6 (SD = 5.4; median = 1). The mean number of bee stings which would have been considered too much by patients who would consider bee venom therapy was 9.2 (SD = 13.7; mean 5).

Bee venom injections using syringes or bee venom ointments were significantly better accepted (mean<sub>BV-syringe</sub> = 4.08; SD = 3.1; median<sub>BV-syringe</sub> = 5); (mean<sub>BV-ointment</sub> = 4.08; SD = 3.1; median<sub>BV-ointment</sub> = 5) ( $p < 0.001$ ; paired student t-test). Patients' willingness to accept these three treatment options is shown in Figure 1. Positive ratings regarding one treatment correlated significantly with willingness to accept the others ( $r = 0.202 - 0.773$ ). Interestingly, an unusually high coefficient of correlation ( $r = 0.773$ ) was found between willingness to accept bee venom injections and willingness to accept bee venom ointment.



**Figure 1.** Patients' willingness to accept live bee stings, bee venom injections or bee venom ointment.

### **Results for pollen**

Only 7.8% of the patients had had earlier experiences with bee pollen and only 1.8% used bee pollen on a daily basis. The mean maximum amount of bee pollen which patients regarded to be acceptable was 14.1 g (SD 23.4; median 5 g). Patients rated their willingness to start a bee pollen treatment with a mean of 3.59 (SD = 3.1; median = 4). We also found a significant correlation between the amount of pollen which was regarded to be acceptable as a treatment and the willingness to accept pollen treatment ( $r = 0.285$ ;  $p = 0.001$ ). Although it was not asked specifically in the assessment form, some patients remarked on the assessment form that a pollen allergy was the main reason they did not consider pollen treatment.

### **Results for royal jelly**

About 4.9% of the patients had had earlier experiences with royal jelly and only 3.5% used it on a daily basis at an average of 20 g a day. However, patients were willing to accept 32.4 g of royal jelly a day (SD 104.4; median 10 g). Their willingness to start a royal jelly treatment was rated with a mean of 4.00 (SD = 4.7; median = 4). Again, we found a significant correlation between the amount of royal jelly which was regarded to be acceptable as a treatment and the willingness to accept royal jelly treatment ( $r = 0.514$ ;  $p < 0.001$ ).

### **Results for propolis**

About 21.7% of the patients had had earlier experiences with propolis. Among users, the treatment of a cold and associated complaints was the most frequent reason (37.9%) followed by the treatment of dry skin and lips (27.6%), the treatment of wounds and viral diseases (herpes, warts) (10.3% each), as well as the treatment of allergies and the strengthening of the immune system (6.9% each). Patients' overall acceptance of a propolis treatment was rated at a mean of 4.1 (SD = 3.4; median = 5.0). Restricting the analysis to current propolis users shows a significantly higher rating (mean = 6.9; SD = 3.1; median = 6.5).

### **Results for apilarnil, bee hive air, and podmore**

None of the patients in this study was acquainted with apilarnil and podmore. Four patients had had earlier experiences with bee hive air. Patients mean overall willingness to use these apitherapeutic methods was 3.1 for apilarnil (SD = 2.7; median = 3), 3.4 for bee hive air (SD = 2.9; median = 4), and 2.4 for podmore (SD = 2.5; median = 2).

### **Influence of health professionals and friends on patients' decisions related to apitherapy**

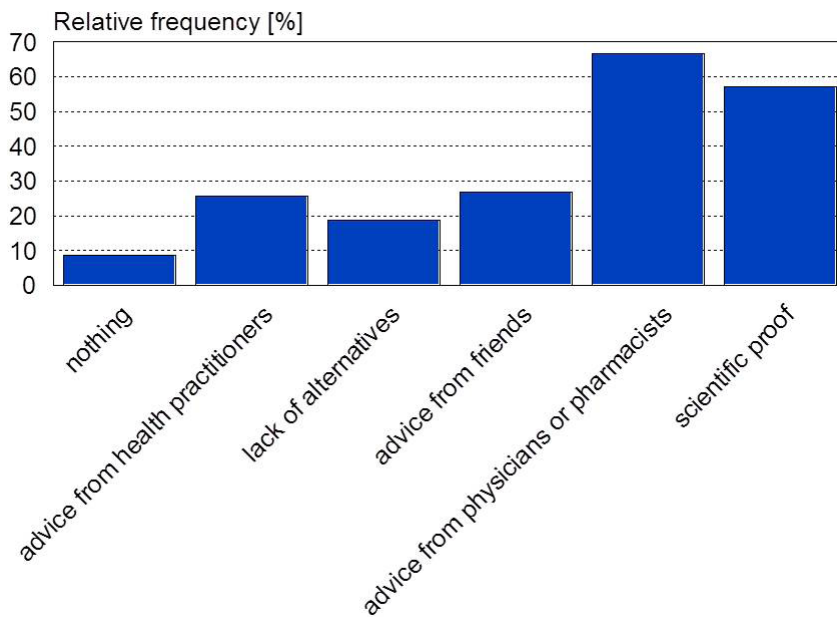
To answer the question whether patients' decisions regarding the use of the referred apitherapeutic products could be influenced by health care professionals or friends, the patients' answers are depicted in Figure 2. It shows that patients would change their attitudes regarding the treatment options of apitherapy if a physician would advise them accordingly, but also scientific evidence seems to play an important role.

### **Discussion**

To the best of our knowledge, this is the first study which assessed the amounts of the various bee products which patients would be willing to consume. It shows that the percentage of patients consuming honey is fairly low and that the amount of honey which patients would accept in the case of a medical problem is low as well. Apart from honey, most patients were reluctant to use other bee products because mean and median ratings regarding the willingness to accept these treatments are below the value of 5 which represents the point at which they are undecided. This study also addressed the question on what could influence patients' decisions. Astonishingly, physicians and scientific evidence were the most important factors. This is interesting because apitherapy is the domain of the beekeepers who promote it. It also has been considered as a part of alternative and complementary medicine. This investigation thus represents the continuation of an earlier study [17]. With this investigation, we are now able to present data on the amount of bee products which can be regarded as acceptable by patients. Such information is important for two different reasons:

1. Set-up of clinical trials. Knowledge of the amounts of bee products which are regarded as acceptable by patients, is important to avoid high dropout rates or with respect to sample size calculations, which can now consider dropout rates to have sufficient patients for analyses.
2. Information of patients prior to treatment. To convince patients that higher doses are necessary or to assure treatment adherence/patient compliance, it is important to be aware of doses which might become a problem. Consultation by informed physicians seems to be of the greatest importance to provide the necessary assurance.

Patients' willingness to accept apitherapy



**Figure 2.** Patients' answers to the question what could influence their decisions regarding the use of apitherapeutical products.

The conclusion regarding the fact that education and counseling plays an important role if the consumption of honey is supposed to be increased is supported by findings from Poland [18].

Patients' preferences for local honey and blossom honey are in line with earlier findings from Kortensniemi et al. [19] who showed that sweet and mild honeys with familiar sensory properties were preferred, while honeys with a strong odor, flavor, and/or coloring were not. The preference for local honey and the avoidance of foreign honey has been described in other studies from Italy and the United States of America [20,21]. The background for this seems to be that consumers are confronted with messages regarding threats to honey bee health, honey adulteration, and the health benefits of locally produced honey in the media [21,22]. The two studies also explain why patients in this study disliked imported honey and forest or woodland honey most. The dislike of imported honey is also in line with the results of a representative survey by the Forsa-Institute ([https://www.bmel.de/SharedDocs/Downloads/Tier/TierzuchtTierhaltung/Imkereiprogramm2017-2019.pdf?\\_\\_blob=publicationFile](https://www.bmel.de/SharedDocs/Downloads/Tier/TierzuchtTierhaltung/Imkereiprogramm2017-2019.pdf?__blob=publicationFile); accessed July 26th, 2019).

Furthermore, this study may help to understand why apitherapy has not become as successful as it could be. Apart from the fact that apitherapeutical treatments must be considered as irrational and esoteric because recommendations in apitherapy books greatly differ and are mostly not

evidence-based [7], this study shows that apitherapy methods are not appealing to many patients and that to a certain percentage, nothing can change their opinion, especially not the healing practitioners (Heilpraktiker), who are unique in Germany and represent an alternative and complementary health care profession by German law, and are allowed to practice as nonmedical practitioners using any unconventional therapy without formal education or training after an examination at the local health authorities. According to the current list of apitherapists of the German Apitherapy Federation (Deutscher Apitherapiebund), 90% (19/21) is "Heilpraktiker" (<https://apitherapie.de/dab-apitherapeuten/>; accessed August 26th, 2019). Clearly, these results only apply to the situation in Germany. It is known from investigations from Lithuania or Malaysia that bee products are much better accepted [23,24].

Unfortunately, we did not take into consideration how far personal health problems might have been the reason why patients refused the use of bee products. Although not very common in the general population, allergies to pollen, honey, and propolis may have had some influence, similar to that of patients suffering from diabetes, fructose intolerance, or caries. We also did not assess how many patients refused bee products because of vegan lifestyle. However, it is known from a recent survey that this relates only to 1% of Germany's population and it should not have influenced our

results to a great extent ([https://www.bmel.de/SharedDocs/Downloads/Ernaehrung/Forsa\\_Ernaehrungsreport2019-Tabellen.pdf?\\_\\_blob=publicationFile](https://www.bmel.de/SharedDocs/Downloads/Ernaehrung/Forsa_Ernaehrungsreport2019-Tabellen.pdf?__blob=publicationFile); accessed July 26th, 2019). This leads to other limitations in our study. Our sample represents a convenience sample. There may be some selection bias; however, since the patients' visits in the practice were not related to any issue regarding apitherapy, the selection bias should be relatively low. By comparing the mean consumption of all patients ( $12.5 \text{ g/d} \times 365 \text{ d} \times 0.358\%$  patients eating honey = 1664 g) in relation to the average honey consumption of honey in Germany which is about 1.1 kg per year (<https://de.statista.com/statistik/daten/studie/422472/umfrage/pro-kopf-konsum-von-honig-in-deutschland/>; accessed July 26th, 2019), one can assume that this sample can be considered to have a favorable attitude toward honey.

In conclusion, this study adds to the current knowledge on patients' acceptance of apitherapy, allowing for a better planning of clinical trials and a better understanding of problems in earlier studies with respect to the amount of a bee product which is likely to be accepted by patients and that information on the medicinal effects of bee products from physicians could improve patients' compliance. Future studies should address the reasons why bee products are not so appealing to most patients.

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Author contributions

Karsten Münstedt and Heidrun Männle conceived of the presented idea. Thomas Riepen carried out the investigation. Karsten Münstedt did the statistical analyses and all authors discussed the results and contributed to the final manuscript. All authors have approved the final article.

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