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FILE: ▪ Propolis
▪ Antimicrobial Activity

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RE: Propolis Found to have Potential Usefulness in Antimicrobial Activity

Ugur A, Arslan T. An in vitro study on antimicrobial activity of propolis from Mugla Province in Turkey. *Journal of Medicinal Food* 2004;7(1):90–94.

Propolis is a resinous substance produced by honeybees. The bees combine the exudates collected from plants with waxes and glandular secretions to create the substance which is used for the construction and defense of their hives. The chemical composition of propolis varies depending on the vegetation in the region where the plant exudates are collected. For example, propolis from temperate zones contains phenolic substances (e.g., flavonoids and cinnamic acid derivatives), whereas propolis from tropical regions contains predominantly diterpenes and prenylated compounds. Propolis has long been used in folk medicine to treat a variety of ailments and is purported to have antibacterial, antifungal, antiviral, antiprotozoan, antitumor, immunomodulatory, anti-inflammatory, and antioxidant activities. Because of this broad spectrum of biological activities, propolis has "attracted much attention as a natural useful substance in medicine, health food, and cosmetic industries." In this study, the authors examine the antibacterial and antifungal activities of acetone and dimethyl sulfoxide (DMSO) extracts of propolis.

Samples of propolis were collected from 45 beehives in the Mugla Province of Turkey in 1999. The susceptibility of *Bacillus subtilis, Streptococcus mutans, Brucella melitensis, Pseudomonas aeruginosa, Shigella sonnei, Salmonella typhi,* and *Candida albicans* to acetone and DMSO extracts of these 45 different propolis samples was assayed in duplicate with the use of the standard disc diffusion method; dosages of 10 and 25 µL of propolis were tested. A control test with standard antibiotics (amikacin, oxytetracycline, penicillin, and ampicillin) was also performed.

The antimicrobial activity of the propolis extracts varied depending on the sample, dosage of propolis, and the solvent used (i.e., acetone or DMSO). Except for *B. melitensis,* the DMSO extracts of most of the propolis samples were more effective growth inhibitors than were the acetone extracts of the same propolis samples. The inhibitory effect of both the DMSO and acetone extracts of all propolis samples increased as the propolis concentration

increased. Of the microorganisms tested, *S. sonnei* and *S. mutans* were the most sensitive to propolis. The diameters of the maximum inhibitory zones at the highest propolis dosage (25 μL from the 100-ppm aliquot) for the acetone and DMSO extracts were as large as 28.0 and 36.0 mm for *S. sonnei* and 25.2 and 26.2 mm for *S. mutans*, respectively. The least sensitive microorganism to propolis was *C. albicans*, which had corresponding maximum inhibitory zones at the highest propolis dosage of 17.3 and 18.2 mm, respectively. Compared with the antibiotics tested, propolis had a similar or greater antimicrobial activity against *S. mutans*, *P. aeruginosa*, *S. sonnei*, *S. typhi*, and *C. albicans*. Antibiotics had a greater inhibitory effect on *B. melitensis* and *B. subtilis* than did any of the 45 propolis samples.

High concentrations of both acetone and DMSO inhibited the growth of the microorganisms tested; however, most of the propolis samples had stronger biological activities than did either solvent alone. The results suggest that DMSO extracts of propolis are more effective in inhibiting the growth of a wider range of microorganisms than are acetone extracts of propolis. In addition, the results suggest that the chemical composition and potency of propolis vary not only among different geographical regions but also within the same geographical region. The authors recommend that "further research is necessary to determine the most effective dosage [of propolis] because [the] antimicrobial activity of all propolis samples...increased with increasing dosage without reaching a plateau at the highest dosage tested (100 ppm and 25 μL)."

—Brenda Milot, ELS

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