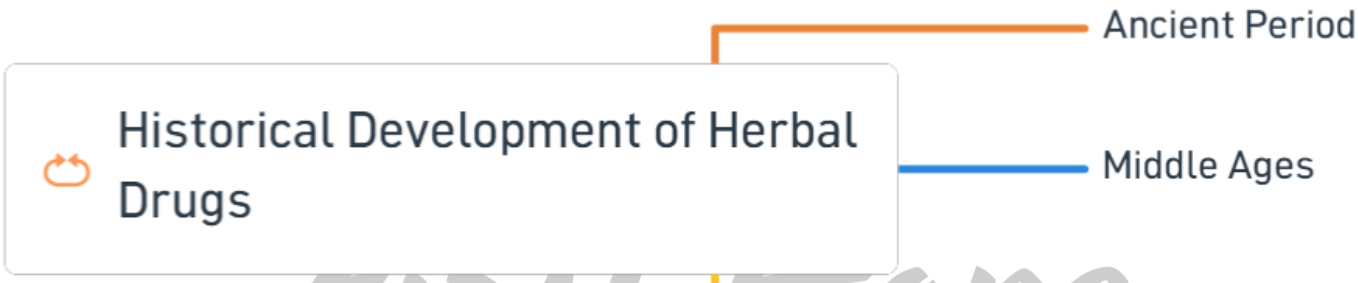
# Drug Discovery and Development

## History Of Herbs As Source Of Drugs And Drug Discovery

### Introduction

- Medicinal plants have been used for thousands of years for the treatment of diseases.
- Ancient civilizations such as Indian, Chinese, Egyptian, and Greek systems used herbs as medicines.
- Traditional systems like Ayurveda, Siddha, Unani, and Traditional Chinese Medicine depend mainly on herbal drugs.
- Many modern drugs were discovered from medicinal plants after studying traditional herbal uses.

### Historical Development of Herbal Drugs




First Hope

1. **Ancient Period**
   - Early humans used plants based on observation and experience.
   - Leaves, roots, bark, fruits, and seeds were used to treat infections, pain, fever, and wounds.
   - Ancient Ayurvedic texts such as Charaka Samhita and Sushruta Samhita described many medicinal plants.
2. **Middle Ages**
   - Herbal medicine became more organized and documented.
   - Arab physicians improved extraction and formulation methods.
   - Herbal preparations were widely used in Europe and Asia.
3. **Modern Period**
   - Scientists started isolating active constituents from medicinal plants.
   - Development of analytical techniques improved drug discovery.
   - Herbal compounds became sources for modern pharmaceuticals.

### Traditional Systems of Herbal Medicine

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

### A. Ayurveda

- Originated in India over 5000 years ago.
- Uses medicinal plants as primary treatments.
- Common plants: Ashwagandha, Tulsi, Neem, and Turmeric.

### B. Traditional Chinese Medicine (TCM)

- Uses herbal remedies to maintain health and treat diseases.
- Important plants include Ginseng and Ephedra.

### C. Unani System

- Uses herbal drugs along with minerals and animal products.
- Many formulations are still used today.

## Contribution of Herbs to Modern Drug Discovery

- Medicinal plants provide diverse bioactive compounds.
- Traditional knowledge helps identify promising plants.
- Natural products serve as lead molecules for new drugs.
- Many modern medicines are derived directly or indirectly from plants.

## Important Drugs Obtained from Herbs

| Herbal Source | Active Compound | Therapeutic Use |
|---|---|---|
| **Cinchona bark** | Quinine | Antimalarial |
| **Ephedra** | Ephedrine | Bronchodilator |
| **Papaver somniferum** | Morphine | Analgesic |
| **Digitalis** | Digitoxin | Cardiotonic |
| **Taxus species** | Taxol | Anticancer |
| **Artemisia annua** | Artemisinin | Antimalarial |

## Importance of Herbs in Drug Discovery

- Source of new bioactive compounds.
- Provide lead molecules for drug development.
- Traditional knowledge reduces time and cost of discovery.
- Continue to supply new medicines for various diseases.

## Advantages of Herbal Sources in Drug Discovery

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

- Plants contain structurally diverse compounds.
- Natural products show broad biological activities.
- Traditional knowledge supports therapeutic claims.
- Herbal compounds may show fewer side effects.

### Limitations

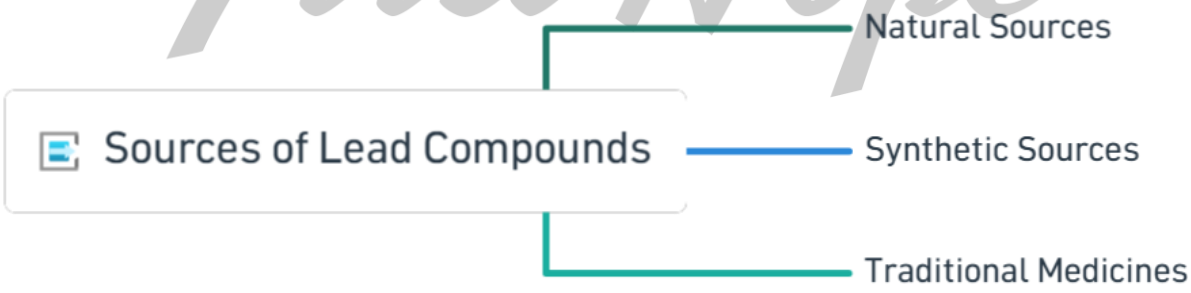
- Active constituents may be present in low quantity.
- Standardization is difficult due to environmental variations.
- Isolation and purification may be complex.
- Some herbal compounds show toxicity.

## Lead Structure Selection Process

### Definition of Lead Compound

- A lead compound is a chemical substance that shows promising biological activity against a specific disease target.
- Lead compounds serve as the starting point for development of new drugs.

### Sources of Lead Compounds




#### A. Natural Sources

- Plants
- Microorganisms
- Marine organisms

#### B. Synthetic Sources

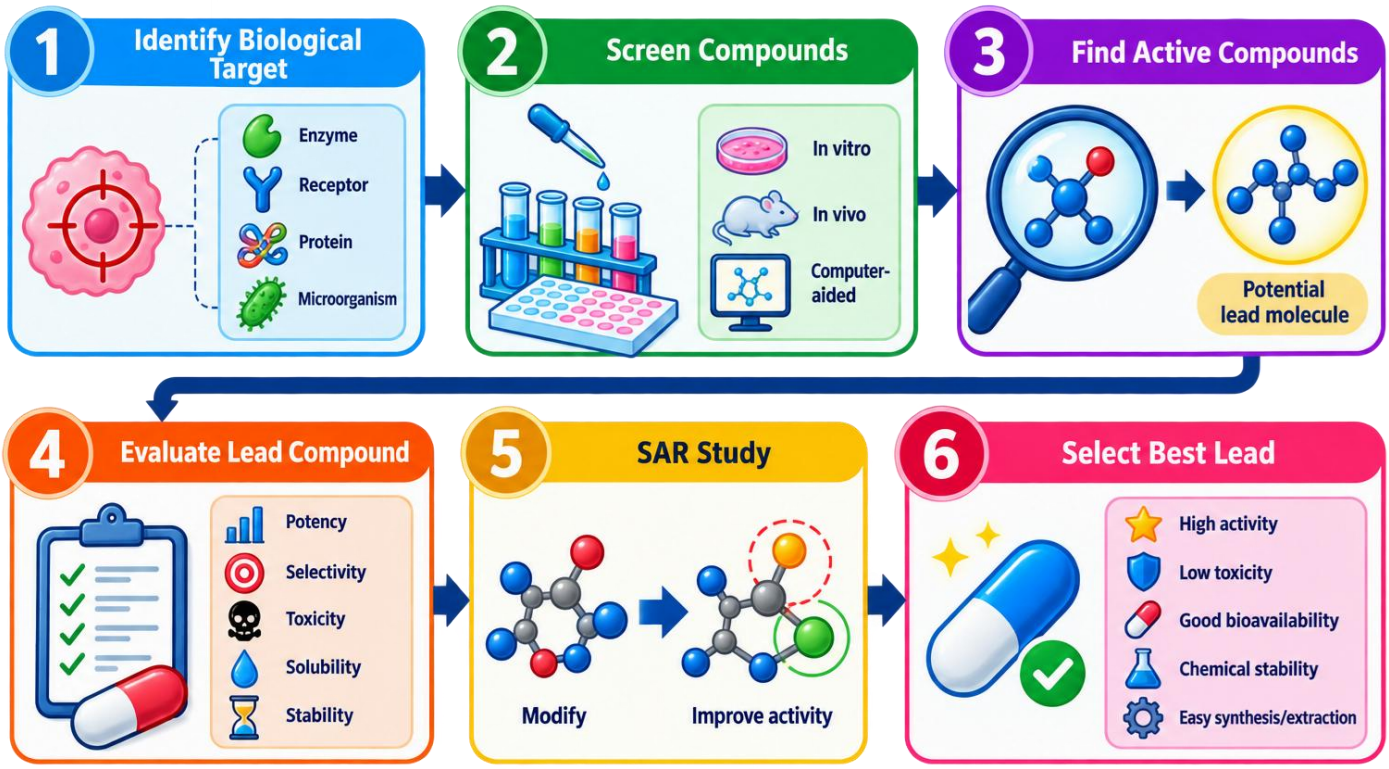
- Chemical libraries
- Combinatorial chemistry

#### C. Traditional Medicines

- Ayurvedic and herbal formulations
- Ethnomedicinal information

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

# Steps in Lead Structure Selection




## 1. Identification of Biological Target

- Scientists first identify the target responsible for disease.
- **The target may be:**
  - Enzyme
  - Receptor
  - Protein
  - Microorganism

## 2. Screening of Compounds

- Natural or synthetic compounds are tested for biological activity.
- **Screening may be:**
  - In vitro screening
  - In vivo screening
  - Computer-aided screening

## 3. Identification of Active Compound

- Compounds showing significant activity are selected.
- These compounds become potential lead molecules.

## 4. Evaluation of Lead Compound

- **The lead compound is evaluated for:**

First Hope

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

- Potency
- Selectivity
- Toxicity
- Solubility
- Stability

### 5. Structure-Activity Relationship (SAR) Study

- Chemical structure is related to biological activity.
- Functional groups responsible for activity are identified.
- Unwanted groups are modified or removed.

### 6. Selection of Best Lead

- **The final lead should have:**
  - High therapeutic activity
  - Low toxicity
  - Good bioavailability
  - Chemical stability
  - Easy synthesis or extraction

First Hope

## Characteristics of an Ideal Lead Compound

- Strong pharmacological activity
- Minimal adverse effects
- Good absorption and distribution
- Suitable metabolic stability
- Economical production

## Importance of Lead Structure Selection

- It reduces time and cost in drug development.
- It increases the probability of obtaining a successful drug candidate.
- It helps identify molecules with better therapeutic potential.

## Example from Herbal Sources

### A. Artemisinin

- Artemisinin was isolated from Artemisia annua.
- It showed strong antimalarial activity.
- Scientists selected it as a lead compound for antimalarial drug development.

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

First Hope

FREE PREVIEW

Click here to visit our website

PHARMACY PREMIUM NOTES

# Complete subject and semesters are available on FirstHope app only.

Scan or click here

Click here to get the app >

Available on Google Play

JOIN THE FIRSTHOPE COMMUNITY

## Join our Telegram channel

Click here to join Telegram >

Scan or click here

@FirstHopeNotes

### Instagram

@firsthope.official

Click here to follow >

### YouTube channel

FirstHope-Pharmacy / Live streams

Click here to watch >

### WhatsApp channel

Follow FirstHope on WhatsApp

Click here to join >

### FirstHope website

firsthope.co.in

Click here to visit >

**B.Pharm / D.Pharm / M.Pharm / Pharm.D**

Preview notes. Complete subjects and semesters in the FirstHope app.