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Enzyme-Mediated Interactions between Drugs and Herbs

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Abstract

Despite the fact that herbal remedies have been used for more than 5000 years, in earlier times, only single herbs were consumed. Nowadays, herbal remedies are used frequently, particularly by women and patients with chronic conditions. Herbal supplements are used by approximately 15% to 20% of people who take prescription medications. However, even if they experience severe side effects, they may be reluctant to tell their doctors about their personal use of herbal medicines for fear of reprisal. This is especially important for the elderly, the frail and people who take multiple medications for chronic diseases have been linked to clinically significant adverse drug reactions. Ginkgo products taken with aspirin, warfarin (Coumadin), or ticlopidine (Ticlid) can cause bleeding when they interact with one another. Additionally, taking antidepressants alongside St. John's wort (SJW) can result in allergic reactions and gastrointestinal issues.

Keywords: Frail • Grapefruit juice • Chronic diseases

Introduction

The majority of herbal safety is based on empirical experience, but these observations do not always prevent side effects. Even after the patient has stopped taking the herbs, the first signs of adverse effects may not always be noticed right away. In addition, the consumption of herbs is frequently misunderstood; consequently, more information should be made available to the general public.10 Extensive research into interactions between drugs and herbs should be carried out in order to provide patients and medical professionals with additional information [1].

When researching the study of herb-drug interactions, a PubMed search revealed that the selection of methods can have a significant impact on the experimental results, primarily due to the intricate mechanisms involved. We classify the experiments according to the various models used to study the interactions of individual herbal ingredients, crude herb extracts and herbal formulas with drugs and their mechanisms of action. While almost all herbal products contain mixtures of pharmacologically active constituents, drugs typically only contain single chemical entities.

Literature Review

The P-gp, which is also important in herb disposition and the CYP system, which is also responsible for metabolizing many medications that inhibit and induce drug metabolism, are likely to interact with more than half of the herbs consumed. A number of factors that are related to co-administered medicine species, dose, dosing regimen, administration route, pharmacokinetic and therapeutic range have previously been reported.109 Before designing an experiment, many factors should be taken into consideration. As a result, herb-drug interactions may be more frequent than drug-drug interactions11 and their mechanism may be more intricate. Clinical trials and case reports, as well as in vitro and *in vivo* studies, demonstrated that herbal agents, particularly SJW and Yinxingye (Ginkgo biloba) L), altered the pharmacokinetic profiles of several prescribed medications and The efflux drug transporter P-glycoprotein (P-gp) and the cytochrome P450 (CYP450) system both play a significant role in the majority of interactions between drugs and herbs [2].

Discussion

The clinical implications of herb-drug interactions depend on these factors. In this section, we gave a comprehensive overview of the data on herb-drug interactions and summarized and categorized the most common study designs according to the purpose of the experiment. The majority of studies made use of in vitro, microsomal and cell culture experiments. Animal experiments were used the most frequently in *in vivo* studies, while clinical trials were used less frequently. In many studies, both *in vivo* and in vitro experiments were used and microsomal or cell culture experiments were frequently used in conjunction with *in vivo* studies. It's likely that the metabolism and transport mechanisms better reflect the results from a combination of methods [3,4].

It's important to draw attention to some unique phenomena. For instance, administering theophylline and high- and low-dose andrographolide at the same time could produce contradictory results for the AUC25. Changing the dose could have a greater impact on the pharmacokinetic parameters than just one dose. However, when Fucus vesiculosus extract (575 mg/kg, p.o.) was administered as a single dose and amiodarone (50 mg/kg intravenously) The AUC0-t, AUC0-inf and Cmax of amiodarone decreased by 30 percent, 27 percent and 55.4%, respectively, when administered together via oral gavage. Amiodarone parameters changed only slightly after 14 days of pretreatment. Not all studies were useful for determining the mechanism and many articles based their speculations on the results. The most common enzymes that mediate interactions between drugs and herbs are CYP and P-gp, but other enzymes are also mentioned. Herb-drug interactions can also be mediated through other mechanisms. For instance, it was discovered that curcumin could significantly increase the absorption of baicalein via MRP1-, MRP2- and breast cancer resistance protein (BCRP)-mediated transport.30 The Zhiqiao (Fructus Aurantii Submaturus) peel, for instance, altered the pharmacokinetic parameters of amiodarone by increasing the rate of gastrointestinal motility. In another study, the effects of various components (quercetin, hesperetin, piperine, curcumin and naringenin) on the transport of irinotecan were investigated using Caco-2 cell monolayers in an in vitro screen that was followed by an *in vivo* study [5,6].

Conclusion

In conclusion, patients as well as healthy individuals ought to pay attention to the potential complications of herb-drug interactions because of the complex ingredients and the widespread applications of herbal products. Their mechanisms of interaction are complicated and potential side effects are

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becoming more common. When designing studies to evaluate these herb-drug interactions, the method chosen ought to be the deciding factor.

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Conflict of Interest

No potential conflict of interest was reported by the authors.

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