Evaluation Of Crude Drug

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❖ Abstract

Evaluation refers to a structured approach used to determine the worth, quality, and relevance of a subject based on established parameters and criteria. This review emphasizes the importance of crude drug evaluation and examines the diverse techniques applied in this field. It provides a concise overview of the main analytical methods used to assess crude drugs, including macroscopic and microscopic examinations, sensory (organoleptic) assessments, physicochemical analyses, and chromatographic procedures.

In this research, hybrid human skin models are introduced to facilitate precise toxicological testing of pharmaceutical and cosmetic substances. To mimic the process of skin cornification, keratinocytes were cultured at the air–liquid interface on the upper layer of a vertical microfluidic device.

The aim of this investigation is to evaluate and compare the rates and mechanisms of enrofloxacin release—an antibiotic—from poly (lactic-co-glycolic acid) (PLGA) nanoparticles in simulated saliva and simulated gastric fluid (SGF). This was achieved by integrating drug release profiling via asymmetric flow field–flow fractionation (AF4) with physical release modeling and density functional theory (DFT) studies. At 30 °C, comparable release patterns were observed in media with nearly neutral pH, such as saliva and phosphate-buffered saline (PBS), whereas a faster antibiotic release occurred in SGF.

❖ Key Words

Natural products, drug discovery, pharmacognosy, herbal remedies.

❖ Introduction

Crude drug evaluation refers to the systematic analysis and examination of natural materials obtained from plant, animal, mineral, or other origins to determine their medicinal or healing potential. These raw substances, termed crude drugs, serve as foundational components in the formulation of numerous modern and traditional medicines. The evaluation process includes multiple stages designed to assess the drug's quality, purity, strength, and safety. Below is an overview of the main elements involved in the evaluation of crude drugs. It is a method of obtaining information to identify problems related to drug use, and if properly developed, it also provides a means of correcting the problem and thereby contributes to rational drug therapy. It improves the quality and cost effectiveness of drug use and thereby improves patient care. It is a required, cross-disciplinary quality improvement program that emphasizes. Rationalization of drug therapy in emergency medicine would be beneficial in handling the wide range of conditions that present for

emergency care. Physicians often face challenges in selecting, initiating, and individualizing appropriate drug therapy for patients in the emergency room.

❖ Crude Drug Material

Crude plant drugs are raw materials obtained directly from plants that are used for medicinal purposes without undergoing any major processing. These include various parts of the plant such as leaves, roots, bark, stems, flowers, seeds, and fruits. Common examples of crude plant drugs are senna leaves used as a laxative, ginger rhizomes for digestive issues, cinchona bark for treating malaria, and digitalis leaves for heart conditions. These plant materials are typically dried and stored in their natural form before being used in traditional remedies or further processed into herbal or pharmaceutical products. Evaluating the identity, purity, and quality of these crude drugs is essential to ensure their safety and therapeutic effectiveness. A naturally occurring substance derived from plants, animals, or minerals that is used in its unrefined or raw form for medicinal or therapeutic purposes is known as crude drug. These substances are often the starting materials for the development of pharmaceutical drugs. Crude drugs may consist of entire plants, plant parts, animal tissues, or minerals, and they have been used for various medicinal, healing, or cultural practices for centuries. Crude drug evaluation is a multidisciplinary approach that combines botanical, pharmacological, chemical, and toxicological principles to ensure the safety and efficacy of natural substances used in traditional and modern medicine. This process plays a vital role in the development of herbal medicines and supplements, contributing to the overall quality and effectiveness of healthcare products derived from natural sources.

❖ Plant Based Crude Drugs

Many crude drugs are derived from plant sources. This includes parts of plants such as roots, stems, leaves, flowers, fruits, and seeds. o Examples of plant-based crude drugs include cinchona bark (source of quinine), opium poppy latex (source of opium alkaloids), and foxglove leaves (source of digitalis glycosides).

❖ Animal-Based Crude Drugs

Some crude drugs are derived from animal sources. This may include parts of animals, such as glands, organs, or secretions. Examples of animal-based crude drugs include thyroid glands (source of thyroid hormones), liver extracts, and bee venom.

❖ Mineral Based Crude Drugs

In several traditional medicinal practices, minerals are utilized either in their natural state or following slight refinement. Examples include different forms of clay, sulfur, and specific metals.

Types of Evaluation Crude Drugs

- **Organoleptic Evaluation**

Organoleptic evaluation means checking a drug or plant using our sense organs like eyes, nose, tongue, and hands. It includes looking at things like color, smell, taste, size, shape, and feel. often just seeing a plant or its extract can help identify it. If that's not enough, its smell or taste may give more clues. The study of a drug's shape or structure is called morphology, and describing what it looks like is known as morphography. For example, the way the inside surface breaks in barks like cinchona, quillaia, and cascara, or in quassia wood, is useful for identification.

Some other examples are:

1. The strong smell of umbelliferous fruits.
2. The sweet taste of liquor ice.
3. The wavy appearance of rauwolfia.
4. The sharp, spicy taste of capsicum and ginger.
5. The brown color of cinnamon.

The unique smell and taste of spices like asafetida, black pepper, nutmeg, caraway, and cumin. These are all key features that help recognize the crude drugs using our senses.

Study of Morphology

Shape and size:

Flowers

1. Floral parts: stigmas, corollas, anther, ovary, receptacle.
2. Leaves and leaflets
3. Length, width, apex, margin, base, venation,
4. the texture of the leaf and the hairs in upper and lower surface.
5. The feel of the surface described as soft, hairy smooth.

Bark

1. The barks occur in three shapes:
2. Flat or curved pieces.

Single quill.

Double quills.

i. Barks have two surfaces, an outer and inner.
ii. The inner surface is usually lighter in color than the outer surface

Odor and taste:

Odor:

1. distinct
2. indistinct aromatic-balsamic, -spicy

Taste:

1) Acidic (sour)
2) Saccharine (sweet): indicates sugar or sugar-like substances
3) e.g., Liquorice.
4) Saline (salty)
5) Alkaline
6) Bitter: indicates presence of substances such as bitter principle
7) e.g., glycoside, alkaloids.
8) Tasteless
9) Distinctive sensations to the tongue

I. Gelatinous and smooth – jelly-like and soft to the touch.
II. Astringent indicates presence of tannin.
III. Pungent (warm biting sensation) e.g., ginger.
IV. Acrid (irritant sensation) e.g., Aconite, coca.
V. Nauseous (those tending to excite vomiting),

Color and external markings.

I. White: e.g., starch,
II. Pale yellow e.g., ginger, squill, white pepper
III. Deep yellow: e.g., peeled licorice.
IV. Light pale brown e.g., nux-vomica, fennel.
V. Dark brown: e.g., cloves buds.
VI. Dark reddish brown: cinchona.
VII. Red: (brick red). e.g., cinnamon bark inner portion
VIII. Pale green e.g., lobelia.
IX. Greenish brown: most of the leaf herbs.

❖ **Microscopic Evaluation**

Microscopic evaluation means studying a drug more closely using a microscope. This helps to identify organized crude drugs (those with a clear structure) by looking at their unique tissue features. It is especially useful for checking both whole and powdered plant parts. Every plant has special tissue structures that help in its identification. A microscope helps to see these small details clearly. To get better results, stains or chemical solutions are used to highlight different parts of the plant cells.

Here are some examples:

1. Phloroglucinol and hydrochloric acid make lignin (a plant substance) turn red.
2. Mucilage turns pink when stained with ruthenium red.
3. Cellulose swells and dissolves when treated with coralline soda and a few drops of
4. sodium carbonate solution.

5. Starch and hemicellulose turn blue when treated with N/50 iodine solution. These
6. reactions help scientists confirm what the plant drug is by checking its tiny inner parts.

❖ Physical Evaluation

Physical evaluation of drugs means checking their physical properties to make sure they are good and safe to use. Moisture content should be low to prevent spoilage; for example, digitalis and ergot should have less than 5% moisture. Solubility tells how well a drug dissolves in different liquids. Optical rotation shows if a drug can rotate light, like eucalyptus oil. Refractive index checks how much light bends through the drug, like in castor oil. Specific gravity tells how heavy the drug is compared to water. Viscosity measures how thick a liquid drug is. Melting point helps to identify the drug by checking at what temperature it melts.

A few of them are

I. **Moisture Content** - Excess moisture in a crude drug can result in spoilage through the activation of enzymes or the proliferation of microorganisms. Moisture content can be measured by drying the drug in an oven at 150°C until a constant weight is achieved.

II. Viscosity - Viscosity of a liquid is constant at a given temperature and is an index of its composition.

III. **Melting point** - It is one of the parameters to judge the purity of crude drugs containing lipids as constituents. They may of animal or plant origin and contain fixed oils, fats and waxes. The purity of the following crude drugs can be ascertained by determining their melting points in the range shown against each of them.

IV. **Solubility** - Solubility tests can help reveal the presence of adulterants or impurities within a drug sample.

VI. **Refractive Index** - When a ray of light passes from one medium to another medium of different density, it is bent from its original path. Thus, the ration of velocity of light in vaccum to its velocity in the substance is said to the Refractive index of the second medium. It is measured by means of refractometer. RI of a compound varies with the wavelength of the incident light, temperature and pressure.

VII. **Ash values** - The inorganic residue that remains after complete combustion of the drug represents its ash content, which primarily consists of carbonates, phosphates, and silicates of sodium, potassium, calcium, and magnesium. The ash value serves as an important parameter for assessing the purity and authenticity of a crude drug.

(in-organic salts of carbonates, phosphates, silicates of sodium, potassium, calcium and magnesium) are known as ash content. Ash value is a criterion to judge the identity OR purity of the crude drug.

VIII. **Extractive values** - In crude drugs, sometimes the active chemical constitutes cannot be determined by normal procedures. In such cases, water, alcohol or ether soluble extractive values are determined for evaluation of such drugs.

IX. **Volatile oil Content** - The therapeutic effectiveness of many crude drugs arises from their aromatic constituents (volatile oils). Therefore, these drugs are evaluated or standardized based on the amount of volatile oil they contain apparatus. The distillate collected is graduated into volatile oil. The amount thus obtained is recorded from the tube.

X. **Foreign organic matter** - The parts of the organ or organs other than those named in the definition and description of the drug are defined as foreign organic matter. The maximum limit for the foreign organic

matter is defined in the monograph of crude drug. If it exceeds the limits, deterioration in quality of the drug takes place. The physical or physico chemical parameters useful in quality profile of a crude drug evaluation

XI. **swelling factor** - Useful in the evaluation of crude drugs containing mucilage Useful for the detection of purity of the crude drug.

❖ Chemical Evaluation

Chemical evaluation of drugs involves testing them to find out what important chemical substances they contain. It includes qualitative tests to identify types of compounds like alkaloids, glycosides, and tannins, using reagents such as iodine for starch or Van Urk's for ergot. Quantitative tests measure values like acid, ester, and saponification to check the number of certain groups in the drug. Chemical assays are used to find out the exact amount of active ingredients, like alkaloids in belladonna or vitamins in cod liver oil. These tests help detect poor-quality or used-up drugs. Instrumental methods, like chromatography and spectroscopy, are also used to analyze the chemical makeup of plant compounds.

The following are various methods of chemical evaluation.

1. Instrumental methods: These involve the use of analytical instruments such as colorimeters, fluorimeters, and spectrophotometers for the evaluation of crude drugs.
2. Chemical constants tests: Parameters like acid value, iodine value, and ester value are determined to identify and assess the quality of fixed oils and fats. for the identification of fixed oils and fats.
3. Individual chemical tests: These are the tests which are used for identifying particular drugs.
4. Microchemical tests: These are the tests which are carried on slides. Example euginol in clove oil is precipitated as Potassium Eugenate crystals.

❖ Biological Evaluation

Biological evaluation is a risk management process used to determine the biocompatibility of a medical device, material, or product. It involves assessing potential biological hazards and risks associated with the device, considering available data like material composition, manufacturing process, intended use and clinical history. The evaluation guides the selection of appropriate biocompatibility tests to ensure the product is safe for its intended use.

It is employed when the drug cannot be evaluated satisfactorily by chemical and physical methods.

In this method, the effect generated by the test drug on a living organism is compared with that of a standard reference preparation.

Such an activity is represented in units as International Units (I.U). Dose is termed as International **units IU**

- Digitalis 1IU=76mg of standard
- Vit-A 1IU-0.344 of standard
- Vit-D 1IU=0.025of standard

Indication of Biological Evaluation

- When the chemical nature of the drug is not known but is has an biological action.
- When chemical methods are not available.

- When only a small amount of the drug is available, making chemical evaluation impractical or impossible.
- Drugs which have different chemical composition but same biological activity.

Example: Cardiac glycosides are evaluated by this method on cats, frogs or pigeons.

❖ Conclusion

The evaluation of crude drugs ultimately ensures their quality, safety, and therapeutic effectiveness, enabling their incorporation into modern healthcare. By integrating botanical, chemical, and pharmacological approaches, this process guarantees the reliability and consistency of natural remedies. Careful assessment also addresses variations arising from cultivation conditions and processing methods, reducing risks of compositional changes and deterioration. Such comprehensive analysis not only protects patient well-being but also helps sustain traditional knowledge in today's pharmaceutical landscape.

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