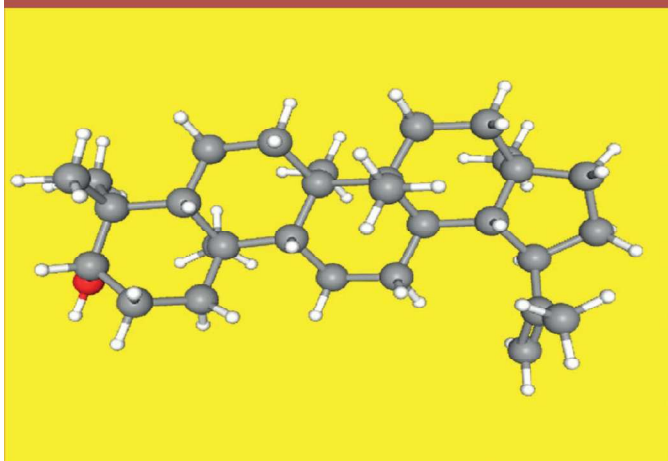


EDITED BY HIFZUR R SIDDIQUE

# LUPEOL

THERAPEUTIC APPLICATIONS  
IN HUMAN HEALTH AND DISEASE



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## Preface

Globalization has influenced different disease patterns, although it has its own merit in some contexts. Since most diseases are linked to a lack of exercise, lifestyle changes, poor dietary habits, and increased stress levels, bioactive compounds can be important in devising future healthcare strategies. Natural products such as Chinese, Ayurvedic, and Unani treatment systems have been important therapeutic aids for alleviating human ailments since ancient times. With advancements in modern science, our understanding of the mechanism of action of different natural molecules at the molecular level has increased immensely. Sustained research is being carried out worldwide to study their efficiency and mechanism of action, among many other aspects. Lupeol, a triterpene, is found in the skin of lupin seeds, latex of fig trees, rubber plants, olive, aloe vera, and many edible fruits, vegetables, and medicinal plants. Lupeol is also an active component of various herbal medicines such as Japanese Kampo medicine, Chinese Traditional Medicine, Unani, to name a few. The importance of lupeol is understandable from the fact that more than 1400 papers published within the last three decades in PUBMED have revealed that lupeol has potential in the treatment of a wide variety of diseases such as cancer, diseases, arthritis, diabetes, cardiovascular, neurodegenerative diseases, skin diseases, parasitic diseases, nephrotic diseases, hepatic diseases, and so forth, through modulation of numerous molecular targets. Based on published research, it is important to bring all this information related to the different beneficial effects of lupeol in a book form. This is the first book to deal specifically with this subject.

In light of the popularity of herbal products and their relationship with modern health care, this book will present a compilation of topics on the beneficial effects of lupeol against various human ailments. The book chapters summarize lupeol's current state and future direction against different human diseases from a translational point of view. They will enlighten all who have a stake in health care, the quest for knowledge, and wish to do further research. The book also covers the mechanistic studies of lupeol, which could lead to discoveries and facilitate clinical application. The present book is a compilation of 18 chapters from leading experts worldwide. Each chapter summarizes the current state and future direction of using lupeol against multiple diseases from a translational point of view, making this reference a valuable source of information for a large audience, including researchers and healthcare providers interested in herbal remedies. In addition, detailed studies have been explained with the help of figures, images, and tables to make it even more exciting and descriptive. Even after my best efforts, I feel there may still be scope for improvement and addition to this work, especially given this field's rapidly evolving and ever-advancing nature. Helpful criticism and suggestions from the readers are dearly welcome. Finally, I thank CRC Press for their keen interest and attention in publishing this book in its present form.

**Hifzur R Siddique**

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# 12 Lupeol as Antimicrobial Agent

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## 12.1 INTRODUCTION

Natural products have a vital role in maintaining human health, and terpenoids, owing to their inimitable carbon skeletons, have different functions. They have diverse properties like anti-inflammatory, antioxidant, and antiviral (Wang et al., 2024). Rotundic acid, a pentacyclic triterpene has shown anticancer effect (Bhuia et al., 2024). Traditional herbs like *Ganoderma lucidum* and ginseng are also rich sources of triterpenoids (Noushahi et al., 2022). Natural triterpenoids, also called phytosterols, have gained popularity because of their diverse biological effects (Ovesná et al., 2004; Fatma & Siddique, 2023). Triterpenes, a broad class of naturally occurring chemicals with significant applications, are made by arranging squalene epoxide in a chair-chair-chair-boat configuration and then allowing condensation to occur (Liby et al., 2007; Siddique & Fatma, 2024). As with cholesterol in animal cell membranes, free triterpenes stabilize phospholipid bilayers in plant cell membranes, making them significant structural elements of plant membranes. A carbon-carbon double bond, usually in the sterol nucleus and occasionally in the alkyl side chain, is present in most triterpenes, which have 28 or 29 carbons (Moreau et al., 2002). Triterpenes occur naturally in human diets. The pentacyclic triterpene lupeol is unique in its range of pharmacological activities. Among these are hepatitis, gastroprotective, renoprotective, anti-inflammatory, anti-atherosclerotic, antimutagenic, antiproliferative, cardioprotective, anticancer, antimicrobial, antidiabetic, and other properties (Maurya et al. 2020, 2022; Cruz-Salas et al., 2023; Khan et al., 2023). Fruits, vegetables, and cereals are the main sources of triterpenes. Although the typical daily intake of triterpenes in

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