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UPPER RESPIRATORY TRACT INFECTIONS IN CHILDREN AND APITHERAPY

Sibel Silici*

Erciyes University, Agriculture Faculty, Department of Agricultural Biotechnology, 38280 Kayseri, Turkey

review paper

Summary

Upper respiratory tract infections (URTIs) are an important health problem of childhood. Children struggle with this disease on average 6-8 times a year, each lasting 8-10 days. URI is one of the most common diseases encountered in primary health care institutions and for which antibiotic and analgesic abuse is thought to be common. Reasons such as irrational drug use, inadequate or toxic effects, especially antibiotic resistance, undesirable effects due to wrong drug selection, and unnecessary drug consumption, cannot provide the desired treatment and cause economic losses. Unnecessary use of antibiotics not only causes antibiotic-related side effects and increases the cost of treatment, but also facilitates the emergence of antibiotic-resistant infections. However, it is known that the majority of URTIs are caused by viral factors and are self-limiting, and they usually heal without the need for medication. Acute URTI is the most common reason for outpatient clinic visits and job and school losses. Although URI is often self-limiting, mild, and short-term, when evaluated between quality of life and job losses; The magnitude of its effect is equivalent to chronic diseases. The lack of a definitive treatment, the fast pace of life, and the desire to recover as soon as possible push both patients and physicians to seek different treatments. For this reason, this study draws attention to the role of bee products, which are natural, have no side effects, and are known to have many beneficial effects, in supporting the treatment of URTI in children.

Keywords: URTI, children, propolis, royal jelly, honey

Introductıon

Upper respiratory tract infections (URTIs) encompass local infections above the larynx and are generally conceptualized as such. The most common infectious disease in children is acute upper respiratory tract infections (Wilke et al., 1996). Uncomplicated URTIs typically cause nasal discharge and congestion, sore throat or itchiness, and a tickling sensation leading to cough (Hueston, 1997). The diseases, which can be of viral or bacterial origin, significantly increase during the winter months, posing a threat to public health.

Pharyngitis is an inflammatory disease of the mucosal and submucosal structures of the throat. It can affect the oropharynx, nasopharynx, hypopharynx, tonsils, and adenoids. The normal flora of the upper respiratory tract and oral cavity primarily consists of gram-positive aerobic organisms. Among these, alpha-hemolytic or gamma-hemolytic streptococci, peptostreptococcus, fusobbacterium, and various Bacteroides species are found. In infectious scenarios, these organisms, or mixed infections involving gram-negative and aerobic agents, can occur. Especially in children, Group A beta-hemolytic streptococcus (*Streptococcus pyogenes*) is most commonly implicated in pharyngitis. *Streptococcus pneumoniae*, Group C streptococcus, and other streptococci can also cause pharyngitis. These organisms can also be isolated from healthy individuals. Whether to treat pharyngitis in a symptomatic patient remains controversial. The incubation period for Group A beta-hemolytic streptococci is between 12 hours and 4 days (Incı, 2008).

The main viral etiology for upper respiratory tract infections includes rhinoviruses, influenza viruses, adenoviruses, enteroviruses, and parainfluenza viruses. While more than 200 viruses can cause upper respiratory tract infections, rhinoviruses are the most common culprit. Parainfluenza virus, respiratory syncytial virus, and enteroviruses can create a similar clinical picture that is difficult to differentiate. Viruses primarily infect the epithelial cells of the upper respiratory tract, leading to the clinical presentation. Some viruses, like rhinoviruses, enhance the clinical picture by triggering the release of chemical mediators such as histamine and bradykinin from infected mucosa. Influenza virus, on the other hand, causes desquamation of the ciliated epithelium in the respiratory tract, resulting in mucosal damage. Symptoms of viral upper respiratory tract infections typically have a rapid onset. After a short incubation period (24-72 hours), patients experience weakness, widespread body aches, nasal discharge, sneezing, sore throat, and cough. Symptoms continue to worsen during the first 3-5 days and then gradually improve, usually resolving spontaneously within 7-14 days after the recovery phase. Fever is generally normal, although it may mildly elevate (<38 °C) and return to normal within 3 days. While burning and tearing of the eyes are common, true conjunctivitis is mainly seen in adenovirus infections and, to a lesser extent, enterovirus infections. Additionally,

*Corresponding author: sibelsilici@gmail.com

exudative tonsillitis, which can be mistaken for streptococcal tonsillopharyngitis, may occur in adenovirus infections. In parainfluenza virus infections, hoarseness and cough are prominent, while rhinovirus infections often present with coryza (runny nose), and herpes virus infections may manifest as gingivostomatitis (Akan, 2012; Incı, 2008).
Four main clinical pictures can be mentioned under the heading of URTI: rhinitis, acute tonsillopharyngitis, acute otitis media, and acute rhinosinusitis. While 75% of acute tonsillopharyngitis seen between the ages of 5-15 years is viral, the rest is bacterial and almost all of the bacterial ones are group A beta-hemolytic streptococci (AGBHS). Although acute tonsillopharyngitis can be differentiated as viral or bacterial based on clinical findings and physical examination, it is necessary to make a differentiation based on throat culture, and antibiotic or symptomatic treatment should be given accordingly. A throat culture is necessary for the diagnosis of tonsillopharyngitis; it is a cheap, practical, ubiquitous, and highly sensitive method, and results are obtained after 24 hours. Another laboratory method for the diagnosis of AGBHS tonsillopharyngitis is rapid antigen detection tests performed on throat swabs. Although this test gives results in as short as 20-30 minutes, throat culture is necessary because of high false negativity. Blood tests are also useful in the diagnosis of ABGHS tonsillopharyngitis. While leukocytosis in peripheral blood supports ABGHS, leukopenia and/or lymphomonocytosis are in the direction of viral tonsillopharyngitis. Antistreptolysin-O (ASO) elevation and C-reactive protein (CRP) positivity may also be detected in streptococcal tonsillopharyngitis (Ulusoy, 2008).

Treatment of upper respıratory tract ınfectıon

Symptomatic treatment

Upper respiratory tract infections (URTIs) are among the most common diseases encountered in primary health care organizations and antibiotic and analgesic misuse is considered to be common in their treatment (Steinman et al., 2003; Chlabicz et al., 2004). Irrational drug use, especially antibiotic resistance, inadequate or toxic effects, undesirable effects due to wrong drug selection, and unnecessary drug consumption cause economic losses (WHO, 1993; Mangione-Smith et al., 2003). In studies, it has been reported that the development of resistance to different antibiotics is very high in areas where antibiotic use is high (Spack and Black, 1998; Cizman, 2003), whereas the rate of resistant pneumococcal infections is at the lowest level in areas where antibiotic use is low (Stephenson, 1996; Arason et al., 1996). Unnecessary antibiotic use facilitates the emergence of antibiotic-resistant infections in addition to the occurrence of antibiotic-related side effects and increasing the cost of treatment (Schwartz et al., 1997; Bauman, 2000).
However, it is known that the majority of URTIs are caused by viral agents, are self-limiting and mostly heal without the need for medication (Colgan and Powers, 2001; Bauman, 2000). In a study conducted by Akıcı et al. (2004) in Istanbul, 73.8% of prescriptions diagnosed with URTI included antibiotics, while this rate was 91.8% in a study conducted by Leblebicioglu et al. (2002) in Samsun. As a matter of fact, an article investigating the use of broad-spectrum antibiotics in acute respiratory tract infections in the USA between 1997 and 1999 showed that 63% of patients were prescribed antibiotics, but another study using the 1992 US national health records showed that this rate was 52% (Gonzalez et al., 1995).
The main importance of intervention is to relieve the symptoms of fever, nasal congestion and cough. Various adrenergic agonists, anticholinergics, antihistamine preparations, antitussives, and expectorants are sold for this purpose. Common ingredients of such medications include first-generation antihistamines, antipyretics (paracetamol) or anti-inflammatory agents (ibuprofen), cough suppressants such as dextromethorphan, expectorants (such as guaifenesin), and decongestants such as pseudoephedrine and phenylpropanolamine (MMWR, 2007). While these provide symptom improvement, there is no comparative evidence that they shorten the duration of symptoms (Schroeder et al., 2004; Paul et al., 2004).
The use of antibiotics for URTI in children is controversial because more than 90% of infections have a viral etiology. Current reasons for prescribing antibiotics include diagnostic uncertainty, socio-cultural and economic pressures, malpractice litigation, and parental expectation of an antibiotic (Pschichero et al., 1999). Antibiotics are prescribed at a high rate for the treatment of URTI, which favors antibiotic resistance (Dowel et al., 1998a). However, it is also true that they have a role in defined indications such as severe acute otitis media and severe acute rhinosinusitis lasting more than ten days (Dowel et al., 1998b). Fahey and Stocks (1998) reported in their systematic review of randomized controlled trials comparing antibiotics with placebo for pediatric URTI that antibiotic treatment did not change clinical status and did not reduce the complication rate. However, the researchers emphasized that its efficacy may be higher in a subgroup at a higher baseline risk of developing complications.

Alternative and complementary treatment

As an aid in the treatment of sore throat due to infection, it is recommended to rest and consume plenty of fluids (fruit juice, water, water with lemon, open tea with honey), consume soft foods, gargle frequently with warm salt water, avoid smoking and smoking environment, take aspirin or acetaminophen if there is pain and fever, takes throat lozenges and increase the humidity of the room (Dogan et al., 2012).
In the world, echinacea, vitamin C, zinc, *Pelorgonium sidoides* (Umckaloaba), probiotics, garlic, and saline irrigation have been investigated therapies (Nahas and Balla, 2012; Douglas et al., 2008; Singh and Das, 2013; Timmer, 2008; Lissiman et al., 2014; Kassel et al., 2010). As a result, echinacea, probiotics, and zinc were found to be effective, while vitamin C requires mega doses for protection, and studies on applications such as garlic, saline irrigation, and hot steam are reported to be inadequate and cannot be interpreted.
Apart from these, Biswas et al. (1999) examined the effect of vitamin A supplement in diarrhea and acute respiratory tract infections in 174 children under 6 years of age, and the effect of single oral administration on the incidence of diarrhea and acute respiratory tract could not be determined. The WHO (World Health Organization, 2001) encourages the use of some safe antitussives such as lemon juice and honey in the treatment of cough and reports that such preparations are not expensive. Honey contains more than 200 compounds such as carbohydrates (glucose, fructose, sucrose, maltose, etc.), free amino acids, vitamins, minerals, organic acids, and antioxidants (phenolic compounds, flavonoids, enzymes, carotenoid-like compounds, and other phytochemicals). Studies on the antimicrobial effect of honey have shown that it has a broad spectrum of activity against gram-positive and gram-negative bacteria. It is effective against bacteria such as *Staphyloccoccus aureus, Streptococcus faecalis, Candida albicans, Klebsiella pneumoniae, Pseudomonas aeruginosa, Escherichia coli,* Salmonella spp., and *Shigella dysenteriae*, which are common agents of upper respiratory tract infections (Adeleye and Opiah, 2003). There are also studies on the antiviral activity of honey (Bogdanov et al., 2008). Indeed, due to these properties, honey has been used in traditional medicine for many years in the treatment of cough (Adeleye and Opiah, 2003). Honey is also used in the treatment of infected wounds and as an ingredient in cough syrups.
Honey reduces inflammation and edema, and stimulates epithelialization, tissue regeneration, granulation, and debridement (Subrahmanyam, 1991; Bogdanov et al., 2008). Honey is recommended for dental hygiene with therapeutic properties in the treatment of gingivitis and periodontal diseases (Bogdanov et al., 2008). WHO (2001) recommends honey as a demulsent agent for cough. Since honey is a sweet product, it stimulates mucus secretion and saliva secretion in the respiratory tract. This effect is combined with the hyperosmolarity of honey and its antioxidant and anti-inflammatory properties.
A Cochrane meta-analysis of 8 pediatric trials of 616 children with viral-induced cough showed that OTC (over-the-counter) medications did not affect cough frequency, severity, number of coughs, and sputum production (Smith et al., 2012). For the treatment of cough in children, dextromethorphan (nonselective serotonin reuptake inhibitor and σ1-receptor agonist) and diphenhydramine (first-generation anticholinergic, antitussive, antiemetic, and antihistamine with sedative properties) are commonly used. The effect of both drugs on cough and sleep quality in children to improve nocturnal syndromes was not higher than placebo (Paul et al., 2004). For years, codeine has also been considered a treatment agent on the grounds that it suppresses cough in the central nervous system. However, there is no evidence that codeine is more effective or safe than placebo (Goldman, 2010).
There is growing interest in the use of complementary and alternative medicines in URTI. Herbal medicines have been studied frequently with conflicting results. The most widely used and studied plants are Echinacea and *Andrographis paniculata*, both of which are believed to be immunostimulants. Similarly, propolis (bee resin) has also been studied and found to increase antibody production. However, the most important problem in the use and study of herbal products is the lack of standardization (Shah et al., 2007). Researchers sought large randomized trials using standardized preparations and measuring well-defined endpoints. There is still insufficient data on safety, especially with long-term use. For example, echinacea is frequently reported to cause rash (Mullins, 1998).

Honey bee products ın the treatment of upper respıratory tract ınfectıons in children

There are studies on the use of honey in the treatment of upper respiratory tract infections and especially coughs. In a partially double-blind randomized study conducted by Paul et al. (2007), they compared buckwheat honey, honey-flavored dextromethorphan (DM), and no drug treatment group given a single night dose (30 minutes before bedtime) in the reduction of difficulty sleeping and night cough in children diagnosed with upper respiratory tract infection. In the two-day study, all groups were instructed not to take any medication or honey on the first night and the application was made on the second night. In the study conducted on 105 children aged 2-18 years with URTI

(duration of illness 7 days or less), the frequency and severity of cough, the quality of cough, and the quality of sleep of families and children were evaluated. While there were differences between the groups, the results of the honey group were better than those of the control group in which no treatment was given, the results of the DM group were not better than those of the control group. The researchers stated that honey can be preferred in the symptomatic treatment of children with sleep difficulties and nocturnal cough due to URTI and that honey can be recommended by physicians as a safe and well-tolerated alternative.

In a similar study, Shadkam et al. (2010) conducted on 139 children aged 24-60 months with cough due to URTI and formed four groups; honey, DM (dextromethorphan), DPH (diphenhydramine), and a control group. Cough frequency and severity were evaluated in the groups, and while there was no statistical difference between the results of DM and DPH groups, the results of the honey group were found to be better than all groups. In conclusion, the researchers reported that 2.5 ml of honey taken before going to sleep had a curative effect on URTI compared to DM and DPH.

The study conducted by Oduwole et al. (2014), which also evaluated the studies of Paul et al. (2007) and Shadkam et al. (2010), focused on the efficacy of honey in the treatment of acute cough in 265 children aged 2-18 years. In the study, DM and DPH, which are the components of commonly recommended cough medicines, and non-medicated groups were compared using a 7-point Likert scale, and although the honey group was better in reducing cough frequency compared to the non-medicated group, it was not found to be different from the DM group. However, irritability, insomnia, and hyperactivity were observed in 7 children in the honey group, moderate adverse reactions in the DM group, and drowsiness in 3 children in the DPH group, but the difference between the groups was not statistically significant. In conclusion, Oduwole et al. (2014) emphasized that honey was better in reducing cough frequency and improving the sleep quality of both families and children compared to the unmedicated group and DPH group, but not better than the DM group.

In a study testing honeys of different botanical origins, Cohen et al. (2012) investigated the effect of three honeys of different botanical origins (eucalyptus, citrus, and honeydew honey) and date syrup extract (brown in color, similar in taste to honey) on night cough and difficulty sleeping in a single overnight dose on 300 children aged 1-5 years with URTI in 2009. The honey group was found to be better in the symptomatic treatment of nocturnal cough and sleep difficulties than the group given date palm extract and was recommended. A review by Eccles (2005) attributed the favorable effects of honey in URTIs to the natural and reflexive salivary secretion of sweet foods, which causes mucus secretion in the respiratory tract, resulting in a demulsant effect on the pharynx and larynx and thus a reduction in coughing. Eccles (2005) reported that the interaction between opioid-responsive perceptual filaments and gustatory nerves can help them produce antitussive effects through the central nervous system mechanism. Raessi et al. (2014) examined the therapeutic effects of prednisolone, coffee, honey, and coffee-honey in the treatment of post-infectious cough (PPC) and compared the effects. Among the groups, the most effective group on cough severity was the group given the coffee-honey combination, which showed success in a short time and was also recommended by the researchers. In a study conducted by Sopo et al. (2014) on 134 children suffering from non-specific acute cough, the effects of a mixture of milk (90 ml) and flower honey (10 ml) were compared with dextromethorphan and levodropropizine (LPD). After three consecutive days of administration, therapeutic success was 80% in the honey+milk group and 87% in the OTC medication groups ($p<0.25$). The researchers showed that milk with honey was at least as effective as DM and LDP groups for non-specific cough. In another study, 30 of 60 patients (group I; mean age 27.4 years) admitted to hospital with cold symptoms in Iran were given the classical treatment regimen (acetaminophen 325 mg/q 6 hours, naproxen 250 mg/q 12 hours + chlorpheniramine 4mg/q 6 hours) while the other 30 patients (group II, mean age 24.4 years) were given 50 g of natural honey daily. Symptoms such as rhinitis, myalgia, fever, throat congestion, cough, and cold were monitored daily. At the end of the study, the symptoms in the group given honey lasted 1-2 days shorter than the control group. This effect was attributed by the researchers to the antioxidant and antimicrobial effect of honey with its phenolic acid, flavonoid and peroxidase content (Pourahmed and Sobhanian, 2009). Naveed et al. (2013) reported that when families with children diagnosed with URTI between the ages of 1-6 years were asked to feed honey, 39 out of 40 families agreed. Raessi et al. (2013) compared the effects of systemic steroids and honey-coffee mixture in the treatment of persistent post-infectious cough (PPC). It was found that the most effective group for PPC was the honey-coffee group. Researchers have shown that a honey and coffee mixture can be used as an alternative in PPC.

Paul et al. (2007) reported that honey is cheaper and safer than other treatment drugs, and especially processed honey carries little risk of allergy. However, it is noteworthy that honey is not given to children under one year of age due to *Clostridium botulunim* toxicity (Oduwole et al., 2014).

Carr and Nahata (2006) investigated the safety and effects of alternative therapy in the prevention and treatment of URTI in their 2005 review. They evaluated 6 clinical trials examining the use of herbal preparations and 9 studies

involving other CAM (Complementary and Alternative Medicine) therapies. They reported that echinacea reduced the duration and severity of URTIs, and *Andrographis paniculata* (Echinacea) reduced nasal secretions but did not affect URTI symptoms. They reported that echinacea-propolis-ascorbic acid decreased the number of URTI episodes, symptom duration, and number of sick days, while ascorbic acid or homeopathy was not effective. Kumar et al. (2011) reported that traditional and complementary treatment practices are used intensively in children due to the safety phenomenon, especially honey is a traditional medicine used in URTIs. In the study, the opinions of 92 families and 30 health professionals (11 focus families) were taken and 29% of the families reported that they used honey in their children and that honey was traditional, accepted, easily accessible, natural, and safe. They stated that they used it with hot water and lemon, especially in URTIs. Waren et al. (2007) evaluated the effects of honey on nocturnal cough and sleep quality in children and reported that honey improved symptom scores and reduced cough frequency compared to the untreated group, but stated that the study lacked appropriate psychometric data for the survey.

Propolis, another bee product, is a product with high resin content that honey bee colonies collect from the buds of trees, add beeswax and enzymes to it, and use it for various purposes with its protective feature against microorganisms in the hive. The antiviral activity of propolis has also been the subject of numerous studies (Amoros et al., 1992; Harish et al., 1997; Serkedjia et al., 1992). Fouad et al. (2012) investigated the efficacy of propolis by taking 17 throat swab samples from children over 11 years of age with URTI in 2011. Among the patient volunteers, 9 children had positive *S. pyogenes* cultures (52.9% prevalence), followed by *H. influenza* (11.8%) in the cultures of 2 children and *C. albicans* (35.5%) in the cultures of 6 children. All isolates were found to be sensitive to propolis. *S. pyogenes, H. influenza,* and *C. albicans* were inhibited at 200 mg/ml propolis concentration. In addition, the therapeutic effect of propolis in URTI was tested in 41 pediatric patients and complete remission of streptococcal and candidal symptoms was achieved in 2-5 days in all patients. In the study, a propolis+goat milk mixture was reported to be an effective antimicrobial agent in throat infections caused by bacterial and candidal species in children. In addition, Cohen et al. (2004) examined the efficacy of a preparation containing echinacea, propolis and vitamin C in the prevention of URTI in children during a 12-week winter period. The study included 430 children aged 1-5 years. The herbal preparation (Chizukit) group showed a 55% reduction in the number of cases of illness, a 50% reduction in the number of cases per child and a 62% reduction in the number of fevers per child. The duration of individual episodes and the total number of days of illness were significantly reduced in the Chizukit group. In conclusion, the preparation containing echinacea, propolis and vitamin C had a preventive effect on the incidence of URTI. Ophori and Wemabu (2010) identified the bacterial agents of URTI infections and determined the sensitivity of isolates to propolis. Ethanol extracts of 0.25, 0.5, 1, 2, 4, and 10 μg/ml propolis were tested in 250 throat cultures from patients (142 males, 108 females) aged 15-30 years diagnosed with URTI at Benin City Central Hospital in Nigeria. Of the 250 samples, 160 (64%) were *Haemophilus influenzae-positive* cultures with the highest prevalence, followed by *Klebsiella pneumoniae* (19.2%) *Streptococcus pneumoniae* (12%), *Moraxella catarrhalis* (10%), *Streptococcus pyogenes* (2%). While the highest isolate rate was obtained from the 15-18 age group, *M. catarrhalis* and *S. pyogenes* were not isolated from the 23-26 age group. All isolates showed sensitivity to all concentrations of propolis, while *K. pneumonia* and S. *pneumonia* inhibition zones were 32 and 30 mm, respectively. In conclusion, researchers emphasized that propolis is a very effective antimicrobial agent in the management and treatment of URTI caused by bacterial species. In another study, El-Shouny et al. (2012) identified the microbial agents causing URTI in children (17 throat swabs in total) diagnosed with URTI at Al-Thawrah Hospital (Yemen) and determined the sensitivity of the isolates to propolis and antibiotics. In 9 of the 17 samples, *S. pyogenes* was positive and had the highest prevalence (52.9%), followed by *H. influenza* (11.8%) and 6 isolates were identified as *C. albicans* (35.3%). *S. pyogenes* was isolated with the highest rate in the 8-11 age group. All isolates were sensitive to ciprofloxacin, amoxicillin, and cephalexin. Some isolates showed resistance to ampicillin and erythromycin. The growth of *S. pyogenes, H. influenza,* and *C. albicans* was inhibited at 200 mg/ml MIC with inhibition zones of 24, 17, and 19 mm. The efficacy of propolis against URTI infections was also tested in 41 pediatric patients.

Marchisio et al. (2010) studied the effect of propolis and zinc solution in 122 children aged 1-5 years suffering from recurrent otitis media (ROM). During the three-month study period, 31 children (50.8%) received propolis and zinc solution while 43 children constituted the control group. The mean number of OM episodes per child/month was 0.23+0.26 in the propolis group and 0.34+0.29 in the control group. The reduction rate was calculated as 32% ($p=0.03$). It was reported that administration of propolis and zinc in children with a history of OM decreased the risk of OM episodes, and no problems were experienced in terms of trust and tolerability with the satisfaction of the families.

In another study investigating the antimicrobial activity of propolis, Mirzoeva et al. (1997) examined the effect of propolis on the physiology of *B. subtilis, E. coli and R. sphaeroides* microorganisms. In the study, it was determined that ethanolic extract of propolis showed a bactericidal effect. Propolis was found to be effective against gram-

positive and some gram-negative bacteria but this bactericidal effect was species dependent. It is thought that propolis acts on the ion permeability of the bacterial membrane and causes dissipation/disruption of the membrane potential. The electrochemical gradient of protons crossing the membrane is essential for bacterial ATP synthesis, membrane transport, and motility, and thus survival. The effect of propolis on membrane potential and permeability contributes to its overall cytotoxic activity and, together with other antimicrobial components, may reduce bacterial resistance. This is also explained by the synergistic effect of propolis with some antibiotics. Some compounds of propolis such as CAPE and quercetin act as ionophores and cause inhibition of bacterial motility. Considering that bacterial motility and chemotaxis guide the adhesion and invasion of bacteria to the relevant sites, the importance of this effect becomes clear (Finlay and Falkow, 1989; Tamura et al., 1995). In conclusion, the antimotility action of propolis components on bacteria has been shown to play an important role in the inhibition of bacterial pathogenesis and infection development. These compounds are probably flavonoids and caffeic acid esters (Pepeljnajk et al., 1985). Scazzocchio et al. (2006) found that EEP (ethanol extract of propolis) showed a significant antimicrobial effect on all clinical isolates tested. The addition of EEP to the tested antibacterial drugs strongly enhanced the antimicrobial effect of ampicillin, gentamycin, and streptomycin, and moderately enhanced the effect of chloramphenicol, ceftriaxone, and vancomycin, but had no effect on erythromycin. The antimicrobial activity of a propolis sample obtained from 4 different regions of Turkey and Brazil was tested against 9 anaerobic lines. It was determined that the main components of propolis were pinobanksin, quercetin, naringenin, galangin, chrysin, and aromatic acids. In the study, it was suggested that propolis could be used in oral cavity diseases due to its antimicrobial activity (Koru et al., 2007). In addition, Lu et al. (2005) investigated the antibacterial activity of Taiwanese propolis against *Staphylococcus aureus.* They evaluated cell age, incubation temperature, and pH. While bacterial culture age was found to be significant, they observed that propolis was more sensitive during the late exponential phase. Additionally, it was noted that pH values of 35 °C and 37.8 °C were more effective.

In conclusion, the antimotility action of propolis components in bacteria has been shown to play an important role in the inhibition of bacterial pathogenesis and infection development. These compounds are probably flavonoids and caffeic acid esters (Finlay and Falkow, 1989; Tamura et al., 1995). However, it is emphasized that pure propolis components containing cinnamic acid derivatives (caffeic acid and CAPE) and flavonoids (quercetin and naringenin) affect bacterial membrane potential and mobility and that the bacteriostatic and bacteriocidal effects of propolis are probably due to the combined action of such compounds. It is also suggested that the identification and characterization of potent bactericidal components of propolis will be useful for the development of new antibiotic drugs (Pepeljnajk et al., 1995).

Conclusıon

Apitherapy, which involves using bee products, has gained importance in recent years for preventing and treating various diseases. Natural products such as honey, pollen, propolis, and royal jelly are generally beneficial for the human liver and cells, and they possess high antioxidant capacity. These natural products contain various compounds, including carbohydrates, vitamins, coenzymes, polyphenols, aroma compounds, phytosterols, and several terpenes and terpenoids. Therefore, as seen in many studies, the use of bee products such as honey and propolis in upper respiratory tract infections in children can be used safely to prevent and support the treatment of such diseases.

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