



Challenges Faced by Phytomedicine in this Modern Era

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Introduction

Phytomedicine, or the use of herbal medicine with medicinal characteristics, has been around for a long time. Although its use was substantially reduced at the advent of the modern era, by the late twentieth century, there was a resurgence of interest in its possibilities, particularly in the discovery of novel medications.

Major challenges

Researchers identified five major limitations in the development of herbal medicine are listed below:

Herbal medicine's biological activity can be replicated: One of the most difficult problems in phytomedicine is the significant failure rate in reproducing the biological activity of particular plant extracts after the first screening phase has been successful. The repeatability of about 40% of plant extracts examined was found to be lacking. This failure in re-sampled and re-extracted batches suggests that biochemical profiles of plants gathered at different times and locations vary, as well as the existence of unique diversity within the same plant variety. Different methods of biological activity extraction and detection in laboratories may also contribute to the lack of reproducibility [1].

Herbal medicine has a wide range of chemical compositions, which necessitates careful chemical analysis to maintain uniformity. This discrepancy in efficacy reports could be attributed to this inconsistency. Furthermore, the synergistic interactions between the many phytochemicals in each extract may have an impact on its activity and efficacy. A single phytochemical may not be responsible for the desired pharmacological action, but rather a mixture of phytochemicals resulting in pharmacodynamic synergism. The whole plant of *Panax ginseng* is more active than the separated compounds. Nonetheless, we may accidentally eliminate phytochemicals with important pharmacological properties in our quest to isolate an active compound from a specific plant.

Herbal medicine toxicity and side effects: Because medical herbs or plants are "natural," there is a widespread belief that they are far safer than conventional medications. Nothing could be further from the truth! Each herbal medication, like all other medicines, has a dosage threshold below which it is both effective and dangerous. Many herbal medicine concoctions have been reported in the literature to be potentially hazardous, with some even being cancerous. Aristolochic acid, for example, is linked to the development of nephropathy and urothelial malignancy in *Aristolochia spp* [2]. The presence of phytotoxins in some unadulterated herbal remedies; botanical identification errors; improper plant combinations; and the use of plants that interfere with conventional pharmacotherapy may all contribute to the hazardous effect of herbal medicines.

Herbal medicine adulteration and contamination: In nations with low purity control regulations, herbal medication may become adulterated and polluted. This could result in serious medical issues, especially in children. For example, between 1975 and 2002, a review discovered 13 occurrences of heavy metal toxicity in children who drank herbal medicine in Singapore, Hong Kong, the United States, the United Kingdom, and the United Arab Emirates [3]. Women who

took herbal supplements (including Ayurvedic or traditional Chinese medicine herbs, St. John's Wort, and "other" herbs) had blood lead levels that were 10% higher than women who did not, according to a recent cross-sectional study of 13,504 adults in the United States. These higher levels were not seen in men.

Herb-Drug interactions issues: Herbal therapy, not surprisingly, can alter the pharmacokinetic profile of prescribed conventional pharmaceuticals. These interactions may enhance or inhibit drug absorption and metabolism, as well as produce side effects such as allergy [4]. Herbal medication, on the other hand, has the lowest rate of reported side effects (7.6%) when compared to other complementary and alternative medicine.

Issues with herbal medication standardization: Herbal medication rarely meets the requirement of standardisation, which is partly due to a lack of scientific information about the operating pharmacological principles of the extracted phytochemicals, as well as the fact that the plants are not grown under controlled conditions. Variability in the quantity and concentration of phytochemicals within the extract, as well as varied extraction and processing procedures used by different producers, contribute to the great variability in content and quality of commercialised herbal products.

Aside from the restrictions mentioned above, one of the issues that plant-based medication research faces is the question of environmental sustainability. Taxol, an anti-tumor agent, was discovered in the bark of *Taxus brevifolia* and *Taxus bacata*. 27,000 tonnes of bark, or 12,000 trees, are required to generate 2.5 kg of taxol [5]. We might assume that if there was no other option for extracting phytochemicals, the mass manufacturing of taxol would lead to the extinction of these rare tree species. Hopefully, with advances in combinatorial organic chemistry, the invention of semi-synthetic analogues, and improved extraction and purification methods, the problem of low yield will be obsolete, resulting in increased yield.

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