



# Fighting Multidrug Resistance

*With Herbal Extracts, Essential Oils  
and Their Components*

**Edited by Mahendra Rai and Kateryna Kon**



# Fighting Multidrug Resistance With Herbal Extracts Essential Oils And Their Components

**Mahendra Rai**



## **Fighting Multidrug Resistance With Herbal Extracts Essential Oils And Their Components:**

Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components Kateryna Volodymyrivna Kon, Mahendra Kumar Rai, 2013-05-24 High prevalence of multidrug resistant microorganisms in the etiologic structure of different infectious processes significantly decreases the effectiveness of the treatment and enhances the probability of an unfavorable outcome from the infection. Combinations between antibiotics and other antimicrobial agents represent one of the most promising approaches for combating multidrug resistant bacteria. A high therapeutic potential exists for combinations of antibiotics and natural antimicrobial substances with complex mechanisms of action and multiple healing properties such as plant essential oils. The purpose of the present chapter is to review published studies on antibiotic essential oil combinations and discuss the prospects for future studies. In general, many studies have shown the potential for essential oils to act synergistically with antibiotics in vitro. The main proposed mechanism of this beneficial effect is through inhibition of efflux pumps by some essential oils which restores the activity of the antibiotic. Future efforts should be directed into further studies of antibiotic essential oil combinations against multidrug resistant bacteria with an emphasis on understanding the mechanisms of the produced effect. Combinations of essential oils with different types of antimicrobial agents such as bacteriophages, nanoparticles and quorum sensing inhibitors require greater attention and are worthy of future investigations.

Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components M.L. Faleiro, M.G. Miguel, 2013-05-24 Aromatic and medicinal plants through their secondary metabolism provide a complex mixture of volatile molecules known as essential oils. These volatile molecules exert antibacterial activity that has been used in folk medicine for centuries. During the last few decades, the emergence of antibacterial resistance has forced us to search for new and efficient antimicrobial agents. The significant number of studies on the use of essential oils and their components against multidrug resistant bacteria such as *Acinetobacter baumannii*, methicillin resistant *Staphylococcus aureus*, *Mycobacterium tuberculosis* and *Pseudomonas aeruginosa* show the exceptional potential of these natural products to curb the development of antibacterial resistance. Moreover, the use of essential oils and their components in combination with antibiotics may increase bacterial susceptibility, thus limiting resistance.

**Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components** Ali Parsaeimehr, Elmira Sargsyan, Amir Reza Jassbi, 2013-05-24 In today's world, multidrug resistance appears to be one of the major health problems. However, screening, discovering and presenting novel effectual phytochemicals from medicinal plants have provided a promising outlook. Phytomedicines have been used for treating diseases and infections since time immemorial, but identifying new phytochemicals and effectual treatment strategies are essential in the fight against multidrug resistant bacteria. Currently, isolated compounds such as mangostin, carnosic acid, epigallocatechin gallate, linalool, myricetin, novoisemanin, terpineol and totarol have exhibited synergistic activity with antibiotics against resistant bacteria. This chapter presents information on multidrug resistant Gram negative bacteria.

and the use of herbal extracts against them      **Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components** Kalpna D. Rakholiya, Mital J. Kaneria, Sumitra V. Chanda, 2013-05-24 Antibiotics are antimicrobial agents that are used to treat infectious diseases The outbreak of pathogenic antibiotic resistant strains illustrates our urgent need to search for new alternative sources of treatment Hence an attempt has been made in this review to list some plant extracts essential volatile oils and their antimicrobial activity against different microorganisms using different methods as well as synergistic effects plant extract plant extract plant extract essential oils plant extract conventional antibiotics phytochemical antibiotics and essential oil essential oil Plant products and their active constituents are useful in the treatment of infectious diseases caused by multidrug resistant microbes food borne diseases caused by food spoiling microbes and oral pathogens Products derived from plants have the potential to control microbial growth in diverse situations and specifically in the treatment of disease The various aspects of this review may be helpful for the food cosmetic and pharmaceutical industries      Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components Valerie Edwards-Jones, 2013-05-24 The global increase in antimicrobial resistance has led to renewed interest in alternative antimicrobial treatment strategies Research is being done into a wide range of possible treatment regimens including phage therapy novel vaccines and novel peptides to name a few Many microbiologists continue to lobby their governments to ensure that the available antibiotics are retained for the treatment of serious infections and their inappropriate use is stopped In addition large pharmaceutical companies are being encouraged to develop new treatments for the future Much research now focuses on medicinal plants and essential oils These and other alternative approaches are outlined in this chapter

**Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components** T.O. Lawal, K.K. Soni, B.A. Adeniyi, B.J. Doyle, G.B. Mahady, 2013-05-24 High prevalence of multidrug resistant microorganisms in the etiologic structure of different infectious processes significantly decreases the effectiveness of the treatment and enhances the probability of an unfavorable outcome from the infection Combinations between antibiotics and other antimicrobial agents represent one of the most promising approaches for combating multidrug resistant bacteria A high therapeutic potential exists for combinations of antibiotics and natural antimicrobial substances with complex mechanisms of action and multiple healing properties such as plant essential oils The purpose of the present chapter is to review published studies on antibiotic essential oil combinations and discuss the prospects for future studies In general many studies have shown the potential for essential oils to act synergistically with antibiotics in vitro The main proposed mechanism of this beneficial effect is through inhibition of efflux pumps by some essential oils which restores the activity of the antibiotic Future efforts should be directed into further studies of antibiotic essential oil combinations against multidrug resistant bacteria with an emphasis on understanding the mechanisms of the produced effect Combinations of essential oils with different types of antimicrobial agents such as bacteriophages nanoparticles and quorum sensing inhibitors require greater attention and are worthy of

future investigations      Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components María José Abad, Luis Miguel Bedoya, Paulina Bermejo, 2013-05-24 Natural products have played a pivotal role in antibiotic drug discovery with most anti infective drugs being derived from natural products or natural product leads However the rapid onset of resistance to most anti infective drugs considerably diminishes their effectiveness and requires a constant supply of new drugs for the effective treatment of infections Infectious diseases account for a third of all deaths worldwide The spread of multidrug resistant strains of bacteria makes it necessary to identify new classes of antibacterials and compounds that inhibit these resistance mechanisms Numerous members of the Asteraceae family are important as cut flowers and ornamental crops as well as being medicinal and aromatic plants many of which produce essential oils used in folk and modern medicine and in the cosmetics and pharmaceutical industries Essential oils generally have a broad spectrum of bioactivity owing to the presence of several active ingredients e g terpenes and phenol derived aromatic and aliphatic components that have various modes of action Extensive studies of the chemical components of Asteraceae species have led to the identification of many substances including essentials oils with interesting antibacterial activity This review summarizes some of the main reports on the chemistry and antibacterial activity of Asteraceae essential oils in the recent literature 2005 to May 2012      *Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components*

Lyndy McGaw, 2013-05-24 Many bacterial diseases affect animals causing important economic losses in livestock Subtherapeutic antibiotic use in production animals as antibiotic growth promoters has been implicated as a causative factor in the development of resistance of bacterial pathogens toward several classes of antimicrobials some of which are used therapeutically in humans This has led to the banning of antibiotic growth promoters by the European Union and such a precedent may be followed in other countries Alternatives to antibiotic growth promoters are necessary to enable the production of animal protein to keep pace with the expanding world population One approach is to use plant extracts or essential oils as supplements to provide beneficial effects including direct antibacterial activity and stimulation of the immune system or enhancement of ruminal digestion The risk of resistance developing to a combination of phytochemicals is lower than the risk of resistance against a single antibiotic and synergistic effects of plant constituents may contribute to the overall activity of the preparation      **Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their**

**Components** Román Yesid Ramírez Rueda, 2013-05-24 Methicillin resistant Staphylococcus aureus MRSA is currently one of the most common causes of serious infections in both hospital and community environments This type of resistance was discovered in the 1960s and now 50 years later it has not been possible to develop an effective therapy to fight against it This chapter compiles the results of several studies demonstrating the activity mainly in vitro of various extracts essential oils and plant derived molecules that can act alone or in combination against MRSA In addition natural alternatives other than from plants being studied for the same purpose are described Finally the important role of phytotherapy in the development of

new therapies against multidrug resistant bacteria such as MRSA is emphasized

**Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components** Mahendra Rai, 2025-02-18 Fighting Multidrug Resistance with Herbal Extracts Essential Oils and their Components Second Edition offers pharmaceutical and life sciences researchers an overview on the most relevant studies for fighting specific multidrug resistant MDR microorganisms such as bacteria protozoans viruses and fungi using natural products This new edition expands the coverage of uses of traditional medicinal plants to against MDR includes new chapters on the potential of plant derived bioactive compounds for reversal of multidrug resistances covers the use of flavonoids to combat microbes and cancer and the use of nanoparticles as drug delivery vehicle The need to combat multidrug resistant microorganisms is an urgent one This book provides important coverage of mechanism of action the advantages and disadvantages of using herbal extracts essential oils and their components and more to aid researchers in effective antimicrobial drug discovery Presents four new chapters and special focus on plant based nanoparticles Provides readers with current evidence based content aimed at using herbal extracts and essential oils in antimicrobial drug development Includes chapters devoted to the activity of herbal products against herpes AIDS tuberculosis drug resistant cancer cells and more Addresses the need to develop safe and effective approaches to coping with resistance to all classes of antimicrobial drugs

**Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components** Adil M. Allahverdiyev, Melahat Bagirova, Serkan Yaman, Rabia Cakir Koc, Emrah Sefik Abamor, Sezen Canim Ates, Serap Yesilkir Baydar, Serhat Elcicek, Olga Nehir Oztel, 2013-05-24 Herpes simplex virus HSV infections comprise one of the most important health problems worldwide HSV 1 and HSV 2 that are the types most frequently seen in disease manifested by sores and blisters on the mouth tongue skin and genitals of infected individuals Moreover herpetic infections can reach life threatening levels for instance HSV 2 prevalence has increased greatly in human immunodeficiency virus positive patients This indicates that the herpetic infection could be a major cause of morbidity in immunosuppressed patients Unfortunately resistance against antiherpetic drugs has recently been reported Therefore there is an immediate need to search for new antiviral agents in order to cope with HSV infections Recently it has been demonstrated that traditional medicinal plants have strong antiviral activity and some are already being used in the treatment of viral infections including herpes simplex infections Accordingly this chapter aims to present published information on various herbal compounds investigate the antiherpetic effectiveness of these compounds and determine the potential of plants as herpetic treatments in the future

*Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components* Maria de las Mercedes Oliva, Mauro Nicolás Gallucci, Maria Evangelina Carezzano, Mirta Susana Demo, 2013-05-24 The genus *Candida* comprises more than 200 species but few of them have been associated with human infections *C. albicans* is the most important cause of disease Other species such as *C. dubliniensis* *C. glabrata* *C. guilliermondii* *C. krusei* *C. parapsilosis* and *C. tropicalis* are also being increasingly recognized as significant human pathogens In recent years the number of clinical

infections caused by *Candida* species worldwide has risen considerably and the incidence of resistance to traditional antifungal therapies is also increasing. There is an exigent need for novel antifungal remedies and plants remain a vital source of these new substances especially in low resource countries. Natural compounds are potential antimycotic agents either in their nascent form or as template structures for more effective derivatives. The data and studies described in this chapter document the antimicrobial activity of plant extracts and essential oils against *Candida* species and show that medicinal plants can be a rich source of potential antifungal compounds.

**Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components** M. Fawzi Mahomoodally, Ameenah Gurib-Fakim, 2013-05-24

Infectious diseases are responsible for one in every two deaths in many developing countries but people in sub-Saharan Africa are particularly vulnerable as poverty is rampant and access to health care is limited. Additionally, the unregulated use of antibiotics in some parts of Africa has led to the emergence of resistance in pathogens. Indeed, one of the biggest pandemics is malaria which kills millions annually. Currently, artemisinin, effective against chloroquine-resistant *Plasmodium*, is the only weapon available to fight this pandemic yet the World Health Organization has reported with concern that some countries in Southeast Asia are beginning to witness resistance to artemisinin. As a consequence, increasing attention is being drawn to botanicals as they have the potential to provide alternative and complementary therapies as well as potential leads to address emerging infections and resistance. This chapter will review some medicinal plants from the African Herbal Pharmacopoeia that show promise for containing existing and emerging infectious diseases.

*Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components* Philip G. Kerr, 2013-05-24

In the search for successful antitubercular treatments, investigators have often turned their efforts to ethnobotany, ethnopharmacology, and phytochemistry. Since many of the world's peoples have well-developed systems of traditional medicine with plants and their extracts as a major component and many of these plants have been used to treat tuberculosis, indigenous herbal medicine is a logical starting point for a research program. The major aims in this chapter are to summarize current antitubercular treatments, look for structural patterns in molecules that have been used successfully in the therapeutics of tuberculosis, examine published evidence of natural products derived principally from macrophytic species with an anecdotal reputation as antitubercular treatments or that have been deliberately tested for antitubercular activity, and identify promising structural classes of plant metabolites that can serve as lead compounds. Finally, I would like to indicate some of the directions being followed by leading researchers in the field and suggest ways forward in drug discovery to treat multidrug-resistant tuberculosis.

*Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components* Mahendra Rai, 2025-01-01

*Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components* Second Edition offers pharmaceutical and life sciences researchers an overview on the most relevant studies for fighting specific multidrug-resistant MDR microorganisms such as bacteria, protozoans, viruses, and fungi using natural products. This new edition

expands the coverage of uses of traditional medicinal plants to against MDR includes new chapters on the potential of plant derived bioactive compounds for reversal of multidrug resistances covers the use of flavonoids to combat microbes and cancer and the use of nanoparticles as drug delivery vehicle The need to combat multidrug resistant microorganisms is an urgent one This book provides important coverage of mechanism of action the advantages and disadvantages of using herbal extracts essential oils and their components and more to aid researchers in effective antimicrobial drug discovery

**Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components** Camila Bernardes de Andrade Carli, Marcela Bassi Quilles, Iracilda Zeppone Carlos, 2013-05-24 Multidrug resistance is the main mechanism by which cancers develop resistance to chemotherapeutic drugs Consequently it is also an important factor in the failure of many forms of chemotherapy This review describes the mechanisms of tumor resistance to drugs and the attempts to discover novel compounds that interact with multidrug resistant tumor cells The information presented here will facilitate retrospective of studies and the identification of new drug development candidates with the potential to treat cell populations with multidrug resistance *Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components*

Victor Kuete, 2013-05-24 The development of vancomycin resistance by some microbial strains has made the treatment of some infections more difficult and in many cases impossible Although the search for new drugs against vancomycin resistant organisms has been very successful resistance can arise against many of these compounds Natural products are an invaluable source of a diversity of biologically active compounds for addressing the challenges facing drug development initiatives to combat vancomycin resistant enterococcal infections Despite the fact that scientific data on plant metabolites active against vancomycin resistant enterococci remain scarce some compounds including terpenoids and phenolics have been reported to have inhibitory effects at various levels This chapter describes the state of the art of research into plant bioactive metabolites against vancomycin resistant enterococci highlighting the hit compounds Antibiotic Resistance

Kateryna Kon, Mahendra Rai, 2016-06-14 Antibiotic Resistance Mechanisms and New Antimicrobial Approaches discusses up to date knowledge in mechanisms of antibiotic resistance and all recent advances in fighting microbial resistance such as the applications of nanotechnology plant products bacteriophages marine products algae insect derived products and other alternative methods that can be applied to fight bacterial infections Understanding fundamental mechanisms of antibiotic resistance is a key step in the discovery of effective methods to cope with resistance This book also discusses methods used to fight antibiotic resistant infection based on a deep understanding of the mechanisms involved in the development of the resistance Discusses methods used to fight antibiotic resistant infection based on a deep understanding of mechanisms involved in the development of the resistance Provides information on modern methods used to fight antibiotic resistance Covers a wide range of alternative methods to fight bacterial resistance offering the most complete information available Discusses both newly emerging trends and traditionally applied methods to fight antibiotic resistant infections in light of



recent scientific developments Offers the most up to date information in fighting antibiotic resistance Includes involvement of contributors all across the world presenting questions of interest to readers of both developed and developing countries

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