

## INTRODUCTION

# Plant-based Medicine and Pharmacology

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Plant-based medicine is an ancient practice which still persists today [1]. Some therapies are passed down through generations while others have emerged more recently. Use of medicinal plants tends to be underreported [2], leading to a chronic ambiguity concerning their therapeutic efficacy but also their acute and chronic side effects. Some may achieve the goal for which they were intended, others may not, but across the board there is a paucity of scientific evidence to support their purported effects.

Studies have shown that people tend to gravitate towards plant-based medicines as a product of family tradition, making them a “first-stop” therapy for many people with mild to moderate illness, or those with multiple conditions [3,4]. Several surveys suggest strong correlations between use of herbal medicine and factors such as age, sex, education, socioeconomic status, and failed success of conventional therapies. In naturalistic circles, plant-based therapies are becoming more and more attractive due to their lack of harmful side-effects and adaptogenic properties. At large, the use of plant-based medicine is growing more over time [5]. As a result, there is an increasingly urgent need for rigorous scientific investigation into the compounds responsible for these plants’ effects. In some cases, studies show promising evidence for the safety and efficacy of long utilized plant-based medicines. In this issue of the *Yale Journal of Biology and Medicine*, Vicknasingam *et al.* provide an example of this with their original research critically assessing the role of kratom in pain tolerance. Using a small clinical trial, they demonstrate that the use of kratom can increase

pain tolerance with no evidence of immediate withdrawal symptoms. However, other pieces in this issue, such as the historical analysis from Tomlinson *et al.* paint a darker picture. In their work, they discuss a disheartening case for *Aristolochia* herbs and iatrogenic disease. Despite persistent use throughout history, cumulative analysis of the literature reveals that the respite from arthritic symptoms offered by the use of *Aristolochia* herbs comes at the cost of severe renal disease.

Our hope with this issue is to resolve some of the fallacies of the field and provide scientific evidence for commonly used therapies where there are none. We approach this by featuring both clinical case studies and basic science to provide a wide-range of perspectives on a blossoming field. In their review, Gerontakos *et al.* assess adaptogenic therapies, stress the importance of homogeneity across studies and the use of clinical trials to bridge basic research, and practical use of plant-based medicines. In the original study conducted by Li *et al.*, the group utilizes a “Releaf App™” designed to collect data from cannabis users on the cannabis flower product type, species, combustion method, THC/CBD content, depression symptom intensity levels, and side effects. This kind of interface demonstrates the power of survey-based studies and emphasizes the importance of understanding how cannabis-based therapies work and which of these would be potentially effective in the clinic. Its approach is contrasted by original work from Koehler *et al.*, in which the authors provide evidence for a novel source of the immunomodulatory activity of *Astragalus membranaceus*, a plant that has been used historically for multiple ailments

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but whose active compounds have remained more or less elusive. This wide scope of pieces are complemented by a collection of thorough reviews covering topics as varied as glaucoma treatment to the myriad uses for essential oils. These reviews discuss both the clinical trials and the basic mechanisms supporting the function of these plant-based drugs and reflect the importance of an integrative approach to their study.

In addition to the aforementioned articles, we also feature a comprehensive perspective from Dr. Pamela Maher detailing a cell-assay-based screening strategy to identify plant compounds that may be useful in treating Alzheimer's Disease. The manuscript describes several successes in the field using this approach, providing a tried and true method for plant-based drug discovery. Dr. Jeffrey Langland's group, in their case-study, describe a successful treatment of oro-facial herpes with a plant-based topical gel. Notably, we also feature two interviews that examine the historical and modern potential of medicinal plants; Dr. Judith Sumner provides a compelling outlook of the botanical history of World War II and Dr. Yung-Chi (Tommy) Cheng from Yale describes harnessing the power of Chinese Traditional Medicine to enhance cancer chemotherapy.

By presenting a diverse selection of literature in this issue, we hope to provide a platform for increased cross-talk between clinical, basic science, and population based studies, addressing some of the missing links in the field. To borrow from the profound thoughts of Dr. Cheng, the path ahead for medicine lies in togetherness; this not only means the emergence of a scientific thought that encompasses clinical, basic and epidemiological research, but also an approach to medicine that integrates the plant-based remedies of the past and present with our needs for the future.

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