HERBAL DOSING, EXTRACTIONS AND INFUSIONS

EVERYTHING YOU NEED TO KNOW

BY GREEN MOUNTAIN GREENERY

Welcome to the enchanting world of herb magic, where we explore the spellbinding ways of turning simple plants into powerful potions. In this guide, we embark on a magical journey to uncover the secrets of extractions and infusions. Picture yourself as a wizard in training, learning to coax out the hidden powers of herbs. Through extraction, imagine you possess the unique ability to gently pull the most potent elements from plants, using tools like water, alcohol, or oil to capture their healing essence. Meanwhile, infusion is akin to brewing a magical tea, where you let herbs share their gifts with water through a warm embrace, creating concoctions that can heal, soothe, and comfort. Join us as we take our first steps into a realm where plants reveal their mysteries, offering their strength to those willing to learn their ancient language.

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THE UNIVERSAL HERBALISTS RATIO

MATERIAL CONCENTRATION ACCURACY:

Without access to a lab, it's challenging to determine specific compound ratios in herbal products. When the ratio mentions milligrams (mg), it typically refers to the total plant material. This aspect is crucial in herbology and is the standard reference point across the field.

Fresh herbs are stronger than dry and essential oils are stronger than standard oil infusions.

Example : Plant material containing 16% THC was tested to have 10mg of THC per 0.97mg of plant material, resulting in a ratio of 1:11.6 (material weighed before decarboxylated at 240F for 50 minutes) when extracted for 24 hours with a temperature of 100-112F.Understanding these ratios and extraction processes is essential in herbology, especially when dealing with potent compounds like THC.

BASIC PRINCIPLE OF RATIOS:

A 1:1 tincture implies one part herb to one part solvent. The solvent commonly used is alcohol due to its efficiency in extracting a broad range of compounds. The volume of solvent (ML) would equal the dry weight of the herb (Gram) to achieve the 1:1 ratio, but this can be scaled down based on your needs.

Example: 100 grams of herb to 100 milliliters of solvent would be a 1:1 Ratio

Solvent Concentration: For a 1:1 tincture extraction, the alcohol needs to be a minimum 80 to 100 proof (40% to 50% alcohol) to effectively preserve and extract the medicinal properties. For a 1:1 oil infusion, you will most likely need to heat the infusion to a specific temperature (commonly 100F).

EXTRACTIONS / INFUSIONS

BASIC PREPARATION:

Mix the dried herb with an equal weight/volume of solvent (for example, 224g of herb to 224ml of alcohol). Ensure there is enough head space in your glass container for expansion and for shaking the mixture. Seal the glass container and store it in a cool, dark place, shaking it daily for 2-6 weeks.

Time and solvent of Extraction: Depends on the compounds you are looking to extract. Some require water, some require alcohol and some oil.

After the soaking period, strain the mixture to separate the liquid (your tincture) from the solid herb parts. A fine mesh or cheesecloth works well for this step. Use a press to receive max yield.

Bulk Material Concentration Challenges:

Manufacturing a 1:1 liquid extract is difficult without a concentration step due to the bulky nature of most herbs, which exceeds the volume of the liquid.

If the plant material is not as dense and absorbs more of the liquid, you might need to increase the volume of the menstruum (solvent) to keep the plant material fully submerged.

This ensures that the entirety of the plant material is in contact with the alcohol, facilitating optimal extraction of its constituents.

OVER EXTRACTION:

Inefficiency and Poor Extraction:

Ineffectiveness can result from too lengthy an extraction process where the solvent becomes saturated, and no additional beneficial compounds can be dissolved. Beyond a certain point, prolonged extraction might only contribute to extracting more undesired compounds, such as tannins or other potentially harmful substances, without increasing the concentration of desired compounds.

Loss or Alteration of Phytochemicals:

Phytochemicals— the active chemical compounds in plants—can be lost or changed during the concentration process. If an herb is extracted for too long, especially under conditions that are not optimized (such as excessive heat or prolonged exposure to solvent), it could lead to the degradation or modification of these sensitive compounds.

CHOOSING A SOLVENT:

Alcohol:

Highly efficient for a broad range of compounds, including those difficult to extract with water or glycerin. Particularly effective for extracting certain alkaloids, terpenoids, and flavonoids.

Water:

Extracts water-soluble compounds well. Less effective for fat-soluble compounds, which are better extracted by alcohol or oil.

Oil:

Ideal for extracting fat-soluble compounds. Not as effective for compounds that are more soluble in alcohol or water.

Glycerin:

Less efficient than alcohol for certain compounds such as alkaloids.

Provides a non-alcoholic means of extraction, valuable for users avoiding alcohol.

ALCOHOL AS A SOLVENT:

Alcohol is touted as a universal solvent in the context of herbal extractions, primarily because it is effective at extracting both the essential oils and most of the other chemical compounds that water can extract from herbs. Additionally, alcohol can access medicinal components that require a double-extraction process, involving both water and alcohol, to be fully extracted.

This makes alcohol-based tinctures a preferred choice for creating comprehensive and potent herbal remedies. Alcohol not only dissolves nearly all relevant ingredients of an herb but also serves as a long-term preservative. 30% alcohol or more in a tincture will preserve it, but more will preserve it longer.

Can you use 190 Proof? Higher alcohol concentration can penetrate plant material more effectively, ensuring a potent extraction of its medicinal constituents. At such a high proof, alcohol acts as an excellent preservative, maintaining the tincture's potency and stability over time. Certain herbs are most efficiently extracted using pure 190-proof ethyl alcohol. Examples include Milk Thistle seed, Chaparral, Myrrh, and Calendula.

MIXING ALCOHOL AND WATER:

Mixing water with alcohol, a process frequently used in creating tinctures and extracts from herbs, involves the basic principle that alcohol mixes well with water (and glycerin) in all proportions. This quality is essential for medicinal preparations as it allows for the extraction of a large variety of active plant substances, some of which are not readily soluble in water alone.

Cloudy Mixture:

The mixture can get cloudy sometimes due to the presence of certain compounds in the herbs that are not completely soluble in the alcohol-water solution. The cloudiness might arise from the extraction of plant starches, gums, and mucilaginous materials because, while alcohol is a powerful solvent, it does not dissolve these plant substances as readily as it does others

Specific Situations:

Ensure the correct proportions of alcohol to water when following specific recipes, especially when working with mushrooms (mentioned below) or lichens, as outlined in the provided methods which suggest a mix involving significant parts of both alcohol and distilled water.

Be aware that evaporation of alcohol over time is one of the biggest risks to the integrity of a tincture, thus keeping them in well-sealed containers is crucial .

DISTILLED WATER:

Distilled water is "hungry water" and loves to absorb things. It's also very clean and void of bacteria and other compounds or chemicals.

Purity: Distilled water is free from chemicals, minerals, and other impurities found in non-distilled water sources. These impurities can interact with the compounds being extracted from the herbs, potentially affecting the efficacy, taste, and clarity of the final tincture. The absence of such impurities in distilled water ensures that the only solvents acting on the plant materials are the alcohol and the water itself, allowing for a "cleaner" extraction of active substances.

Solvent Efficacy: Alcohol has a unique importance as a solvent, not just for its ability to dissolve many active plant substances that water alone cannot, but also because it avoids extracting certain components such as albuminous matter, plant starches, gums, and mucilaginous materials, which water can dissolve.

This property of alcohol to exclude certain plant substances—referred to as its "negative strength"—is particularly relevant. Using distilled water reduces the risk of unintended substances being dissolved in the water part of the extraction, thus making the alcohol's role in the extraction process more precise and effective.

Consistency in Extractions: The consistency in the chemical makeup of distilled water can lead to more consistent results in the extraction process. Because distilled water always has the same properties (unlike tap water, which can vary significantly in mineral content and purity depending on the source), it makes the process more predictable and repeatable.

WATER TO ALCOHOL RATIO:

A 95% alcohol mixture would still absorb both water-soluble and alcohol-soluble constituents, but its efficacy might vary depending on the specific constituents you aim to extract. For substances that are more readily soluble in water, the lower water content might reduce the extraction efficiency of those particular constituents.

Some extractions require high alcohol and some require higher water ratios. This will all depend on the herbs and the uses you are aiming to use. You can also extract the material again using something like water or oil after the alcohol evaporates to grab the rest of the compounds.

REDUCE OR REMOVE AND REPLACE ALCOHOL:

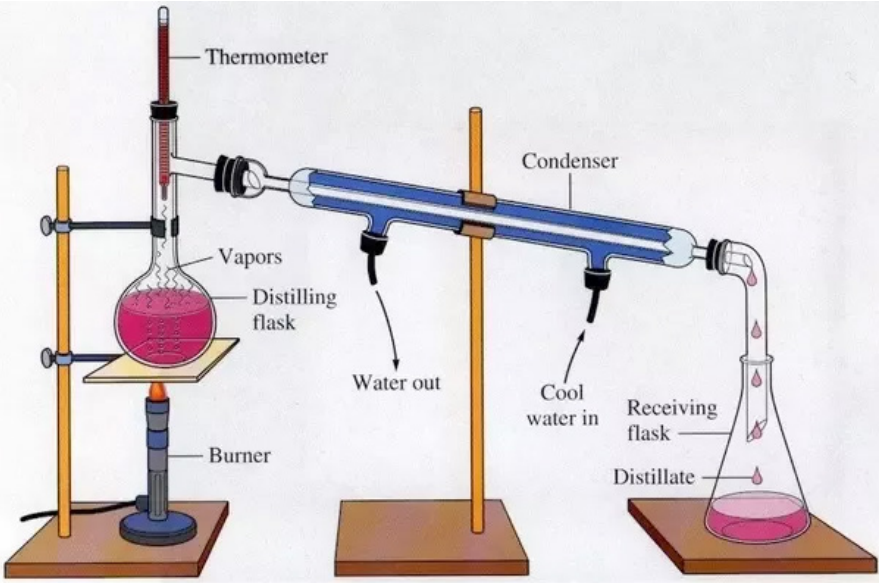
Using Glycerin: After initially preparing the extract with alcohol, you can switch out the alcohol and use glycerin instead (by letting the alcohol evaporate (reduce) and pouring glycerin (or oil or water) over the remains. Glycerin acts as a non-alcoholic preservative, making it a suitable option for those avoiding alcohol.

Evaporation Method for Individual Doses: For an alcohol-free dose, deposit a single dose of the extract onto a wafer or another edible, porous substance. Leave it in a place that is airy and free from humidity until the alcohol evaporates completely. The active ingredients from the extract will remain infused in the wafer, ready for consumption without the alcohol content.

Gentle Heat Evaporation: To concentrate the tincture, use gentle heat to evaporate some of the alcohol. This can be done by placing the tincture in a water bath (double boiler) at a low temperature. It's crucial to ensure the setup is safe for handling alcohol over heat, taking care to avoid any open flames as alcohol fumes are flammable.

Natural Evaporation: Alternately, if you prefer not to use heat, you can simply leave the tincture open in a well-ventilated area. The alcohol will slowly evaporate over time, leaving a more concentrated tincture behind. This process requires patience and time.

Monitoring the Process: Keep a close eye on the tincture as it concentrates, checking regularly to achieve the desired level of concentration. Remember, removing too much alcohol might increase the risk of spoilage since alcohol acts as a preservative.



CONCENTRATION:

Formula Example:

To reduce a 1:10 100ml extraction to 1:1, Reduce the volume of the extract by:

Current: 1:10 = 100ml Alcohol containing 10mg Extract
Goal: 1:1 = 10ml Alcohol containing 10mg Extract

To convert the initial 1:10 ratio to the desired 1:1 ratio, you need to evaporate 90ml of the original 100ml extraction. By doing so, you will be left with 10ml of alcohol containing the same amount of extract, achieving the 1:1 ratio as desired.

OIL AS A SOLVENT:

Oils are used to extract lipophilic (fat-soluble) compounds from herbs, which are not as effectively extracted by alcohol or water. This includes certain vitamins, sterols, and other fat-soluble phytochemicals. Infused oils are typically used for topical applications rather than internal use, which is a key difference in the utilization of oil extractions compared to alcohol-based tincture. However Coconut oil and other oils can be used for internal use of these oil only compounds.

Basic Oil Infusion:

1) Mix into a Glass container 1:5 (Ratio - Crushed or Powdered Herb grams : Coconut Oil milliliter (or other)).
2) Infuse the mixture in the dark at 115F (100F-120F) for 2 Weeks (Stirring as much as possible).
3) Strain and press the oil out of the material into a clean glass jar and let sit overnight (material settle).
4) Pour out the top layer of liquid into cheese cloth into a clean amber jar leaving the material bits (Decant).
5) Now seal and label with date and herb - Will last up to 2 years if stored in cool dark place.

SOME OTHER ADVANCED TECHNIQUES:

Extractions exist such as: supercritical fluid extraction using CO2 and ethanol (5%) as solvents to obtain extracts rich in active components from marigold. This method significantly increases the concentration of certain active compounds, indicating that advanced extraction techniques can enhance the bioavailability of specific phytochemicals. Essential Oils are created through a steam distillation process.

THE SYNERGY OF HERBS

Understanding Herb Properties:

Research the properties of each herb you plan to use. Understand their active components and effects and Identify complementary effects where one herb enhances the benefits of another. For example, combining a relaxing herb like lavender with chamomile might amplify the soothing effects.

Be acutely aware of any potential negative interactions between herbs, especially if they share similar side effects or if one might exacerbate a condition that another is supposed to alleviate.

Source high-quality herbs, as the potency and purity will directly impact the effectiveness of your blend. Ensure freshness, as this can significantly influence both the therapeutic qualities and flavor profile of the herbs.

Multiple Herb Formulas with Single herb extracts:

Determine the effect or role of each herb in the blend to decide on the proportion of each extraction in the final mixture. The aim is to balance the mixture to achieve a synergistic effect where the properties of one herb enhance or complement another.

1. **Concentrate each herb to a 1:1 Extract.**
2. **Choose your desired Volume.**
   Example: 100ml
3. **Choose each herbs mg per dose desired.**
   Example: 300mg – 1000mg – 400mg - 300mg
4. **Convert each of the doses from mg to ml (1ml/1000mg).**
   Example: 0.3ml – 1.0ml – 0.4ml – 0.3ml
5. **Add up the total ml of the desired dose.**
   Example: 0.3ml + 1.0ml + 0.4ml + 0.3ml = 2ml
6. **Divide the desired dose total by the desired volume.**
   Example: 2ml / 300ml = 150 (Vol/Dose)
7. **Multiply the "Vol/Dose" by the ml of each desired dose to get the amount to add of each**.
   Example: 150 * 0.3ml = 45ml

Note: To reduce the dose you can further concentrate and reduce the solvent.
Go to iKnowNature.com and search for the Excel document with the premade formula!

RE-USE OF THE SEDIMENT

Re-purposing the sediment from an alcohol-based herbal extract (tincture) and extracting it with oil could indeed allow you to obtain compounds that weren't originally extracted by the alcohol. This is because different solvents can extract different compounds based on their solubility.

The process involves first using alcohol for its efficiency in extracting a broad range of plant constituents. Then, for those looking to avoid alcohol, this initial solvent can be replaced with another, such as glycerin, to target different compounds. This method of solvent exchange can be further optimized by removing the material post-alcohol extraction, allowing the alcohol to evaporate, and subsequently infusing the material in oil. This sequence ensures the absorption of a wide array of compounds by leveraging the complementary solubility profiles of alcohol and oil.

DECANTATION

Decantation is a method used to separate mixtures, including the process of removing liquid from a container without disturbing the sediment at the bottom. In the context provided by the document, decantation is employed as a means to avoid dispensing any sediment present in the liquid, which is critical in the preparation and dosing of herbal tinctures.

Certainly, decanting is a simple yet effective method to separate liquid from sediment, often used in herbal medicine preparation. Here's a quick and easy guide to decant your tinctures or other preparations:

1. **Wait for Sediment to Settle:** First, allow the liquid and sediment mixture to sit undisturbed. This will let the heavier particles settle at the bottom, creating a clear separation between the liquid and sediment.

2. **Prepare for Transfer:** Position a clean container where you will decant the liquid. If you aim to filter the dregs, have a fine clean cloth or a muslin/nylon mesh bag ready.

3. **Gently Decant the Liquid:** Slowly and carefully tilt the original container and begin pouring the liquid into the new container. The goal is to transfer as much liquid as possible without disturbing the sediment at the bottom.

4. **Stop Before Sediment Transfers:** As you pour, watch carefully for when the sediment at the bottom starts to approach the lip of the container. Stop pouring immediately to avoid transferring the sediment.

5. **Optional - Setup for Pressing:** After the decantation step where the clearer liquid has been separated from the sediment, the mixture that contains the residual solvent (and possibly plant material) can be placed in a muslin or nylon mesh bag within a press setup.

Pressing: Gently apply pressure using the wine press (or any suitable press) to extract the remaining liquid from the herbs. This process should be conducted slowly to maximize the extraction of liquids while minimizing the transfer of unwanted material.

Final Extraction: Continue pressing until no more liquid drips from the press. The liquid collected at this stage will contain the solvent possibly along with the desired soluble compounds from the plant material.

6. **Disposal or Reuse of Sediment:** Based on the specific preparation and your discretion, decide whether to discard the sediment or re-purpose it. Some sediments may have uses, while others should be rejected.

DECARBOXYLATION

Decarboxylation might sound like a complex term, but it's actually a simple concept once you break it down. Imagine you have a fresh leaf from a plant that contains a special type of ingredient, which could be more useful if slightly changed by heat. This process is similar to baking soda becoming active in a cake mixture when heated, helping the cake to rise.

Here's how decarboxylation works in simple terms:

It's a Chemical Reaction: Decarboxylation is a chemical reaction that removes a carboxyl group from a molecule and releases carbon dioxide (CO2). In the context of cannabis, for example, it's what turns THCA, which isn't psychoactive, into THC, the compound that gets people "high."

Heat is Key: This reaction happens naturally over time or can be sped up with the application of heat. Think about baking cookies in an oven; you start with dough, and with the right amount of heat and time, you get delicious cookies. Similarly, applying heat to certain herbs causes decarboxylation, transforming the substances inside to make them more active or potent

Why It's Important: For certain herbal remedies or ingredients to be effective, they need to go through decarboxylation. This is because the active components are not fully available until the acid part of the molecule is removed through this process.

So, in a practical sense, decarboxylation is like activating an ingredient's hidden potential with heat, making it ready for its intended use, much like activating yeast in bread making to make the bread rise.

Can you damage the herbs?

Decarboxylating compounds in herbs when it's not necessary can indeed have negative effects. Decarboxylation typically involves the application of heat to activate certain compounds within the herb, changing their chemical structure and making them more bioavailable or active. However, not all compounds found in herbs need to be decarboxylated to exert their effects, and applying heat indiscriminately can degrade some sensitive compounds, potentially reducing their efficacy or altering their intended effects.

For example, within the context of herbal medicine, certain anti-carcinogenic constituents found in herbs are not antagonistic until mixed with other components, suggesting that the interaction between various compounds within the herb can significantly affect their overall effect on the body. Applying heat through decarboxylation without needing to could potentially disrupt these natural balances, leading to unintended outcomes.

Moreover, many herbs contain compounds that are already in their active form and do not require decarboxylation. Overheating these herbs can lead to the degradation of essential oils and other volatile compounds, which are often responsible for the herb's therapeutic effects. This degradation can diminish the potency of the herb and consequently its effectiveness in addressing health concerns.

Furthermore, it's important to consider that the metabolism of certain compounds differs across species; substances that are processed into active forms within one organism may not follow the same metabolic pathways in another. This fact underscores the complexity of herbal constituents and highlights the potential for decarboxylation to unintentionally alter compounds in ways that might not be beneficial and could harm their therapeutic properties.

Decocting:

Decocting, an alternative method that involves simmering plant materials to extract medicinal constituents, is favored for tougher parts of the plant like roots or barks. This approach illustrates that not all herbal preparation methods necessitate high temperatures or the transformation of constituents via decarboxylation to be effective.

Can you Decarboxylate while the material is on the solvent?

While disregarding safety and solely focusing on the chemical feasibility, heating your material in alcohol to a controlled temperature (like 245°F) for decarboxylation within the solvent could be conceptually effective. This process would need to ensure that the active constituents of the herb are stable at the temperature used and that your method allows for maintaining a consistent temperature without the loss of solvent through evaporation or other means. Always prioritize safety and consider the physical and chemical properties of all components involved in your extraction process.

UNIQUE AND SPECIAL EXTRACTIONS

Example: Extracting psilocybin from mushrooms using alcohol is an intriguing process that highlights the unique attributes of alcohol as a solvent in herbal extractions.

Psilocybin and mushrooms :

The method described for mushrooms involves a double-extraction technique, combining alcohol and water processes to fully harness the psychoactive compound psilocybin, alongside other medicinal compounds present in mushrooms.

Double-Extraction Method:

The process starts with an alcohol extraction, followed by a water decoction. This meticulous process ensures that both the alcohol-soluble and water-soluble compounds are extracted from the mushrooms. Alcohol alone might not extract all the vital components, especially those more readily soluble in water This double-extraction is particularly important for mushrooms, as it not only captures a wide range of compounds but also maximizes the extraction of psilocybin, which may have varying solubility in alcohol and water.

High Alcohol Content for Preservation:

The method outlined involves using 80 to 100 proof alcohol, ensuring a high enough alcohol concentration in the final tincture mixture (around 30%). This level of alcohol content is crucial for the preservation of the extract, making it shelf-stable for many years if stored properly in a sealed container. Alcohol acts as a preservative by being "uniformly fatal to any microorganisms" that may come into contact with the tincture, thus preventing decomposition and extending the shelf life of the extract.

Versatility of Alcohol as a Solvent:

Alcohol is called a "universal solvent" in the context of tincture making because of its ability to extract essential oils and other chemical compounds that water can also extract, and it's worth noting that some herbs (and mushrooms, in this case) require alcohol to fully access all medicinal compounds. The document underscores the effectiveness of alcohol in creating potent extracts, which is particularly relevant for extracting psilocybin from mushrooms, given the compound's psychoactive properties.

Water vs Alcohol for Mushrooms (Psilocybin):

the excerpts do mention that ethanol ranging from 75-95% ABV works fine for extractions, it also warns against the use of denatured alcohol (often found in higher concentrations) due to its toxic methanol content.

The preference for 70% ethanol, as recommended by Alexander Shulgin, a renowned chemist known for his synthesis of over 230 psychoactive compounds, stems from its optimal balance for mushroom extraction processes.

Solubility of Psilocybin:

Psilocybin's solubility in alcohol can vary based on the concentration of the alcohol. At 70%, there is a good balance between alcohol and water, allowing for effective extraction of psilocybin from mushroom material. Higher alcohol concentrations may not extract psilocybin as efficiently because certain constituents of the mushroom might dissolve better in a solution that contains some water.

Method (for the sake of discussion and research):

Shred the Mushroom:

It is recommended to pulverize the mushrooms to a consistency like very coarse sand for alcohol extraction. This preparation aids in maximizing the surface area of the mushroom material that's exposed to the solvent, leading to a more efficient extraction of its psychoactive compounds.

Ratio:

For every 10 grams of Psilocybin Mushrooms combine 20ml of Alcohol (Ethanol Cane Sugar)

Temperature:

70F or lower ensuring a safe and effective extraction of compounds from the mushroom material without degrading their potency or leading to unwanted chemical transformations.

Length:

Paul Stamets as presented in his lecture, suggests a simple extraction process that could take 24-48 hours for optimal results and documents suggests using ethanol solutions ranging from 75-95% ABV, emphasizing the importance of selecting the right concentration to achieve a successful extraction.

Stirring:

Occasional stirring could benefit other extraction processes by ensuring the active compounds are more efficiently leached from the mushroom material into the solvent.

"Stir gently and let settle for about 15 minutes while stirring occasionally"

Important Evaporation:

After the Extraction, let some of the ethanol evaporate to remove some of the unwanted volatile compounds that the alcohol may have extracted from the mushroom. After some evaporation, top the ethanol back off to the correct ration of 20ml per 10 grams of mushrooms.

When evaporating the ethanol to concentrate the extract, the guidance is clear that you should not apply heat. The document explicitly states, "don't be tempted to heat it!" during the evaporative phase to reduce the volume down to 20 milliliters. This is likely to prevent the degradation of sensitive compounds within the extract.

Storage:
Keep at 70F or lower in a brown glass bottle out of light and can last up to 2 years.

Extracting longer than recommended:
Prolonged exposure to ethanol might affect the stability and shelf life of certain compounds within the extract, possibly leading to degradation over time.

While not explicitly mentioned in the excerpts, in general, prolonged extraction can lead to the dissolution of more unwanted materials from the mushroom material, potentially altering the extract's taste, purity, or even safety

Risk of Overdose:
While this is more directly related to the dosing post-extraction, it's conceivable that overly potent extracts (potentially from over-extraction) could heighten this risk if the user is unaware of the increased concentration.

Suggested dose from this recipe:
10g/20ml 48-hour ethanol Extraction = Final extract: 1ml = 0.5G Dried Mushrooms

Heavy dose:
2.0g - 3.5g (4ml - 7ml)

DOSAGES

When combining herbs in General be aware of their contradictions, the pros and cons of each herb. The effects either good or bad will double up when combined.

Important dosing aspects:

1) Adjusting the dose according to the individual's weight and sensitivity.

2) Prioritizing smaller, frequent doses over larger, infrequent ones.

3) Remaining within recommended dosage limits to avoid adverse effects.

4) Seeking professional guidance, particularly for long-term use or when treating sensitive populations like children.

5) Tailoring doses in herbal formulas according to clinical goals and possible sensitivities.

General Principles for Dosing Adults:

Standard Adult Dosages are tailored around an average weight of approximately 150 pounds. Adjustments should be made for individuals who are significantly above or below this weight to avoid under dosing or overdosing.

Modulate Dosage Based on Sensitivity, for those who are smaller or show sensitivity to herbs and supplements, lower-range dosages are advised. Conversely, larger individuals or those less sensitive may require doses on the higher end of the spectrum.

Frequency over Quantity, It's emphasized that herbs typically offer more benefit when administered in smaller doses throughout the day, rather than in large single doses which can lead to adverse reactions.

General Principles for Dosing Children:

Adjust the dose according to the child's age and, implicitly, their size and metabolic rate, following the general age-based reductions.

Exercise caution and professional guidance, as children are more sensitive to medications and supplements than adults.

Remember that these dosing guidelines offer a starting point; individual sensitivity, health condition, and the specific herb's potency and side effects should be considered.

General Reduction Based on Age:

For 6 to 12 months old, the dosage should be 12% of the adult dose.
For 1 to 6 years old, the dosage should be 25% of the adult dose.
For 7 to 12 years old, the dosage should be 50% of the adult dose
For 12 to 18 years old, the dosage should be a range of
75%-100% of the adult dose based on health and size

General Principles for Dosing animals:

Preparation of Standard Infusion: The document specifies making a standard infusion with one large handful of the fresh herb (or two heaped tablespoons of dry herb) prepared with a pint of cold water. This mixture should be simmered without boiling, then left to brew off the heat for four hours, without straining. This infusion should be made fresh every three days, or two days in hot weather, to ensure potency and safety.

A significant point made in the document is that herbal medicines are generally safe for dogs since there is no fear of overdose with the plants recommended by the herbalists in this book. The need for extreme accuracy in dosing is specifically associated with chemical remedies, not with the herbal preparations discussed. However, the document cautions against using poisonous plants, recommending herbalists not deal with them without experience.

The following doses will work as a good starting place to develop experience.

Dogs: Correspond to adult human dose according to weight - (Clarks Rule) Standard Human Adult Dog/ Human: are tailored around an average weight of approximately 150 pounds. So a 75 pound dog would be 50% of the standard adult human dose.

Keep in mind herbs are best given in extracts due to the dogs diet and digestive system not being dialed in for fiber and plants like a herbivore but herbs in their entirety are sometimes necessary for the desired benefit.

Cats: 1/8 to 1/4 the dose for an adult human

Horse: 8 to 16 times the dose for an adult human

Cow: 12 to 24 times the dose for an adult human
Goats and sheep: 1 1/2 to 2 1/2 times the dose for an adult human

Swine: 1 to 3 times the dose for an adult human

TESTING FOR LEVELS OF COMPOUNDS

Spectroscopy - Quantitative Analysis:
Using the calibration curve, the concentration of the compound in the sample can be calculated, typically in units like mg/mL or µg/mL.

Mass Spectrometry (MS):

Ionization: Compounds in the sample are ionized by gaining or losing a charged particle, generating ions.

Separation: The ions are accelerated into a mass analyzer, where they are separated based on their mass-to-charge ratio (m/z).

Detection: Ions of different masses reach the detector at different times, creating a mass spectrum that shows peaks corresponding to different ions.

Identification: The mass spectrum provides information on the molecular weight of the compounds, enabling the identification of unknown substances.

LC-MS (Liquid Chromatography-Mass Spectrometry): LC-MS combines the separation capabilities of liquid chromatography with the highly sensitive detection and identification capabilities of mass spectrometry. It is commonly used for identifying and quantifying compounds in complex mixtures such as pharmaceuticals, environmental samples, and biological fluids.

IR-MS (Infrared Mass Spectrometry): IR-MS is a hybrid technique that combines the molecular fingerprinting power of infrared spectroscopy with the molecular weight information obtained from mass spectrometry. It enables the analysis of a wide range of compounds, especially for identifying functional groups in organic molecules.

GC-MS (Gas Chromatography-Mass Spectrometry): GC-MS combines the separation capability of gas chromatography with the detection and identification power of mass spectrometry. It is commonly used for separating and analyzing volatile and semi-volatile compounds in various samples, such as environmental pollutants, drugs, and metabolites.

ICP-MS (Inductively Coupled Plasma-Mass Spectrometry): ICP-MS is a highly sensitive analytical technique used primarily for trace elemental analysis. It ionizes the sample in an inductively coupled plasma source and then separates and detects the ions based on their mass-to-charge ratios. ICP-MS is widely used in environmental, clinical, geological, and nuclear applications.

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