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An overview of pharmacokinetic and pharmacodynamic database of herbal medicines.

Aadil Mohammad[1*], Pankaj Chasta[2]

[1*] Research Scholar, Department of Pharmacy, Faculty of Pharmaceutical Science, Mewar University, Gangrar, Chittorgarh 312901, Rajasthan, India.
[2] Assistant Professor, Department of Pharmacy, Faculty of Pharmaceutical Science, Mewar University, Gangrar, Chittorgarh 312901, Rajasthan, India.
Email: dar612213@gmail.com
Email: pankajchasta@mewaruniversity.co.in

ABSTRACT:

Herbal medicines have been used for centuries in many traditional and natural healing systems. As they become more widely accepted in modern healthcare, it's important to understand how they work in the body and how the body processes them. This includes studying their pharmacokinetics (how they're absorbed, distributed, broken down, and removed) and pharmacodynamics (how they affect the body). This article gives an overview of key databases that collect this kind of information on herbal medicines. It explains what these databases contain, why they're useful for researchers and healthcare professionals, and how they support safe and effective use of herbal treatments. The article also highlights some challenges in creating and using these databases, and looks at future opportunities in herbal medicine research.

Keywords: Herbal medicine, how herbs work in the body, herbal databases, safety of herbal remedies, natural treatments, plant-based medicine, drug effects, herbal research, metabolism of herbs, body's response to herbs.

Introduction:

People have been using plants for healing for thousands of years, and many traditional systems like Chinese medicine, Ayurveda, and Kampo are still used today. As more people turn to herbal treatments, it's important to know how they actually work inside the body.
Unlike regular medicines that often use just one chemical, herbal remedies can contain dozens of natural compounds. This makes it harder to study them, especially when it comes to how they're absorbed, spread through the body, broken down, and removed. That's where special herbal medicine databases come in. These digital tools help researchers and doctors better understand the effects of herbal compounds.

Why These Databases Matter:

Pharmacokinetics (PK) explains what the body does to a compound (like breaking it down or getting rid of it), and pharmacodynamics (PD) explains what the compound does to the body. Databases that collect this kind of information are helpful because they:

- Help avoid dangerous interactions between herbs and prescription drugs
- Support the design of better herbal medicines
- Help monitor safety and side effects
- Make it easier to run computer models that predict how a compound works
- Provide useful data for health regulations and approvals

These databases pull together many types of information—such as plant compounds, how they work on a molecular level, and what diseases they might treat.

Key Herbal Databases:

TCMSP

This database focuses on Traditional Chinese Medicine. It gives information on over 500 herbs, including how well they're absorbed, whether they can cross into the brain, and which body targets they interact with.

TCMID

TCMID brings together details on herbs, their chemical ingredients, how they might affect genes, and links to diseases. It even includes old herbal recipes. However, it doesn't have a lot of lab- tested pharmacokinetic data.

HERB

HERB is a reliable source that connects herbs to genes and proteins. It uses systems biology and artificial intelligence to help researchers figure out how herbs might affect health at a molecular level.

KTKP

This Japanese database focuses on Kampo formulas. It helps link traditional Japanese remedies to modern scientific research, including how they're processed in the body.

NPASS

NPASS collects data on natural products from plants and animals, including how effective they are (e.g., their IC50 values). It's useful for comparing how herbs might work across different species.

IMPPAT

Focused on Indian medicinal plants, IMPPAT includes information on over 1,700 herbs and 10,000 plant chemicals. It combines traditional knowledge with modern data like safety and absorption profiles.

Understanding PK and PD in Herbal Research:

Pharmacokinetics (PK)

This involves how the body handles a compound:

- Bioavailability – How much of it actually gets into the blood
- Half-life – How long it stays in the body
- Metabolism – How the liver or other organs break it down
- Excretion – How it leaves the body

Studying this in herbal medicine is tricky because the content and strength of herbal products can vary. Databases help by collecting and organizing lab-tested and computer-predicted data.

Pharmacodynamics (PD)

This looks at how herbal compounds affect the body—what receptors they bind to, what pathways they influence, and how they change biological activity. Since herbs usually have many active compounds, databases are essential for exploring how these might work together (or against each other).

Current Challenges:

Even with great tools, there are still problems:

- Inconsistent data – Different names, preparation methods, and testing approaches
- Lack of human studies – Many studies are in the lab or in animals, not people
- No global standard – There's no shared system for naming or testing herbs
- Missing data from some regions – African, Latin American, and Southeast Asian herbal systems aren't well represented

To fix these problems, we need better data organization, more international teamwork, and integration with genetic and chemical databases.

Looking Ahead:

To improve herbal PK/PD databases, we can:

- Use AI and machine learning to predict how new herbs might work
- Add omics data like genomics and metabolomics
- Create shared data standards so everyone is on the same page

- Use digital tools to simulate herb and drug interactions

With these advances, herbal medicine can become more precise, effective, and globally accepted.

Conclusion:

Herbal PK and PD databases are powerful tools for turning traditional remedies into scientifically supported therapies. They help researchers, doctors, and regulators work with herbs in a safer and more informed way. As technology improves and more global data becomes available, these databases will play an even bigger role in modern medicine.

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