SELEZIONE BIBLIOGRAFICA SU PROPOLI
(in grassetto articoli su multicompositi Asoltech)

Antiproliferative activity of Greek propolis.
Pratsinis H, Kletsas D, Mellou E, Chinou I.
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The butanolic extract and the isolated chemical constituents, mainly diterpenes and flavonoids, from Greek propolis have been tested for their cytostatic activities against human malignant and normal cell strains. The extract and the diterpenes were found to be the most active against HT-29 human colon adenocarcinoma cells, without affecting normal human cells. Manool, a diterpene isolated for the first time from Greek propolis, was the most active compound, arresting the cancer cells at the G(2)/M phase of the cell cycle.

Antimicrobial activity of two propolis samples against human Campylobacter jejuni.
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The aim of this study was to analyze the antimicrobial activity of two ethanolic extracts of propolis (EEPs) and selected flavonoids against 16 Campylobacter jejuni clinical isolates and several Gram-positive and Gram-negative human pathogens. The antimicrobial activity of EEPs and flavonoids was evaluated by the agar well diffusion method. The EEPs inhibited the growth of C. jejuni, Enterobacter faecalis, and Staphylococcus aureus. The most active flavonoid was galangin, with the highest percentage of sensitivity among C. jejuni strains (68.8%); lower percentages of sensitivity were observed for quercetin (50%). The minimal inhibitory concentrations (MICs) of EEPs and flavonoids for C. jejuni isolates were determined by the agar dilution method. EEPs showed MIC values of 0.3125-0.156 mg/mL for all C. jejuni strains; galangin and quercetin gave MICs ranging from 0.250 to 0.125 mg/mL. Thus propolis preparations could be used as support to traditional therapy for Campylobacter infection, especially when the antibiotic agents show no activity against this microorganism.

Mechanism of herpes simplex virus type 2 suppression by propolis extracts.
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Genital herpes caused by herpes simplex virus type 2 (HSV-2) is a chronic, persistent infection spreading efficiently and silently as sexually transmitted disease through the population. Antiviral agents currently applied for the treatment of herpesvirus infections include acyclovir and derivatives. Aqueous and ethanolic extracts of propolis were phytochemically analysed, different polyphenols, flavonoids and phenylcarboxylic acids were identified as major constituents. The aqueous propolis extract revealed a relatively high amount of phenylcarboxylic acids and low concentrations flavonoids when compared to the ethanolic special extract GH 2002. The cytotoxic and antitherpetic effect of propolis extracts against HSV-2 was analysed in cell culture, and revealed a moderate cytotoxicity on RC-37 cells. The 50% inhibitory concentration (IC(50)) of aqueous and ethanolic GH 2002 propolis extracts for HSV-2 plaque formation was determined at 0.0005% and 0.0004%, respectively. Both propolis extracts exhibited high levels of antiviral activity against HSV-2 in viral suspension tests, infectivity was significantly reduced by >99% and a direct concentration- and time-dependent antitherpetic activity could be demonstrated for both extracts. In order to determine the mode of virus suppression by propolis, the extracts were added at different times during the viral infection cycle. Addition of these drugs to uninfected cells prior to infection or to herpesvirus-infected cells during
intracellular replication had no effect on virus multiplication. However both propolis extracts exhibited high antiherpetic activity when viruses were pretreated with these drugs prior to infection. Selectivity indices were determined at 80 and 42.5 for the aqueous and ethanolic extract, respectively, thus propolis extracts might be suitable for topical therapy in recurrent herpetic infection.


Antiviral activity and mode of action of propolis extracts and selected compounds.

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Aqueous and ethanol extracts of propolis were analysed phytochemically and examined for their antiviral activity in vitro. Different polyphenols, flavonoids and phenylcarboxylic acids were identified as major constituents. The antiviral effect of propolis extracts and selected constituents, e.g. caffeic acid (1), p-coumaric acid (2), benzoic acid (3), galangin (4), pinocembrin (5) and chrysin (6) against herpes simplex virus type 1 (HSV-1) was analysed in cell culture. The 50% inhibitory concentration (IC50) of aqueous and ethanol propolis extracts for HSV-1 plaque formation was determined at 0.0004% and 0.000035%, respectively. Both propolis extracts exhibited high levels of antiviral activity against HSV-1 in viral suspension tests, plaque formation was significantly reduced by >98%. In order to determine the mode of antiviral action of propolis, the extracts were added at different times during the viral infection cycle. Both propolis extracts exhibited high anti-HSV-1 activity when the viruses were pretreated with these drugs prior to infection. Among the analysed compounds, only galangin and chrysin displayed some antiviral activity. However, the extracts containing many different components exhibited significantly higher antitherpetic effects as well as higher selectivity indices than single isolated constituents. Propolis extracts might be suitable for topical application against herpes infection.


In vitro antimicrobial activity of a novel propolis formulation (Actichelated propolis).

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AIMS: This study compared in vitro activities of Actichelated propolis (a multicomposite material obtained with mechano-chemical activation) and of a hydroalcoholic extract of propolis. METHODS AND RESULTS: Minimal inhibitory concentration (MIC) and minimal bactericidal concentration (MBC), determined by means of microdilution broth method, against five strains of Staphylococcus aureus, Streptococcus pyogenes, Haemophilus influenzae, Enterococcus spp., Escherichia coli, Proteus mirabilis and Pseudomonas aeruginosa, showed a greater potency of Actichelated propolis (MIC range: 0.016-4 mg flavonoids ml(-1)) in respect to the hydroalcoholic extract (MIC range: 0.08-21.4 mg flavonoids ml(-1)). Concentrations of Actichelated propolis active against adenovirus, influenza virus, parainfluenza virus and herpes virus type 1 were at least 10 times lower than those of the hydroalcoholic extract. Preincubation of Strep. pyogenes and H. influenzae with subinhibitory concentrations of Actichelated propolis (1/4 and 1/8 x MIC) significantly reduced the number of bacteria that adhered to human buccal cells. CONCLUSIONS: Actichelated propolis has proven to possess antibacterial and antiviral activity higher than a hydroalcoholic extract, being also able to interfere on bacterial adhesion to human oral cells. SIGNIFICANCE AND IMPACT OF THE STUDY: This new formulation of propolis showing better antimicrobial and physical characteristics could improve the application of propolis in respiratory tract infections.


Aggregation of Staphylococcus aureus following treatment with the antibacterial flavonol galangin.
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AIM: The flavonol galangin, an antimicrobial constituent of the traditional medicines propolis and Helichrysum aureonitens, is being assessed as part of an ongoing investigation into the antibacterial activity of flavonoids. The present study sought to establish whether galangin has any aggregatory effect on bacterial cells. METHODS AND RESULTS: In preparatory time-kill assays, 50 microg ml(-1) of galangin was found to reduce colony counts of c. 5 x 10(7) CFU ml(-1)Staphylococcus aureus NCTC 6571 by approximately 15 000-fold during 60 min of incubation. Subsequent light microscopy studies demonstrated significant increases in the number of large clusters of bacterial cells in populations treated with the flavonol. CONCLUSION: Data presented here show that galangin causes aggregation of bacterial cells. SIGNIFICANCE AND IMPACT OF THE STUDY: The finding that galangin causes bacterial cells to clump together may implicate the cytoplasmic membrane as a target site for this compound's activity. More importantly, this observation indicates that decreases in CFU numbers detected in time-kill and minimum bactericidal concentration (MBC) assays in previous investigations were at least partially attributable to this aggregatory effect. This raises the possibility that galangin is not genuinely bactericidal in action, and calls into question the suitability of time-kill and MBC assays for determining the nature of activity of naturally occurring flavonoids.

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Topical antiinflammatory activity of an innovative aqueous formulation of actichelated propolis vs two commercial propolis formulations.

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A novel aqueous commercial formulation of a new hydrophilic propolis product (Actichelated(R)) Propolis, contained in 'LeniGola PropolEffect Spray Senza Alcohol'; Pharbenia, Milan, Italy) was evaluated for its topical antiinflammatory activity in comparison with a hydroglyceric propolis spray solution ('Propoli LeniGola Spray Senza Alcool'; Pharbenia, Milan, Italy) and a hydroalcohol preparation ('Propoli LeniGola Spray Forte'; Pharbenia, Milan, Italy). Actichelated propolis (Asoltech, Trieste, Italy) is a multicomposite material obtained with a patented technology, mechano-chemical activation, which application led to a new hydrosoluble form of propolis. Each propolis preparation provoked a dose-dependent inhibition of the croton oil-induced ear oedema in mice. Considering the administered doses of flavonoids, 'LeniGola PropolEffect Spray Senza Alcool' (ID(50) = 13.6 microg cm(-2)) corresponding to 13.6 microg flavonoids/cm(2)) is slightly more active than the hydroglyceric formulation 'Propoli LeniGola Spray' (ID(50) = 13.7 microg cm(-2)) corresponding to 20.6 microg flavonoids/cm(-2)) and six times more active than the hydroalcohol preparation 'Propoli LeniGola Spray Forte' (ID(50) = 5.5 microg cm(-2)) corresponding to 82.5 microg flavonoids/cm(-2)). As a reference, 15 microg cm(-2) of the commercial sprays Tantum Verde and Froben, containing 37.5 or 45 microg of the non-steroidal antiinflammatory drugs benzidamine hydrochloride or flurbiprofen, induced 18% and 35% oedema inhibition, respectively.


In vitro antimicrobial activity of propolis samples from different geographical origins against certain oral pathogens.


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Propolis is an agent having antimicrobial properties, however, its composition can vary depending on the area where it is collected. In the present study, the antimicrobial activity of five propolis samples, collected from four different regions in Turkey and from Brazil, against nine anaerobic strains was evaluated. Ethanol extracts of propolis (EEP) were prepared from propolis samples and we determined minimum inhibitory concentrations (MIC) and minimum bactericidal concentrations (MBC) of EEP on the growth of test microorganisms by using agar dilution method. All
strains were susceptible and MIC values ranged from 4 to 512 microg/ml for propolis activity. Propolis from Kazan-Ankara showed most effective MIC values to the studied microorganisms. MBC values of Kazan-Ankara EEP samples were ranged from 8 to 512 microg/ml. Death was observed within 4 h of incubation for Peptostreptococcus anaerobius and micros and Lactobacillus acidophilus and Actinomycyes naeslundii, while 8 h for Prevotella oralis and Prevotella melaninogenica and Porphyromonas gingivalis, 12 h for Fusobacterium nucleatum, 16 h for Veillonella parvula. It was shown that propolis samples were more effective against Gram positive anaerobic bacteria than Gram negative ones. The organic chemical compositions of EEPs were determined by high-resolution gas chromatography coupled to mass spectrometry (GC-MS). The main compounds of EEPs were flavonoids such as pinobanksin, quercetin, naringenin, galangine, chrysin and aromatic acids such as cafeic acid. Because of increased antimicrobial resistance, propolis may be kept in mind in the treatment of oral cavity diseases.


Flavonoid analysis and antimicrobial activity of commercially available propolis products.

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Propolis ethanolic solutions are the most used propolis products on the market for the treatment of minor ulcers in the mouth, angina, thrush or skin infections. Since it is still an unofficial drug in pharmacy, we analyzed the contents of flavonoids in ten commercially available ethanolic solutions of propolis from the Croatian market using two complementary colorimetric methods. Antimicrobial activities, determined with the diffusion method, against six bacterial species (Bacillus subtilis NCT 8236, Staphylococcus aureus ATCC 25923, Streptococcus pyogenes ATCC 12204, Enterococcus faecalis ATCC 29212, Escherichia coli ATCC 10536, Pseudomonas aeruginosa ATCC 27853, and one yeast-like fungus Candida albicans ATCC 10231 were compared. Results of flavonoids analysis suggested that the contents of flavones and flavonoids in the products were uniform and ranged from 0.14 to 0.41%, but the content of flavanones varied greatly from 0.43 to 18.78%. Total flavonoid content, as the sum of two colorimetric methods, in propolis products was between 0.78 and 18.92%, and most products had the flavonoids content below 9%. All products with the total flavonoids content above 1% showed antimicrobial activity against the four Gram-positive bacterial species tested, and against P. aeruginosa and the yeast-like fungus C. albicans. Total flavonoids contents, expressed as the sum of two colorimetric methods, could be useful methods for estimating the flavonoid contents of propolis products. Our results indicate that the quality of commercially available propolis products requires verification.


Galangin expresses bactericidal activity against multiple-resistant bacteria: MRSA, Enterococcus spp. and Pseudomonas aeruginosa.

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The antimicrobial activity of three propolis ethanol extracts (EEP) was examined for various Gram-negative and Gram-positive bacterial species, including multiple-resistant Staphylococcus aureus, Enterococcus spp. and Pseudomonas aeruginosa strains. EEP had a good bactericidal activity against Gram-positive species, and all multiple-resistant bacterial strains tested were sensitive to EEP. Minimal inhibitory concentrations (MICs) were lower in samples of higher flavonoid content (from 0.65 to 7.81 mg mL(-1)), indicating the influence of the concentration of some potent bactericidal compound(s) in propolis or synergism among some bactericidal compounds. Antimicrobial-guided separation of flavonoid aglycones (bioassay in situ on thin-layer chromatogram) showed that galangin (3,5,7-trihydroxyflavone) is one compound in EEP with bactericidal activity. Galangin was isolated by preparative chromatography. After determining the quantity present, the MIC against multiple-resistant bacteria was determined. The MIC of galangin against multiple-resistant bacterial strains was significantly lower (from 0.16 to 0.44 mg mL(-1), p < 0.05) than that of EEP. The bactericidal activity of galangin against P. aeruginosa strains was present at 0.17+/-0.05 mg mL(-1).

Anti-herpes simplex virus effect of an aqueous extract of propolis.

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BACKGROUND: Propolis, a natural product from beehives, comprises a complex of chemicals, the most important group being flavonoids, which play a role in antiviral protection. OBJECTIVES: To test the inhibitory effect of propolis extract against herpes simplex viruses in vitro and in vivo. METHODS: In vitro: propolis was added to Vero cells at various times and concentrations before, at or after infection with HSV-1. In vivo: the effect of propolis was tested in newborn rats infected s.c. or i.p. and on rabbit come as infected with HSV-1. RESULTS: In vitro: 0.5% propolis extract caused 50% inhibition of HSV infection. There was indirect evidence for a strong interaction between the propolis extract and the surface of the Vero cells, but there was no direct interaction with HSV-1 particles. Administration of propolis before or at the time of infection yielded the most significant inhibitory effect, but even when 10% propolis extract was added 2 hours post-infection it gave 80-85% protection. In vivo: as little as 5% propolis prevented the appearance and development of symptoms of local and i.p. HSV-1 infection in rats and of corneal HSV-1 infection in rabbits. There were no cytotoxic effects at a concentration of 10% in vitro or 20% in vivo. CONCLUSIONS: The potent antiviral activity of propolis against HSV-1 infection in vitro and in vivo is probably due to prevention of virus absorption into the host cells and/or inhibition of an internal step(s) during the viral replication cycle.


Propolis from the Mediterranean region: chemical composition and antimicrobial activity.

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The chemical composition of propolis from Bulgaria, Turkey, Greece and Algeria was investigated by GC-MS. All of them contained mainly flavonoids and esters of caffeic and ferulic acids, which indicated that their main source are buds of poplars of the taxonomic section Aegiros. Some Turkish samples contained a low percent of diterpenic acids, while in Algerian samples significant amounts of a hydroxyditerpenic acid (M=322, its structure not determined by its MS) were found. All samples showed significant antibacterial and weak to moderate antifungal activity.


In vitro activity of propolis against Streptococcus pyogenes.

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Propolis, a multifunctional substance used by bees to maintain the safety of their hives, is popular for its therapeutic potential against some micro-organisms. Ethanolic extracts of two propolis specimens, collected from different areas within a region in the north-west of Italy, were examined to evaluate their antimicrobial activity against 46 Streptococcus pyogenes strains. By both agar dilution and agar diffusion methods, the minimal inhibitory concentration (MIC) and minimal bactericidal concentration (MBC) were <\= 234 microg ml-1, corresponding to a one in 512 dilution of the 12% (w/v) extracts. One of the two propolis samples was more active and this extract was shown to be richer in the flavonoids pinocembrin and galangin using HPLC. Therefore, with a simple microbiological assay technique, in particular the agar dilution method, it was possible to standardize the analysis of propolis samples to identify the quality parameters of this natural product before use for medical treatment.

Antibacterial, antifungal and antiviral activity of propolis of different geographic origin.

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Propolis samples from different geographic origins were investigated for their antibacterial (against Staphylococcus aureus and Escherichia coli), antifungal (against Candida albicans) and antiviral (against Avian influenza virus) activities. All samples were active against the fungal and Gram-positive bacterial test strains, and most showed antiviral activity. The activities of all samples were similar in spite of the differences in their chemical composition. In samples from the temperate zone, flavonoids and esters of phenolic acids are known to be responsible for the above mentioned activities of bee glue; tropical samples did not contain such substances but showed similar activities. Obviously, in different samples, different substance combinations are essential for the biological activity of the bee glue. It seems that propolis has general pharmacological value as a natural mixture and not as a source of new powerful antimicrobial, antifungal and antiviral compounds.


Rediscovering the antibiotics of the hive.

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Honey and other bee products were subjected to laboratory and clinical investigations during the past few decades and the most remarkable discovery was their antibacterial activity. Honey has been used since ancient times for the treatment of some diseases and for the healing of wounds but its use as an anti-infective agent was superseded by modern dressings and antibiotic therapy. However, the emergence of antibiotic resistant strains of bacteria has confounded the current use of antibiotic therapy leading to the re-examination of former remedies. Honey, propolis, royal jelly and bee venom have a strong antibacterial activity. Even antibiotic-resistant strains such as epidemic strains of methicillin-resistant Staphylococcus aureus (MRSA) and Vancomycin resistant Enterococcus (VRE) have been found to be as sensitive to honey as the antibiotic-sensitive strains of the same species. Sensitivity of bacteria to bee products varies considerably within the product and the varieties of the same product. Botanical origin plays a major role in its antibacterial activity. Propolis has been found to have the strongest action against bacteria. This is probably due to its richness in flavonoids. The most challenging problems of using hive products for medical purposes are dosage and safety. Honey and royal jelly produced as a food often are not well filtered, and may contain various particles. Processed for use in wound care, they are passed through fine filters which remove most of the pollen and other impurities to prevent allergies. Also, although honey does not allow vegetative bacteria to survive, it does contain viable spores, including clostridia. With the increased availability of licensed medical stuffs containing bee products, clinical use is expected to increase and further evidence will become available. Their use in professional care centres should be limited to those which are safe and with certified antibacterial activities. The present article is a short review of recent patents on antibiotics of hives.


Functional properties of honey, propolis, and royal jelly.


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Honey, propolis, and royal jelly, products originating in the beehive, are attractive ingredients for healthy foods. Honey has been used since ancient times as part of traditional medicine. Several aspects of this use indicate that it also has functions such as antibacterial, antioxidant, antitumor, anti-inflammatory, antibrowning, and antiviral.
is a resinous substance produced by honeybees. This substance has been used in folk medicine since ancient times, due to its many biological properties to possess, such as antitumor, antioxidant, antimicrobial, anti-inflammatory, and immunomodulatory effects, among others. Royal jelly has been demonstrated to possess numerous functional properties such as antibacterial activity, anti-inflammatory activity, vasodilative and hypotensive activities, disinfectant action, antioxidant activity, antihypercholesterolemic activity, and antitumor activity. Biological activities of honey, propolis, and royal jelly are mainly attributed to the phenolic compounds such as flavonoids. Flavonoids have been reported to exhibit a wide range of biological activities, including antibacterial, antiviral, anti-inflammatory, antiallergic, and vasodilatory actions. In addition, flavonoids inhibit lipid peroxidation, platelet aggregation, capillary permeability and fragility, and the activity of enzyme systems including cyclo-oxygenase and lipoxygenase.


Antimicrobial activity of flavonoids.

Cushnie TP, Lamb AJ.

Erratum in:

Flavonoids are ubiquitous in photosynthesising cells and are commonly found in fruit, vegetables, nuts, seeds, stems, flowers, tea, wine, propolis and honey. For centuries, preparations containing these compounds as the principal physiologically active constituents have been used to treat human diseases. Increasingly, this class of natural products is becoming the subject of anti-infective research, and many groups have isolated and identified the structures of flavonoids possessing antifungal, antiviral and antibacterial activity. Moreover, several groups have demonstrated synergy between active flavonoids as well as between flavonoids and existing chemotherapeutics. Reports of activity in the field of antibacterial flavonoid research are widely conflicting, probably owing to inter- and intra-assay variation in susceptibility testing. However, several high-quality investigations have examined the relationship between flavonoid structure and antibacterial activity and these are in close agreement. In addition, numerous research groups have sought to elucidate the antibacterial mechanisms of action of selected flavonoids. The activity of quercetin, for example, has been at least partially attributed to inhibition of DNA gyrase. It has also been proposed that sophoraflavone G and (-)-epigallocatechin gallate inhibit cytoplasmic membrane function, and that licochalcones A and C inhibit energy metabolism. Other flavonoids whose mechanisms of action have been investigated include robinetin, myricetin, apigenin, rutin, galangin, 2,4,2'-trihydroxy-5'-methylchalcone and lonchocarpol A. These compounds represent novel leads, and future studies may allow the development of a pharmacologically acceptable antimicrobial agent or class of agents.


Propolis, an old remedy used in modern medicine.

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Propolis is one of the few natural remedies that has maintained its popularity over a long period of time. The pharmacologically active molecules in the propolis are flavonoids and phenolic acids and their esters. These components have multiple effects on bacteria, fungi and viruses. In addition, propolis and its components have anti-inflammatory and immunomodulatory activities. Moreover, propolis has been shown to lower blood pressure and cholesterol levels. However, clinical studies to substantiate these latter claims are required.


Antibacterial agents in the control of supragingival plaque--a review.

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This review considers the main agents which have been used as antibacterial agents in mouthwashes and other vehicles to inhibit the growth of supragingival plaque. The agents discussed are bisguanide antiseptics, quaternary ammonium compounds, phenolic antiseptics, hexetidine, povidone iodine, triclosan, delmopinol, salifluor, metal ions, sanguinarine, propolis and oxygenating agents. The plaque inhibitory, anti-plaque and anti-gingivitis properties of these agents are considered along with their substantivity, safety and possible clinical usefulness. Clinical trials of these agents that have been published are also reported. The possible clinical uses of antiseptic mouthwashes are finally considered along with some advice about assessing manufacturers claims. Throughout this review the terms plaque inhibitory, anti-plaque and anti-gingivitis have been used according to the clarification of terminology suggested by the European Federation of Periodontology at its second workshop. This defines a plaque inhibitory effect as one reducing plaque to levels insufficient to prevent the development of gingivitis; an anti-plaque effect as one which produces a prolonged and profound reduction in plaque sufficient to prevent the development of gingivitis; and anti-gingivitis as an anti-inflammatory effect on the gingival health not necessarily mediated through an effect on plaque.


Antibacterial properties of propolis (bee glue).
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Propolis (bee glue) was found to have antibacterial activity against a range of commonly encountered cocci and Gram-positive rods, including the human tubercle bacillus, but only limited activity against Gram-negative bacilli. These findings confirm previous reports of antimicrobial properties of this material, possibly attributable to its high flavonoid content.


Propolis’ antimicrobial activity: what’s new?
[Article in Italian]
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Propolis is a hive product that bees manufacture from balsamic resins actively secreted by plants on leaf buds and barks. Propolis composition is highly variable, depending on the plant species and on the season of collection. However, propolis essentially contains resins, balsams, essential oils, flavonoids, vitamins, minerals and pollen, albeit at different concentrations. Although more than 300 constituents have been identified in propolis samples, biological activity is mainly due to few substances, such as flavonoids, terpenes, caffeic, ferulic and cuminic acids and esters. Propolis is characterized by multifactorial activities, but only some of them have been substantiated by clinical and experimental evidence. It is widely acknowledged to exert antimicrobial activity against a wide range of microorganisms (bacteria, fungi and viruses), but also exerts antiinflammatory, anaesthetic, healing, vasoprotective, antioxidant, antitumoral, antiulcer and hepatoprotective activities. The wide spectrum of activities has led in recent years to the development of new technologies to improve propolis properties of the traditional hydroalcoholic extract. This paper reviews the antimicrobial properties of propolis, focusing on respiratory pathogens. These characteristics make propolis a valid option for therapy of upper respiratory tract infections.


Recent progress in pharmacological research of propolis.
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Propolis is a resinous hive product collected by honeybees from various plant sources. It is a popular folk medicine possessing a broad spectrum of biological activities. It has also been used as a health drink in various Asian, European and American countries. Several groups of researchers have focused their attention on the biological activity of propolis and its active principles. Many scientific articles are published every year in different international journals related to the pharmacological properties of propolis. This review article compiles recent findings (since 1995) on the pharmacological properties of propolis focusing on its antipathogenic, antitumour, antioxidative, antimicrobial and anti-inflammatory properties. The possible mechanism of action of propolis as well as the active compounds are discussed.


The biochemistry and medical significance of the flavonoids.

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Flavonoids are plant pigments that are synthesised from phenylalanine, generally display marvelous colors known from flower petals, mostly emit brilliant fluorescence when they are excited by UV light, and are ubiquitous to green plant cells. The flavonoids are used by botanists for taxonomical classification. They regulate plant growth by inhibition of the exocytosis of the auxin indolyl acetic acid, as well as by induction of gene expression, and they influence other biological cells in numerous ways. Flavonoids inhibit or kill many bacterial strains, inhibit important viral enzymes, such as reverse transcriptase and protease, and destroy some pathogenic protozoans. Yet, their toxicity to animal cells is low. Flavonoids are major functional components of many herbal and insect preparations for medical use, e.g., propolis (bee's glue) and honey, which have been used since ancient times. The daily intake of flavonoids with normal food, especially fruit and vegetables, is 1-2 g. Modern authorised physicians are increasing their use of pure flavonoids to treat many important common diseases, due to their proven ability to inhibit specific enzymes, to simulate some hormones and neurotransmitters, and to scavenge free radicals.


Flavonoids, a class of natural products of high pharmacological potency.

Havsteen B.

A review has been presented of the biochemistry and pharmacology of a class of natural products, the flavonoids. These substances which are widely distributed in the plant kingdom and present in considerable quantities in common food products, spices and beverages have in a concentrated form (Propolis) been used since ancient times by physicians and laymen to treat a great variety of human diseases but they have yet to pass the tests of modern, controlled, clinical experimentation. An attempt has been made to present the fundamental evidence from the basic biological sciences which is required to stimulate the interest of the clinicians in this new field. The few existing reports on the careful pharmacodynamic, pharmacokinetic and clinical studies which have been made have been summarized to provide a basis for a full-scale investigation of the therapeutic potential of flavonoids.