Glycerin versus Alcohol – Concerning Herbal Liquid Extracts

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WHAT IS GLYCERIN?

Glycerin, sometimes spelled glycerine, also called glycerol, is a commercial byproduct of making cooking oils, soaps, and other products where oils and sterols (i.e., lipid-based waxy solids), as pure fatty acid compounds are separated (via 'fractionation'), clarified and purified from plant or animal fats leaving glycerol as the main byproduct. The terms glycerin, glycerine, and glycerol are often used interchangeably in the literature.

Glycerin is one of the most versatile and valuable chemical substances known to man. It possesses a unique combination of physical and chemical properties that are utilized in a myriad of products, both consumable and technical. Glycerin has over 1,500 known end uses, including many applications as an ingredient or processing aid in cosmetics, toiletries, personal care, drugs, *food, beverage, and confectionary products*. Glycerin's dietary supplement category ingredient product is also utilized in totally alcohol-free liquid herbal processing and extraction technologies.

In addition, glycerin is highly stable under typical storage conditions, compatible with many other chemical materials, virtually non-toxic and non-irritating in its varied uses, and has no known adverse environmental effects. In other words, glycerin is for the most part… safe! We are here referring to USP grade, Kosher certified, Halal certified, GMO-Free vegetable glycerin when making this assertion. A water-clear, odorless, viscous liquid with a sweet taste, glycerin is derived from both natural and petrochemical sources. It occurs in combined form, as triglycerides, in all animal and vegetable fats, and constitutes, on average, about 10 percent of these materials. Glycerin is obtained from both saturated and unsaturated triglycerides during soap and fatty acid separation/clarification/purification production, and by transesterification (an interchange of fatty acid groups with another alcohol). The separated glycerin is subsequently concentrated and purified prior to commercial sale. Synthetic glycerin is produced from petrochemical building blocks via several processing steps designed to achieve a desired concentration and high product quality. Synthetic glycerin is typically used for pharmaceutical reagent work and pharmaceutical production, and highly technical applications, but NOT for food-grade use! Glycerin, whether recovered from triglycerides or synthesized, is principally used as a highly refined and purified product, with a very high concentration of glycerin.

Glycerin has the chemical formula C 3 H 5 (OH)3. It is a trihydric alcohol, possessing two primary and one secondary hydroxyl groups, which are its potential reaction sites and the basis for glycerin's versatility as a chemical raw material. For example, glycerin esters, the reaction products of glycerin with various fatty acids form an important class of derivatives that are extensively used in the food, beverage and confectionery industry. The physical properties and characteristics of glycerin are as significant as its chemical properties for many applications. These qualities enable glycerin to be used as a humectant, plasticizer, emollient, thickener, solvent, micro-encapsulating agent, dispersing medium, lubricant, sweetener, bodying agent, antifreeze and processing aid. It is not unusual for glycerin to contribute two or more features or attributes to a product or application. In all applications, whether as a solvent, reactant or as an additive, the virtual non-toxicity and overall safety of glycerin is always of significant benefit. Glycerin applications appear to be limited only by the imagination and creativity of the scientific and technical communities. It is this final statement of "imagination and creativity" that was behind the invention and its continuing development of a proprietary serialized multi-step process for using glycerin as a solvent medium for making liquid herbal concentrates and a totally alcohol-free mono-element-based triiodide of fixed iodine (commonly called 'nascent' iodine).

Most of the glycerin marketed today is manufactured to meet the stringent requirements of the United States Pharmacopeia (USP) and the Food Chemicals Codex (FCC). However, technical grades of glycerin

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that are not certified as USP or FCC are available. For herbal glycerites and glycerides of single-element-based diiodine-molecular (I_2) iodine-making purposes only, the USP/FCC grade, GMO-Free, Kosher & Halal-certified vegetable glycerin is used. Glycerin is used in many consumer products such as personal care preparations, cosmetics, pharmaceuticals, foods, beverages, and confectionery products because of its contribution to product properties, stability, micro-encapsulating properties (i.e., in chemistry called 'Protective Caging'), and compatibility with a wide variety of chemicals, and relative non-toxicity. For these consumer-oriented applications, the quality and purity of the ingredients are crucially important. The use of USP and FCC certified glycerin, versus technical grade glycerin, in medical and consumer product applications ensures that the manufacturer has specified the glycerin quality and consistency required for these products.

Compliance with USP and FCC requirements means more than meeting the specifications given in the USP and FCC glycerin monographs as determined by analysis. It also means strict compliance with FDA regulations, specifically, in the context of this White Paper, for the dietary supplements industry, that includes the liquid herbal products manufacturers, with procedures outlined in CFR Title 21 of the FDA Good Manufacturing Practices (GMP) to assure facility and equipment cleanliness and to avoid contamination during handling, distribution, or packaging. Facilities, warehouses, and clean rooms where processing, bottling, finishing, packaging, or repackaging is performed are subject to intermittent, unannounced FDA inspections. Complete record-keeping and documentation of all aspects of operations are obligatory to ensure that every batch of product is traceable by lot number and that, where a quality problem arises, it can be identified and resolved expeditiously and efficiently. A Certificate of Analysis also accompanies every shipment of USP/FCC glycerin from a vendor.

[Parts of the above text are taken from 'The Soap & Detergent Association' website, with inserted clarifications and further detailing by the author of this White Paper. We thank 'The Soap & Detergent Association' for their well-written and easy-to-understand information.]

WHAT DO 'USP' AND 'FCC' MEAN?

The abbreviation USP stands for United States Pharmacopeia, a document first published in 1820 by the Medical Society of New York State. Recognized as official by Congress in 1848, this document served as a standard reference for physicians prescribing medicines. Today, the USP includes chemical descriptions, differing 'fit-for-use' identifying tests, and purity tests, primarily for active ingredients. All materials listed in the USP are considered drugs and/or ingredients for drugs by law and subject to all the U.S. Food & Drug Administration requirements pertaining to drugs. Labeling a product or a substance as USP implies that it is indeed USP and qualifies for medical use, and also must conform to all the legal requirements of the FDA, and that it was produced in accordance with the principles outlined and currently published in FDA's Good Manufacturing Practices (GMP). A new edition of the USP is published every five years, in years ending in "0" and "5," with ongoing revisions and additions issued during the intervening years.

Many other nations have also compiled official national pharmacopeias, similar in scope and content to the USP. Currently, there is a collaborative international program to harmonize the glycerin monographs in the USP and in the European Pharmacopeia, which may later be expanded to include other nations.

The abbreviation FCC stands for Food Chemicals Codex, an internationally recognized compendium of monographs covering food ingredients. It contains specifications for many direct food additives, including glycerin. The Institute of Medicine of the National Academy of Sciences developed and maintains the FCC. The FDA also supports this compendium. The specifications for food-grade glycerin given in the FCC are generally comparable to those given in the USP.

A definition of USP and FCC has been included in this presentation, since the Kosher & Halal-certified vegetable glycerin used in a proprietary, serialized, multi-step, multi-dynamic liquid herbal glycerite extraction process technology is not only a G.R.A.S.-listed food ingredient (as opposed to an *additive*) but is also USP-grade and FCC-listed. The next question being, what is GMP?

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GMP, i.e., Good Manufacturing Practices, as in FDA GMP, for the dietary supplements industry, of which herbal products are part, are governed under the Code of Federal Regulations (CFR), Title 21, Sections 110 and 111. These policies govern every aspect of the procurement, testing, production, labeling, and claims of all dietary supplements. For example, the unique proprietary serialized multi-step, multi-dynamic alcohol-free, glycerin-based liquid herbal processing technology described herein and its resulting products are manufactured in accordance with the policies outlined and published in FDA Title 21, Sections 110 and 111. Foods, beverages, prescription drugs, and OTC medications are also governed by CFR Title 21, with specific sections addressing each, and are referenced in the current editions of the USP and FCC.

Some GMPs include, but are not limited to, 3rd-party ingredient identity testing/verification and contaminant testing; separate or defined holding areas for raw materials, in-process materials separated from completed products to prevent contamination or mix-ups; and post-production/finished-product 3rd-party safety and stability testing. Facility traffic flow must also be controlled to minimize vectors of contamination. Requirements for lighting (i.e., minimal lumens per cubic foot), ambient dust and moisture control, ventilation and filtration, water supply source and purity, facility maintenance, cleaning, and refuse containment and disposal, to name a few, are all part of GMP considerations.

Additionally, a company that attains NSF GMP certification for its facility and operations adds another layer of quality oversight through independent 3rd-party verification that it meets GMP standards for both FDA and NSF's own additional GMP standards, if any. Being Organic-certified is another level of quality control that typically addresses 'what not to use' in growing, harvesting, and processing. Being Vegan-certified verifies that no animal ingredients are used, with only botanical-based and certain mycelium ingredients used in products. A Company that obtains Kosher and/or Halal certification adds another level of quality standards intended to meet religious and/or consumer-desired dietary standards. Typically, a company has a mix of these additional QC-based certifications.

Glycerin – A Protein, Fat, or Carbohydrate?

While classified by the FDA as a carbohydrate, due solely to biochemical, not source-of-origin considerations, as is done for defining carbs, fats, and proteins, this category placement was decided upon by default only. Even though, in nature, glycerin is derived from complex fats (i.e., 'triglycerides'), it cannot be listed as a fat since it does not contain fatty acids or is derived from fats, and is therefore not a fat, and it cannot be listed as a protein because it has no amino acids or is derived from proteins, and is technically not a sugar, because it is not derived from carbohydrates; nevertheless, glycerin, which possesses a macronutrient of caloric value, ended up being categorized as is a carbohydrate. This determination was based on the biochemical fact that glycerin is ultimately converted, via the liver's gluconeogenic pathway, into glucose, a sugar, even though fatty acids and amino acids can also be converted into glucose.

Even so, glycerin possesses distinctive macronutrient qualities distinct from carbs, fats, and proteins, with some viewing it as a separate macronutrient category because it is not chemically a fat, protein, or even a carbohydrate in the classical chemistry or source-of-origin sense. The problem is further complicated in that it's chemically referred to as a 'sugar alcohol.' The name sugar alcohol is often taken to imply that it is composed of a sugar, i.e., 'carbohydrate,' which it is not, just like the term 'alcohol' does not mean alcohol in its effect sense regarding glycerin. This terminology conundrum further complicates the addition of a 4th macronutrient category, which is, in turn, resisted.

For clarification, a sugar alcohol is typically, but not always, defined as any compound that ends in 'itol' (i.e., sorbitol, mannitol, xylitol, erythritol, etc.). Glycerin's names don't end in 'itol.' Two other points defining 'itol' sugar alcohols are that 'itols' are typically derived by hydrogenation and are referred to as polyols. However, glycerin is not a polyol; it is chemically known as a trihydric alcohol and is not derived from hydrogenation, but from a process known as 'fractionation' – a totally different process altogether, which results in a much safer and more natural end product than hydrogenated sugar alcohols, which do not possess the same food-like macronutrient basis glycerin does.

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Glycerin, while 'chemically' and source-origin appears to be its own unique calorie category, continues to be included in the carbohydrate macronutrient category based solely on its biochemical considerations, unlike carbs, fats, and proteins, which are based solely on chemical makeup and source-origin considerations, thereby technically skewing currently accepted 'chemistry & source-based' macronutrient classification. The point being, carbs, fats, and proteins are classified as macronutrients one way, while glycerin, technically its own macronutrient classification, is considered a carb in another way.

Proprietary Multi-Condition-Based Serialized Multi-Step, Multi-Dynamic Processed Liquid Herbs – 100% *true* Alcohol-Free Glycerites

The proprietary multi-condition-based serialized multi-step, multi-dynamic glycerin-based processing technology mentioned herein, also scientifically referred to as a *multi-conditions* process, as developed by L. Carl Robinson, MH, FH, TT, CCHt, RH(AHG), now in a 12th-generation iteration as of this writing, is a commercially applied, glycerin-based liquid botanical manufacturing process that exclusively uses this unique technology to produce totally alcohol-free liquid herbal products. Though trade-secreted, this process is fully 'manufacture-standardized,' fully documented, and securely kept. It is not intended for this presentation to be an advertisement for a specific company's process technology and its resultant products or the like, which is why no specific company/product brand is referred to herein. However, due to the fact that only one company incorporates all the principles and complete manufacturing protocols of this unique and original proprietary serialized multi-step multi-dynamic 'manufacture standardized' liquid herbal processing technology, we are left with no choice but to refer to the process itself due to the unique and exclusive position in the industry and marketplace it holds. The products this process produces are the first and only in the industry to be *Halal Certified*, a 3rd-party verification that alcohol is never used.

Glycerin versus Alcohol

SUMMARY (THE BRIEF OVERVIEW):

1 – Glycerin does NOT denature, render inert, or drive REDOX/oxidation of constituents and components, whereas alcohol possesses denaturing and inert-rendering properties, and drives REDOX/oxidation of many constituents, components, and mineral complexes. [This is the MOST important and overriding consideration of all]

2 – Glycerin preserves the integrity of constituents and components. Hence, it preserves therapeutic potential, whereas alcohol's denaturing, inert rendering, and REDOX/oxidation-driving effects diminish it. [Preserving constituents' integrity is the second most important consideration]

3 – Glycerin is a macronutrient and possesses a low glycemic index AND a low glycemic load – whereas alcohol is not a nutrient and, while also possessing a low glycemic index, in turn possesses a high glycemic load. [Many dieticians and nutritionists consider the glycemic load more critical than the glycemic index]

4 – Glycerin possesses a succulent quality, making it more compatible with soft tissues, whereas alcohol has a biting, harsh quality that compresses oral tissues, distorts taste, hinders immediate oral absorption, and makes it less compatible with soft tissues. [Oral response and taste are essential to the digestive utilization of constituents and systemic synchronicities]

5 – Glycerin possesses high versatility and solvent extractive potential greater than that of alcohol, whereas alcohol possesses limited versatility and lower solvent extractive potential than glycerin. [The point is that different constituents require different processes to remove. The 'TincTract®' process is, as the name implies, a multi-condition-based process technology for removing different constituents from the same botanical ingredient being processed, in a way no other fluid extraction methodologies do]

6 – Glycerin, as used in the multi-condition-based serialized, multi-step, multi-dynamic TincTract® process, is 'worked' in a unique proprietary way that accesses and utilizes the high versatility and full

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potential of glycerin as an effective broad-spectrum extractive solvent for liquid herbs. [How an extractive solvent is utilized determines the range of what it can remove]

7 – The multi-condition-based serialized, multi-step, multi-dynamic TincTract® process uses less amount of herbs than saturate-based alcohol or other glycerin-based processed products do, making TincTract® herbs one of the most eco-friendly, carbon-neutral products in the industry, that contributes to the biological sustainability of herbs in a way other companies don't. [Using more herb material does not always mean a better or more efficacious finished product outcome]

8 – The ability to use less herb amounts for making TincTract® processed products and yet produce as great or greater efficacy gain than other liquid herbal processes that use more herbs, often far more, in the making of their products, is based on the multi-condition processing principles and applications of 'serialized' fluid chemistry, which is the opposite of typical 'saturate'-based fluid chemistry principles and applications used by other liquid herbal products producers. [Fluid chemistry is not exclusive to saturate-based processes. There's more, such as 'serialized' processes, which are just as, or more effective in extraction potential, especially broad-spectrum extraction potential]

9 – Glycerin possesses a 'protective solvent cage' property (aka 'protective caging') that contributes to stability, flavor integrity, staunching REDOX, and no post-process/blending complexing of constituents – whereas – alcohol does not possess any protective caging properties to enhance stability, flavor integrity, staunch REDOX, or prevent post-process/blending complexing of constituents. [Protective caging possesses many benefits that are additionally important to liquid herbal product quality and stability]

10 – Serialized TincTrace® made herbal products taste remarkably good, often similar to a freshly harvested herb, and are unmatched in tasting good, even by other liquid herbal producers – whereas alcohol-based herbal products, even alcohol-removed, typically do not taste good (due to the denaturing, inert rendering, and distorting effects of alcohol upon flavor components). [As far as consumerism is concerned, at the end of the day, taste holds the high ground for consumer approval and use of a product]

11 – The multi-conditions-based serialized, multi-step, multi-dynamic TincTract® processed herbal products possess an independent third-party lab-verified six (6) year label BBD (Best By Date) – the longest BBD listing of any liquid herbs in the industry – which is a testament to the astounding stability of a 'true' alcohol-free multi-condition serialized multi-step TincTract® made product. [*The long-term stability of a product, especially without preservatives, additives, or enhancers, is one of the best indicators of a process technology's integrity and finished product quality there is*]

THE DETAILED PRESENTATION:

The first order of this detailed presentation is to present a chart listing the relevant properties of glycerin and alcohol:

Relevant properties

Property	Glycerin	Alcohol
Hydroxyl groups	3	1
Molecular weight	92.09 g/mol	46.07 g/mol
Normal boiling point	290°C/554°F	78.4°C/173°F
Vapor pressure at room temperature	Extremely low	Relatively high
Hygroscopicity	High	Lower

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Hydrogen-bonding capacity	High	Lower
Viscosity at approximately 20°C	Approximately 1,400 mPa·s	Approximately 1.2 mPa·s
Property	**Glycerol**	**Ethanol**
Hydroxyl groups	3	1
Molecular weight	92.09 g/mol	46.07 g/mol
Normal boiling point	290°C/554°F	78.4°C/173°F
Vapor pressure at room temperature	Extremely low	Relatively high
Hygroscopicity	High	Lower
Hydrogen-bonding capacity	High	Lower
Viscosity at approximately 20°C/68°F	Approximately 1,400 mPa·s	Approximately 1.2 mPa·s
Dielectric constant	42-47	24-25

Glycerin's advantage vs alcohol	**Scientific basis**
Multiple hydrogen-bonding interactions	Three hydroxyl groups per glycerol molecule, versus alcohol's two
Broad aqueous extraction versatility	Adjustable glycerol-water concentrations
Broad-spectrum constituent extraction potentials	Verified where multi-condition-based process used
Low volatility & higher stability	Very low vapor pressure and high boiling point
Thermal processing flexibility	Much higher boiling point than ethanol or water
Potentially high extraction/recovery of multiple phytochemical classes	Comparative botanical extraction studies
Greater hydrogen-bonding capacity than alcohol	An established chemistry property
Protective caging of solvated constituents	An established chemistry property
Long-term fluid stability and shelf life	Real-time Lab verified stability testing
Nutritive qualities alcohol doesn't possess	An established dietary/nutritional basis

Glycerin offers a versatile solvent platform for multi-condition, broad-spectrum, poly-constituent botanical extractions. Its tri-hydroxyl molecular structure provides extensive hydrogen-bonding capabilities, while its high thermal stability, extremely low volatility, hygroscopic properties, dielectric potential, and complete miscibility with water allow extraction conditions, such as those seen with a TincTract® process, to be adjusted across a wide range of glycerol-water concentrations and process dynamics.

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Peer-reviewed comparative studies and real-world multi-condition-based extractive settings demonstrate that aqueous glycerol systems can equal or outperform hydroalcoholic extraction systems in recovering numerous botanical constituents, such as, but not limited to, polyphenols, flavonoids, phenolic acids, flavanols, tannin-bound compounds, many alkaloids, and other botanical constituents. Unlike ethanol, glycerin's exceptionally low volatility and process stability also allow it to remain as the continuous solvent phase in the finished liquid extract without requiring evaporative solvent removal. (See Makris & Lalas (2020), Huamán-Castilla et al. (2020), and García et al. (2014) in the REFERENCES section.)

The following is a list of some botanical constituents that glycerin is known to extract, especially where non-static multi-conditions processes are utilized in their extraction/recovery. It is not inclusive of all constituents that a multi-condition-based glycerin-water extraction, but gives a good sampling of the broad-spectrum extractive potential of a multi-conditions processed botanical, such as results from the TincTract® process:

Flavonoid glycosides; Polyphenols (that include but are not limited to phenolic acids, stilbenes, lignans, coumarins, anthocyanins, proanthocyanins, anthraquinones, and catechins); Tannins; Nitrogen-containing compounds (that includes alkaloids (such as berberine, hydrastine, lobeline, caffeine, morphine, theobromine, piperine, yohimbine, reserpine, quinine, ephedrine, and numerous others), betaines, choline, amines, purine derivatives, pyrimidine derivatives, and others); Organic acids; Water-soluble carbohydrates; Certain saponins; Certain amino acids and other polar compounds; Phenylpropanoids; Essential oil complexes; Most aromatic constituents (including but not limited to Phenolic aromatics, Aromatic aldehydes, Aromatic alcohols, Aromatic organic acids, Certain terpenoid compounds (i.e., monoterpenes, sesquiterpenes, diterpenes, triterpenes, triterpenoid saponins, iridoids, and secoiridoids), Certain oxygenated terpenes, Eugenol, Vanillin, Cinnamaldehyde, Menthol); Non-aromatic flavor components; Certain coumarins; Certain aromatic glycosides; Phospholipids (limited); Glycolipids (especially polar species); Certain fatty acids; Certain medium-chain fatty acids; All short-chain fatty acids; Certain lipid-associated phenolics; Certain sterol glycosides; Certain amphiphilic compounds; Certain proteins and protein-associated compounds (that includes Water-soluble proteins, Albumins, Certain globulins, Peptides, Oligopeptides, Polypeptides, Glycoproteins, Certain protein-polysaccharide complexes, Enzyme proteins, Lectins, Protease inhibitors, and Certain amino-acid-containing complexes); Polysaccharides & structural carbohydrates (that include but is not limited to Beta-glucans, Alpha-glucans, Arabinogalactans, Galactomannans, Glucomannans, Pectins, Mucilages, Certain hemicelluloses, Soluble dietary fibers, Fructooligosaccharides, Certain oligosaccharides, Glycosaminoglycan-like polysaccharides, where present); Mycelium and fungal constituents (including but not limited to immunologically-active polysaccharide-protein complexes, structural polysaccharides, cell-wall components (such as chitin and chitosan), ergothioneine, glycoproteins, protein complexes, nucleosides, nucleotides, amino acids, antioxidant compounds, organic acids, carbohydrates, pigments, and secondary metabolites).

Potentially extractable constituents, when subjected to a multi-condition-based glycero-process, include: Certain resins (such as resin glycosides, certain phenolic resin constituents, resin-associated organic acids, water-compatible resin-associated compounds, phytosterols, and sterol-rich waxes); Certain diterpenoid and triterpenoid glycosides; Certain balsamic constituents.

Multi-condition-based glycerin-water extractions are also extract/recover numerous nutritional factors, such as: Vitamins (especially water-soluble vitamins); Mineral electrolytes/salts; Trace elements complexes; Nucleosides; Nucleotides; Organic acids (including but not limited to citric, malic, tartaric, oxalic, formic, pyruvic, glycolic, caffeic, gallic, ellagic, benzoic, cinnamic, vanillic, etc.); prebiotics, digestible fibers (i.e., mucopolysaccharides); fructan-based polysaccharides (i.e., inulin); phytopigments; Certain precursor-driving botanical hormones.

This list of botanical constituents and components, produced by a multi-condition glycerin-water extraction, such as the serialized, multi-step, multi-dynamic TincTract® process, is extensive and clearly shows glycerin's numerous extractive potentials, especially its broad-spectrum extractive potential that alcohol does not possess.

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It is glycerin's broad-spectrum extractive potential that differentiates it from alcohol's lack of a broad-spectrum extractive potential where foods, beverages, confectionery, and botanical preparations are concerned, and such broad-spectrum extracts also possess a highly nutritive basis from both the botanical recovery aspect as well as the intrinsic macro-nutritional basis of glycerin, when compared to that of alcohol. *A* totally alcohol-free multi-condition-based botanical glycerite concentrate delivers broad-spectrum extractive potential and high nutritional value, but only when subjected to a multi-condition glycerin-water extraction, such as the unique serialized TincTract® processing technology provides.

Glycerin As Used in a Multi-Condition Process

When used in a multi-condition-based botanical extraction process, such as the TincTract® process, glycerin possesses greater broad-spectrum extractive potential than alcohol. This is the result of:

- **An aqueous-glycerin system** that can be used sequentially across cold maceration, dynamic agitation, and temperature-elevating extraction, while retaining the same basic solvent system.
- **An aqueous-ethanol system's** operating range is constrained by ethanol's volatility, low boiling point, and flammability—particularly when heating and dynamic processing are used.

➢ That distinction matters because the extraction potential of a solvent, especially broad-spectrum extraction potential, is not determined solely by its chemical affinity for a particular constituent. It is also affected by *the range of extraction conditions under which the solvent can be used, the ability to change those conditions sequentially, and the ability to maintain the solvent system throughout the process*, exactly as the TincTract® process does.

Serialized multi-step, multi-dynamic processed liquid herbal products result in a premium class of liquid herbal products that also possess a unique broad-spectrum nutrient and micronutrient aspect. Every step of this process is totally alcohol-free (meaning 'ethanol' free). Alcohol is NEVER used anywhere or at any time in the process. This particular process approach preserves extracted water-soluble and alcohol/heat-sensitive components such as aromatics (especially rarefied top note aromatic components), vitamins, enzymes, co-factors, and other water-soluble constituents that may be diminished, denatured, rendered inert, or altered in constrained alcohol-based processes. The latter points are proven scientific facts based on the known intrinsic chemical characteristics of glycerin versus alcohol. These facts are also withheld from consumers by some (but not all) companies that process their herbal products with alcohol, with many disingenuously making their product labels appear as if their products are alcohol-free, which they are not. Most surprisingly, many companies in the liquid herbal products industry are either unaware of, or ignore, alcohol's intrinsic denaturing and inert-rendering effects on many of the extracted/recovered herbal constituents in their products.

Am I saying that alcohol-processed herbal products have no place in the clinician's dispensary or on a store's shelves? No! Far from it. Both glycerin-based and alcohol-based herbal products have their place in herbalism and herbal medicine. However, what is being specifically pointed out is that many important facts and factors concerning alcohol-processed herbal products, such as the intrinsic denaturing, inert rendering, and REDOX driving effects of alcohol on many biological constituents and compounds, are either knowingly withheld from practitioners and consumers, outdated in their premise, or simply not realized by the makers of alcohol-based products, thus depriving practitioners and consumers of making more informed choices. The latter two points will be addressed later.

To be sure, glycerin, amount for amount, is second to alcohol in outright disinfecting-antiseptic action (alcohol has the upper hand on that one), and if that were all there is to be concerned with as to the subject of glycerin versus alcohol relative to liquid herbal products, nothing more would need to be said. But there is more… Much more indeed.

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'Denaturing' Defined

Denaturation is a process in which external stress causes affected components to lose the complex structures present in their native state. However, denaturation reactions are not strong enough to break many strong bonds, such as the peptide bonds of proteins. Therefore, they don't lose their primary structure but do lose their functional and interactive basis. This stress disrupts interactions and can be chemical, physical, or both. Denaturing can affect many phytochemical constituents and nutrients.

Take proteins, for instance. When proteins in a living cell denature, cell activity is disrupted, which can lead to diminished potential, aberrant activity, or cell death. An example of a denaturing process is the difference between a fresh or soft-cooked egg yolk and a hard-cooked, solidified egg yolk. The former is in its 'natural' whole complex colloid-bound state, but the latter is in a denatured state where the yolk, in a more solidified state no longer possesses its intrinsic ratio-intact, delicate, complex bonds with minerals (such as sulfur), enzymes, lecithin, etc., but are now dissociated in a denatured concrete state, which accounts for why a soft yolk egg is easier to digest and benefit from than a hard yolk egg is with its denatured reduced-benefits lecithin, and sulfurous forming gasses as a digestive side reaction to the aberrant state of the cooked solidified egg yolk. Denaturing changes the 'nature' of something.

Furthermore, denaturation is not a one-directional process with respect to the resulting states. While denaturing results in breaking down and de-complexifying intrinsically complex bound molecules and their parts, denaturing can also involve a sort of post-denatured reverse super-binding of molecules and components, taking place within fractional moments of the denaturing process, such as happens with the hard cooking of an egg's yolk and white, and similar to alcohol's effect on a mushroom's chitin hetero-saccharide complex, resulting in a post-denaturing over-binding that crystallizes the chitin cellular shell wall, making it even harder to break down and extract from. Denaturing is a bi-directional phenomenon.

This same alcohol-based post-denaturing over-binding also occurs with certain other hetero- and polysaccharide compounds found in foods and herbs. Not all, but some. Either way, an initial 'changing,' 'simplifying' of the intrinsic complex state has been denatured from its delicate, natural, ratio-intact complex state.

The concept of 'denaturing' is a standardly understood purpose-oriented process in food science, where protein denaturation, for instance, is used as a tool to cook, create new ingredients, and enhance specific cooking processes, rather than using alcohol, which would, on a technical chemistry level, achieve the same sort of 'denaturing' effect. These are simplified descriptions of denaturing in the context of organic chemistry and biological molecule dynamics, acknowledging that it is a more complex subject than presented here. Nevertheless, the fundamentals detailed here convey the overriding premise.

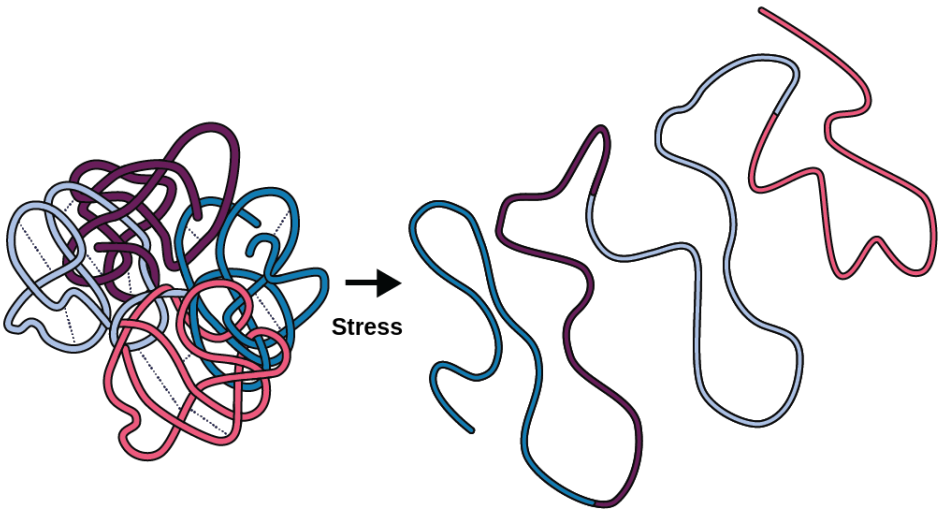
One further illustrative incident regarding alcohol's denaturing effects. In 2015, the New York State Attorney General moved to shut down the herbal products industry's selling of herbal products in the state, triggered by his receiving an unverified report that alleged herbal products did not contain the herbal ingredients listed on their product labels due to a plaintiff lawyer's sort of investigation based on a then-emerging DNA barcode testing protocol that showed there was no detectable DNA of the stated herbs in the bottles of liquid herbs tested. It turns out that the liquid herbal products segment of the industry was DNA-barcode tested, which set off this action by the AG of New York. The media picked up the action nationally, but it quickly escalated into an embarrassing, career-diminishing scandal for New York's Attorney General, as two issues came to light. First, DNA barcoding was still in development, with bugs being worked out and AOAC testing standards still being defined. The technology's lead developer, a Canadian, stepped forward and publicly stated that the New York AG had used it and jumped on it in a 'Not-Fit-for-Use' manner. Why? Because the tested liquid herbal product samples that triggered the AG's actions had been subjected to the DNA-denaturing and inert-rendering effects of alcohol! So, it would not have been possible to obtain fully intact DNA from alcohol-based samples for analysis, as the DNA had been denatured and rendered inert by alcohol. The New York AG had to rescind his actions and issue a highly public retraction.

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The following illustration shows what happens to a biological structure when it is denatured.

The effect of denaturing (i.e., 'Stress') on complex molecules and components



Intact/Complex Structure Disassembled/Collapsed Structure

Denaturation Process Explained

Here, protein denaturation is used as an example. Alcohols (e.g., ethanol, methanol) disrupt hydrogen bonds in secondary, tertiary, and quaternary structures. They form new hydrogen bonds with the amino acids. This exposes hydrophobic amino acids at the surface, which are more soluble in organic solvents such as alcohols, and subsequently causes a conformational change that denatures the protein. This happens, for instance, when using 70% ethanol to disinfect the skin before an injection. The alcohol denatures proteins in any bacteria on the skin, rendering them nonfunctional and helping prevent infection at the injection site. This means the denaturing process also renders the affected subject inert, meaning it loses the ability to be active and, concurrently, loses its natural capacities and potential. The same denaturing effects of alcohol can, and do, happen at much lower concentrations, especially if something is left in the alcohol solution for a period of time.

Alcohol's denaturing effects go beyond denaturing protein conjugates alone. Other non-protein-bound botanical conjugates, such as aromatics, glycolipids, flavonoid glycosides, mucilaginous polysaccharides, certain organic salts, and tannin conjugates, to name a few, can also be alcohol-denatured.

(See REFERENCES, citing scientific studies establishing glycerol's non-denaturing property.)

Alcohol's Intrinsic Nature

(Highlighted text, hereafter, is intended to emphasize the core of the point being presented LCR)

All simple (diatomic) ethanolic alcohols used in making herbal products possess the intrinsic property of denaturing and rendering inert many (but not all) of an herb's extracted constituents. This is a chemical fact about the intrinsic nature of diatomic alcohols, such as ethanolic alcohol. A long-standing premise of chemistry (and biochemistry) states that if the structure of something is changed, then the outcome (i.e., effect) of that something will, to some degree, be changed as well. It's part of the cause-and-effect equation of chemistry and also life itself. This fundamental chemistry principle regarding the denaturing and inert-rendering effects of alcohol on the biological integrity of many botanical constituents and

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components was a significant determinant in the author's reinvention of botanical extraction, and hence, 'Reinventing Liquid Herbs™.'

The structures of aromatic components (e.g., essential oils, resins, gums), glycosides, certain polysaccharides (especially linked and cross-linked polysaccharides), enzymes, many co-factors, etc., of a plant can be altered by the denaturing and inert-rendering effects of alcohol. Even though removed from a plant, the alcohol-denatured, inert-rendered constituents and components were previously significant contributors to a raw herb's therapeutic value, the basis for making an herbal extract in the first place.

The perfume and fragrance industry knows of the denaturing and inert-rendering effects of alcohol on different aromatic components and often requires that alcohol be used for denaturing high-grade essential oils and resins used in their fragrances as part of preparing their scents for the marketplace so that their products maintain proper preservation and the sought-after finished scent/aroma quality while being void of unwanted therapeutic effects (commonly known as 'emotional triggers') that could potentially cost them sales and market share.

This was verified to this white paper's author by a perfumer with many decades of experience who worked for Berje' Inc. (name of person purposefully withheld). Also, being a flavorist who worked with food, beverage, and confectionary customers who knew of and understood alcohol's denaturing and inert rendering effect on certain biological constituents and components, and the distorting of flavor components that results in unwanted flavor effects, he was surprised that an herbalist who uses liquid herbs, let alone someone in the liquid herbal products manufacturing industry was even aware of the denaturing and inert rendering effects of alcohol on many botanical constituents, components, especially aromatic and non-aromatic ones, and its effect on therapeutic potential, given that the alcohol-based liquid herbal manufacturers, and practicing herbalists at that time were ignoring and even averse to considering these facts regarding the use of alcohol for making liquid herbs, and at least investigating alternative extractive solvents, which again, at the time, they refused to do. For the alcohol-free, multi-condition-based glycerin-water herbal glycerite concentrates this white paper's author presented to him for assessment, he was surprised at how these particular herbal glycerite concentrates extracted/recovered and retained the raw ingredient flavor profile. For him, this was indicative that a botanical's constituents and biological integrity were more intact and of higher quality in the product sample presented to him than he felt was possible with alcohol-based extracts.

Polysaccharides, particularly linked and cross-linked ones, various aromatic components, many glycosides, vitamins, enzymes, co-factors, and other micronutrients, are denatured and rendered inert when brought into contact with alcohol. This is due to alcohol's disinfecting, sterilizing, and dissociating qualities. It's true that important marker constituents and compounds may be removed by alcohol solutes, some to a high degree, but to what end?

If those constituents and compounds are denatured and rendered inert due to alcohol's intrinsic nature to do so, then those same constituents and compounds would also be diminished, and in some instances potentially reduced therapeutic value in biological systems due to their denatured and/or inert state, resulting in diminished results or the need to substantially increase the 'effective' dosage to get enough biological value, which appears to be the fall-back recommendation for the mono-constituent-based fraction/isolate Standardized phytopharmaceutical potency enhanced preparations, which is both ironic and contradictory, since the higher percentage of a specific constituent is supposed to imply concurrent higher effectiveness with the super-potency dose, which has and is not proving to always be the case, again due to the denaturing and inert rendering effects of the extraction and concentrating process used in making such products. Remember, many mono-constituent-based fraction-isolate botanical constituents are typically 'effective' dosed at levels that far exceed what naturally occurs in the whole raw botanical itself, often by many times more. This white paper's author views this as a result of the standardized fraction-isolate products being highly denatured, necessitating higher dosing for effect.

Just because something is removed and present, even at high concentrations, in a finished product does not automatically mean it will be biologically active, viable, or utilizable to the degree represented or sought. *How* something is removed and *what* it is removed with are as important as what is being removed, because the 'how' and the 'what' will definitely affect the finished state of what is being

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removed. These are all scientific and technologically verified facts that are not only part of the science of fluid chemistry but also studied in advanced high school chemistry courses and 101-level college chemistry courses – so the concepts presented here are simple and fundamental.
Which brings us to an interesting point. While it is generally known that glycerin exists in both animals and plants as a part of triglycerides (i.e., complex fats), what is less known, and contrary to what some in the herbal products industry have said or would have us believe, is that certain plants can contain intrinsic ethanolic alcohol, such as agave, for instance, but in very small 'trace' amounts, and such ethanolic alcohol is sequestered from other constituents, components, and structures within the plant's cellular complex. Science has, as of this writing, still not figured out what the purpose of this micro alcohol content in plants entails, if any. Some have hypothesized that it may be part of those plants' immune systems, or that alcohol has no intrinsic effect on the plant's biology, but that a protective sequestering of alcohol is triggered in the event of a lack of oxygen, in which in vivo micro-fermentation would ensue. What is being pointed out here is that nature endowed plants with the ability to 'sequester' any in vivo-produced alcohol, so that no denaturation of other constituents or components in the plant occurs.

Compensating For an Intrinsic Weakness of Alcohol

Super-saturate liquid alcohol-based extraction processes in pursuit of high levels of a given marker constituent (that also may be denatured and/or rendered inert due to the process itself) may have the resultant drug-like physio-biochemical effect in the body of 'forcing' a specific metabolic pathway (which is what chemical drugs are designed to do), especially when the 'effective' dose is high, just like pharma-based chemically synthesized drug analogs do, of the denatured and inert-rendered constituents into the body's systems. However, if a restorative/regenerative and nutritive goal is more desired, then taking a more holistically-oriented broad-spectrum approach requires less of that same active constituent(s), if it's in a non-denatured or non-inert rendered, and intrinsic synergies-preserved ratio-intact poly-constituent retained state – not too dissimilar to the difference that's been biochemically noted for needing less of a natural cold-processed source of biologically active pro-vitamin C, with all its secondary, tertiary, and quaternary companion factors, versus the otherwise high amounts of heat/solvent processed fractionate/isolate-based crystalline concentrated vitamin C, as pure ascorbic acid, to get a similar benefit (again, speaking 'biochemically' here, not just pure in-vitro based chemistry shills). The same can be said for pre-vitamin A, as ß-carotene versus high-dose chemically synthesized vitamin A acetate.

Again, because a higher amount/concentration of a fraction-isolate constituent is present, it doesn't necessarily mean it possesses the high synergies-driven ratio-intact broad-spectrum poly-constituent-based biological activity it formerly possessed in the raw un-fraction/un-isolated state in a natural ratio to the other naturally occurring constituents and compounds in a whole herb, or increased efficacy thereof, especially when the type of 'solvent' for extracting a compound and the methodology used for doing so is also taken into consideration.

Not all 'saturate'-based liquid processes of a raw whole herb ingredient are aimed primarily at a 'Standardized' phytopharmaceutical-type of outcome that utilizes 'super-saturate' processes. However, the intrinsic nature of a super-saturating approach (as different from a serialized multi-step, multi-dynamic approach for broad-spectrum constituent extraction/recovery) results in certain constituents or constituent groups, sometimes to a highly specific and concentrated degree, being extracted to the exclusion of other secondary, tertiary, and quaternary constituents and components if the liquid extraction process goes from a traditional saturating approach to a 'super' saturating approach.

Those endeavors that keep their liquid extraction process to a more traditional saturating approach will result in a more ratio-intact poly-constituent-based product than those that utilize a 'super-saturate' process, which mitigates the ratio-intact poly-constituent nature of the raw whole herb being liquid-processed. Typically, those herbal practitioners and liquid herbal manufacturing companies who operate on a more 'traditional' model of herbal medicine-making utilize the 'general' saturate approach to making liquid herbal products, whereas the 'Standardized' phytopharmaceutical manufacturers with their potency-enhanced fractionate-isolate-based products utilize 'super-saturate' approaches to making their products. The latter phytopharmaceutical manufacturers utilize aggressive extractive technologies and solvents such as HPGE (High Pressure Gas Extraction, with CO_2, Propane, etc.), Acetone, Benzine,

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Hexane, Ether, and Alcohol, all in the name of a 'Natural' alternative to pharmaceutical chemically synthesized drugs, when, in fact, push comes to shove, they are a sort of mirror image of the very thing they believe them to be different from, which from an intentional basis, they are not, and chemistry fundamentals clearly bear out.

Some of Alcohol's Problematic Nature Regarding Its Use for Herb Extraction

Ethanolic alcohol, typically derived from grains, sugar cane, sugar beets, and potatoes, is also implicated as being problematic for either causing or aggravating many health problems, from the subtle to the profound. Alcohol, in any form or amount, can, in sensitive individuals, be an endocrine disruptor and is contraindicated for pregnant mothers and recovering/recovered alcoholics, who often 'trigger' even with so-called "alcohol-free" products that were actually processed with alcohol and then had the alcohol removed, realizing that 100% of alcohol is not able to be removed, leaving a percentage residue of alcohol that is detected by both wet and dry alcoholics. Even the 'energetic' signature for alcohol seems to remain, which alcohol-sensitive individuals may also be aware of and be triggered by.

According to some religious and philosophical beliefs, there are injunctions against alcohol, even touching any consumable at any time that would be internally consumed, such as the Muslim dietary code of Halal, banning alcohol as being Haram and not approved for use in making or ever coming into contact with consumable foods, drinks, confectionery, and medicines. The Halal standard is specifically mentioned because it is one of the fastest-growing segments of the global dietary and herbal supplements industry and, therefore, cannot be ignored. Jainism and Mormonism are two other religions that forbid ingesting alcohol.

Again, this white paper's author reiterates that, in principle, they are not opposed to alcohol-based herbal preparations, as they have a 'proven' place in herbal medicine. However, if alcohol-based herbal preparations are, in fact, not as effective as they could be, or appear to be too often overstated as to their efficacy potential, given that not all, but many important constituents and components are denatured and rendered inert by the alcohol, and therefore, as a chemical fact of chemistry and biology, would, in turn, affect therapeutic potency and integrity. It is a question for which an answer has never been pursued on a comparative clinical basis, either in herbalism or orthodox medicine. In fact, the question itself is seldom asked or ignored altogether. Now, this does not imply that alcohol-based herbal preparations don't work. They do. But are such alcohol-based preparations actually as potent as non-alcohol-based preparations, based on an equal constituent amount-for-constituent amount, when denaturing and inert-rendering factors are factored in, and added to that, when a multi-condition process versus a mono-condition process is considered?

As of this writing, the best that can be ascertained regarding this question is what we know regarding when something of a chemical or biological nature is denatured or rendered inert- that, put in simpler terms, 'changed '–that such a change, whether inorganic or organic, will result in a concurrent consequential change in outcomes. This is a fundamental cause-and-effect rule of chemistry. Given these facts, it should be reasonable to surmise that since alcohol does possess the intrinsic properties to change the biological integrity (i.e., denatures and renders inert) of many of an herb's constituents and components, then, in turn, it can be expected to change (i.e., affect) the now altered outcome/action(s) of the changed constituents and components, and hence therapeutic integrity and potential. To deny this possibility would be foolhardy and smack of a cognitive bias, even cognitive dissonance at its most extreme.

Given alcohol's denaturing and inert rendering of many constituents in herbs, this also includes documented evidence that it denatures and renders many nutrients inert and suppresses digestive enzymes in the digestive tract (including the oral cavity). Would the same apply to an alcohol tincture's extracted component in finished alcohol-based herbal products? On the surface, especially chemically speaking, the answer is an obvious yes. Even alcohol-tinctured herbal blends that are then distilled into 'liquor,' as a digestive aperitif, will upset digestive enzymes and processes should the alcohol portion make it to the gut due to ingesting too much of the digestive aperitif liquor, which is why a small half-finger amount in the bottom of a small aperitif glass is recommended, slowly sipped, and kept in the mouth for a

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time before swallowing to allow the alcohol to orally vaporize and escape from the mouth, because the digestive aperitif liquor's taste receptor-driving action of stimulating digestive processes takes place and starts in the mouth due to the aromatic and bitter components effects on taste receptors responses on the gut's digestive activity. This effect of the aromatic and bitter components, though denatured and/or rendered inert, is not a direct biochemical action of the aromatic and bitters, but is a physio-neuro triggering effect of the aromatic and bitter components on the oral taste receptors directly.

Even though alcohol may be a great sterilizing agent, due to its '-cidal' disinfecting and disassembling nature, it nevertheless denatures and renders inert so many constituents and nutrients that an alcohol-based product possesses a reduced level of therapeutic and nutritive potential, and hence, reduced efficacy to one degree or another, typically requiring a higher effective dose amount to get an anticipated effect, all due to alcohol's limiting its full potential and therapeutic benefits, especially when compared to the broad benefits contained in a 100% alcohol-free serialized multi-step multi-dynamic, multi condition processed liquid herbal glycerite concentrate. Again, this is not to say that alcohol-based liquid herbs don't have a place in herbal medicine – they do. However, there are now known limitations to their role in herbal medicine, with more remaining to be ascertained and/or recognized; especially since, compared with efforts to determine the effects of alcohol-based preparations, little effort has been made to identify the constituent-based efficacy limitations of alcohol-based herbal preparations, except where honest '*effective*' dosing is clinically determined. A lot is known about what herbs may do, even what an effective dose for doing so is, but studies determining how much therapeutic potency is lost due to alcohol's denaturing and inert-rendering effects on many constituents and components have not been done.

What is being said, both from an alcohol chemistry effect and common-sense perspective, is that the prior, and long outdated, claim that "Alcohol is the preferred medium for extracting botanicals." is no longer valid, with the understanding that, with there being an established and known denaturing and inert-rendering effect on many herbal constituents and components, previously not realized and/or acknowledged, then there would be a concurrent diminishing effect on certain therapeutic aspects of such alcohol made products. To reiterate, denying this observation would be considered a form of 'cognitive dissonance': the inability to see and accept the facts even when the proof is in plain sight, since it is, after all, a fundamental scientific fact.

Glycerin's Highly Versatile Nature & Intrinsic Stability

It is becoming more evident to those who study and use both typical mono-condition processed alcohol-made and multi-condition processed glycerin-made botanical preparations that a fair and comprehensive comparative evaluation of each, both on their own merits and compared to each other, supports the premise that the totally alcohol-free serialized multi-step, multi-dynamic, multi-condition processed botanical glycerites may be more versatile in their applications (as opposed to other mono-condition process-types of glycerite products) than previously realized. And, because of glycerin's non-denaturing and non-inert rendering quality and stability, the broad-spectrum extracted constituents and compounds retain more of their ratio-intact, biologically active nature and synergies, thereby, on a constituent-for-constituent basis, presenting the distinct possibility of requiring less of a given active constituent or compound for an anticipated effect of the serialized multi-step, multi-dynamic processed herbal glycerite than an alcohol extract processed product might otherwise require.

Also to be recognized is the driving need for alcohol-based processes that super-saturate for their finished products, or even post-extraction add Standardized phytopharmaceutical potency-enhanced fraction/isolate ingredients to their products to boost a singular active constituent or constituent group in a drug-like potentizing fashion, results in the disturbing observation that almost all super-saturate-based extraction technologies have incredible wastage of their partly spent herbs, along with the pressure it puts on the harvesting of and commercially-driven demand for herbs, especially those of questionable biological sustainability, that have become and continue to be more prevalent in the marketplace.

On the other hand, the multi-condition serialized, multi-step, multi-dynamic glycerin-based processing of liquid herbal products offers a versatility and extractive potential previously unavailable in at-large alcohol- or glycerin-based processes and their resulting products, a fact that does not go unnoticed by

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health practitioners, herbalists, and consumers alike. A multi-condition-based serialized, multi-step, multi-dynamic processed glycerin-based herbal product can be taken straight, with water, in juices and smoothies, or sprinkled over foods, without tainting the taste or quality of the medium to which these true 100% alcohol-free herbal glycerite concentrates are added.

Additionally, the multi-condition proprietary, serialized, multi-step, multi-dynamic glycerin-based processing technology uses significantly less raw herbal material while yielding potent concentrations and efficacious products that taste remarkably good. Taste, especially a potent one, very close to that of the raw harvested herb itself, indicates that the extraction potential retains the synergies and intrinsic ratio-intactness of an herb's poly-constituent basis.

The 'Herb-to-Fluid' Ratio Marketing Ploy Is Irrelevant To a Liquid Herbal Finished Product, And Has No Relevance to Quality or Efficacy When Listed on Product Labels.

Because the multi-condition-based serialized, multi-step, multi-dynamic glycerin-based liquid herbal processing technology developed by this white paper's author utilizes less raw material to obtain similar or in-kind potencies, efficacy, and results for finished products, the 'herb-to-fluid' ratio listing on product labels, which is the rage for many companies, particularly alcohol-processed products, has no relevance as to the 'implied' product quality or efficacy potential, as such herb-to-fluid ratio listings attempt to represent, intimate, or imply. In other words, herb-to-fluid ratio listings on product labels are irrelevant to a store/reseller or consumer as to quality, efficacy, etc.

Even for companies who use this marketing ploy – as far as distributors, wholesalers, retailers, consumers, and practitioners are concerned, it has no relevance as to the finished quality of a particular product, especially regarding level of efficacy, when other factors such as raw material consistency from harvest to harvest, solvent used, processing methodologies, etc., are taken into account as regards final concentration, potency, and the afore stated efficacy potential of a finished product, that substantially varies from company to company, and therefore, from product comparison to product comparison where the same herb-to-fluid ratio might be listed for each, which clearly shows that herb-to-fluid ratio listings on a product label are irrelevant when the other factors for making products are taken into account. There is no across-the-board industry manufacturing standard that applies to all to justify using herb-to-fluid ratios on product labels and in marketing endeavors, and it's also a disingenuous market and sales ploy.

The following example illustrates what is being said here:



These 3 cups of tea have identical herb-to-fluid ratios.
Same herbs. The same amount of herbs in each tea bag.
The same amount of water in each teacup.

The same herb-to-fluid ratios.
So, why different outcomes?

Answer: THE PROCESS!

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Efficacy Is Measured Not Only By What Goes In But, Most Importantly, By What Comes Out.

Why are the different colors of steeped teas indicative of the concentration levels of the differing tea cups? According to the purveyors of herb-to-fluid ratio listings, things are supposed to somehow be equal, or gaslight the consumer into believing so. The amount of raw herb material in the tea bags and the amount of water in the cups are the same, except for one essential factor that's purposefully kept from the consumer by the purveyors of herb-to-fluid ratio listings – the time the tea bags are exposed to the water. Yes! The 'process' factor! The first cup takes little time to steep; the second takes longer; the third takes much longer. Different soaking/steeping times, akin to different processing approaches for making liquid herbs, make them distinct from each other, yet they have the exact same herb-to-fluid ratios. So yes! Herb-to-fluid ratio listings on liquid herbal product labels have no relevance and are disingenuous?

Herb-to-fluid ratios are relevant only to a company's internal operations as part of its FDA GMP-required MMR (Master Manufacturing Records) documentation, SOPs (Standard Operating Procedures), and manufacturing protocols, and have no tangible marketing relevance or context regarding implied quality, particularly with respect to efficacy potential, when listed on a finished product label. This is even more true when a totally alcohol-free, multi-condition-based, serialized, multi-step, multi-dynamic processing technology is utilized to make herbal glycerites. Fact is, on finished product labels, the listed herb-to-fluid ratio 'numbers,' sans, for example, any harvest-to-harvest constituent content levels data of raw materials, or production methodology specifics used, being just two examples of many, do not validate or are remotely indicative of the quality or efficacy potential of a product, and are deemed by this white paper's author to be disingenuous sales puff and misleading as to an assumed quality standard that is non-existent when used outside a company's internal documentation and operations. As for a consumer, herb-to-fluid ratio listings on product labels represent an assumed phantom for something that in fact does not exist. And make no mistake: some companies have switched over to listing raw herb equivalencies to listed dosing in an attempt to appear to be moving away from herb-to-fluid ratio listing, even though those herb equivalencies to dosing are still an herb-to-fluid claim, only using semantics to do so.

Source of The Misconceptions, Misunderstandings & Misrepresentations Surrounding Glycerin

So why is ethanolic alcohol (i.e., alcohol derived mainly from grains, cane, and root crops) listed as it is in the texts dealing with making liquid herbs, so dogmatically accepted in the industry at large as the 'preferred' extractive medium for liquid processing of botanicals? The answer lies in the early research and assumptions made by botanically based eclectic physicians from the mid-1800s through the early 1900s. These holistic physicians, legendary for their safe, sane, effective *eclectic* approach to medicine and healthcare, became involved in the emerging analogs-driven pharmaceutical search for botanically based crude drug medicines. Their research and work were astounding and, in many areas, groundbreaking for their time. It also fell short because of discoveries/scientific studies yet to be made.

Part of their early research involved determining what they believed would be the safest, most universal, and preferred extractive medium for liquid processing of medicinal botanicals, especially botanically derived crude drug extracts. In the end, they settled on ethanolic alcohol, and though not the only extractive solvent available to them, nevertheless made it the generally accepted 'standard' extractive medium – a tenaciously held-to premise that still prevails among many herbal practitioners and in the liquid herbal products manufacturing industry at large today, as of this writing.

However, regarding glycerin as a viable extractive solvent for botanicals, in 1869, the eclectic physician William Cook, MD, said, "*Glycerin possesses a peculiar and powerful solvent property, and is also an excellent preservative. For both these qualities, it is second only to alcohol and deserves to come into considerable use.*" It should be noted that the last part of Dr. Cook's statement, "*… and deserves to come into considerable use*," was never taken to "considerable use" by his peers or later eclectics. Contemporary liquid herbal product manufacturers and most practicing herbalists who use alcohol-based liquid herbs in their practices have done the same. Instead, they appear to have dogmatically opted for alcohol as the dominant, and in most cases, exclusively preferred, extractive medium for extracting botanicals, and largely excluded glycerin, except in highly remote instances, such as making mono-condition-based

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decoctions, from their efforts. Dr. Cook's view that glycerin is "second only to alcohol" as an extractive solvent would come to be proven incorrect.

Within a short time following the apex of the Eclectics work in this area, three very important things would challenge and even invalidate some of the early assumptions that alcohol was the best, hence, preferred medium for liquid extraction and preservation of liquid-processed botanicals, even challenging Dr. Cook's assertion that glycerin "is second only to alcohol,' with glycerin instead, later being verified as being 'second only to water,' not second to alcohol, in its solvent and extractive potential and efficiency, which would mean it is a more 'universal' extractive solvent than alcohol, since glycerin, and alcohol by implication, are exceeded in a 'universal' extractive potential, by water (due to its ability to be the 3 forms of fluid, solid, and vapor), with glycerin, not alcohol, being the second most effective extractive solvent as later studied and verified.

Enzyme Theory

Firstly, in the Eclectics' time, enzyme theory had not yet been discovered and elucidated, or even postulated, and so was not considered in the implications of eclectic theories and work, not only as related to the processing of botanical products but, most importantly, relative to the 'actual' denaturing and inert rendering effects upon the protein conjugate constituents of alcohol-processed liquid botanical preparations both therapeutically and nutritionally. Without this foundational enzyme theory knowledge, they could not have been aware of the 'biologically' active nature that certain enzymes and enzyme cofactors play in the therapeutic and, just as important, nutritional efficacy of an herb, which alcohol intrinsically denatures, dissociates, and renders inert. Enzyme theory was decades away from being postulated, theorized, verified, and elucidated, and it was not until after that that science fully elucidated the effects of alcohol on enzymes and enzyme cofactors.

This is especially ironic, given that the Eclectics were firm believers in the principle of a 'Vital Force,' which is why Eclectics were referred to as 'Vitalists.' They believed that their endeavors, at their core, revolved around correcting, vivifying, and maintaining the body's vital force, and they sought to preserve the vital forces inherent in the botanicals they extracted with alcohol, or so they thought. Once enzyme theory came into being, further research, elucidation, and peer review would ascertain the modern premise that enzyme theory explains the vital force principle, as enzymes and their actions have been found to be key to energy, vitality, stamina, and longevity, all principles associated with the 'vital force' principle espoused by the Eclectics.

It's a pretty sure bet that had the Eclectics known of enzyme theory and had any idea that alcohol denatures and renders inert enzymes, enzyme co-factors, and suppresses enzymatic actions, today deemed by many to be the core of vital force activity, energy, and longevity, even in botanicals, along with alcohol's denaturing and inert rendering effects on constituents of herbs, it is highly doubtful they would have dogmatically continued with the premise of alcohol being the preferred universally accepted extractive medium for making liquid herbal medicines, and in all likelihood would have been more attentive in working with glycerin, as their contemporary, Dr. Cook asserted be done. But alas, that would not happen until generations later, when the author of this white paper, a non-Eclectic learned non-dogmatist clinical & formulary herbalist, nutritionist and CAM practitioner, would broaden his studies and views by re-reviewing high school and college chemistry, delving into food and fluid chemistry, as he dealt with his glycerin versus alcohol observations, questions, and experimentations leading to the development of an industry-first ever multi-condition-based serialized multi-step, multi-dynamic glycerin-water process for making totally alcohol-free liquid herbal concentrates.

Unrealized & Unmatched Versatility

Secondly, although they used glycerin in several of their experiments and in some remote product preparations, typically as a sweetening agent or a preservative in alcohol-removed preparations, the Eclectics appear to have been unaware of, and/or unconfident in glycerin's enormous *versatility* as an extractive solvent, except for occasional glycerin-based decoction processing where alcohol cannot be used. The problem the Eclectics faced was that when glycerin was used for making 'tinctures,' it was

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typically subjected to an alcohol-type mono-condition 'cold' tincturing methodology, which resulted in 'weak' herbal glycerites, possibly due to two factors known to Eclectics at the time – 1, that chemically, glycerin is technically an alcohol, not in the effect sense, but in the structural sense, being a triatomic alcohol, like comparing refined sugar (ethanolic alcohol) to a complex polysaccharide carbohydrate (glycerin). And 2, the Eclectics (and later adherents of the Eclectics) did not have, nor attempt to develop, a multi-condition-based serialized, multi-step, multi-dynamic processing technology with specialized equipment and implements for processing botanical glycerites in their day. In other words, whatever the reasons, they didn't *work* the far greater spectrum of glycerin's versatility, especially from a multi-condition process basis, beyond the constrained narrow limits intrinsic to ethanolic alcohol's mono-condition-based tincture-making methodology limitations. Some may assert otherwise. But the question begs, "Why did the Eclectics, who were also known for their curiosity and sense of inquiry, not pursue a multi-condition process approach to using glycerin-water as a botanical extractive technology, if they knew all of this about glycerin's intrinsic chemical and utility nature?" The logical answer is, they didn't!

By the 1930s/early 1940s, the Eclectics assumptions concerning alcohol versus glycerin had been invalidated by the medical and food products industry (apart from industrial uses of glycerin), which reached the zenith of glycerin-based research relative to food use, medicine, and veterinary use and concluded, through both industry and scientific research, that aside from water, glycerin is not only the most versatile naturally occurring 'universal' solvent/extractive medium yet discovered, but one of the safest as well. This is borne out by Leffingwell, PhD & Lesser, BS, in their seminal work, 'CHEMISTRY, Its Industrial and Commercial Applications' (1945 Chemical Publishing Co. Inc., Brooklyn, N.Y.), in which they state, "*Glycerin combines the extractive qualities of water and alcohol: and many substances dissolve even more easily in it than in either of the two liquids*." The key that the Eclectics, and followers of the Eclectics, had missed was not whether glycerin was a suitable extractive medium or not (which they assumed was less than ethanolic alcohol in its extractive qualities) but *how* glycerin would later be worked and used in the afore-described multi-condition-based serialized multi-step, multi-dynamic process it is used with to bring out its intrinsic versatility and greater broad-spectrum extractive potential.

The *working* of glycerin in a multi-condition-based serialized multi-step, multi-dynamic liquid herbal extraction process versus a mono-condition-based passive, non-dynamic tincture-type process (i.e., infuse, macerate, percolate, etc.) is precisely what the Eclectics had missed, and the following adherents of Eclecticism continued to miss. The manner in which glycerin is used was a paramount consideration in developing the multi-condition-based serialized multi-step, multi-dynamic glycerin-water liquid herbal extraction process described herein.

The point is, the Eclectics were not aware of glycerin being much more versatile and a better extractive medium for a broader spectrum of botanical constituents and components, that they believed could not be recovered with glycerin, because they did not have access to later research and facts to give them greater clarification of the subject, nor had they ventured further beyond their own original alcohol biased views, that limited their R&D of glycerin's use to find out, with the resultant dogmatic insistence on alcohol being the preferred extractive solvent for making liquid herbal medicines predominating throughout the Eclectic era, and thereafter, even into the present. Typically, even where a liquid herbal product might appear to be glycerin-based because it lists glycerin as its predominant fluid ingredient, such products are typically still first tinctured with alcohol, then the alcohol is removed and the glycerin added in its place, as a preservative, not as the extractive agent; thus, such products are still alcohol-based products, continuing to possess the downsides that alcohol intrinsically imparts to such products.

Non-Denaturing & Non-Inert Rendering Nature of Glycerin

Thirdly, this is the most efficacious and clinically relevant point of all. It was noted in the late 1960s/early 1970s and further observed in the 1980s by clinical aromatherapists that certain therapeutic benefits of essential oils and plant-based aromatic compounds were denatured and/or altered, as in disassembled and dissociated into simpler, inert compounds, when placed in contact with alcohol.

Yes, from a chemistry perspective, this is a form of denaturing in which a complex phytochemical is

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stressed and disassembles into simpler, often inert compounds. The same happens to numerous other non-protein conjugated complex botanical constituents.

Though most of the aroma quality remains, the therapeutic benefits are substantially reduced and/or rendered inert due to alcohol's chemically stressing action of taking extremely complex aromatic molecules and breaking them down (i.e., 'disassembling') into simpler component molecules that no longer possess the complex nature that contributes to nuanced therapeutic potential. Perfumers worldwide are aware of this because they often blend naturally derived aromatic essential oils with a small amount of alcohol to 'fix' the blend, or, in this case, intentionally render the blend therapeutically inert while retaining aroma quality. Again, alcohol's denaturing and inert-rendering effect also affects other non-protein conjugated complex components.

This aspect of alcohol's effect on the aromatic constituents of a plant appears to have been either unknown or not really understood by the Eclectics. There is no doubt that they observed some denaturing of botanical constituents when alcohol was used, as happens with certain mucilaginous polysaccharides and structural polysaccharide complexes. But this was observational, not yet fully studied or understood at the molecular level, and the chemistry was not elucidated at the time.

The Eclectics were also unaware that glycerin is a superior non-denaturing/non-inert-rendering solvent to alcohol for removing essential oils, certain volatile components, and other aromatic-based compounds from plants while preserving their intrinsic complexity, since this aspect of glycerin research would not come to light until the 1940s and later. In fact, glycerin has been found to be an excellent non-denaturing, non-inert-rendering agent for preserving aromatic compounds, essential oils, and flavorings due to its protective solvent-caging properties, which are important for confectionery, beverage, and flavorings.

Many accomplished contemporary clinical aromatherapists have noted similar observations and share a similar feeling among their professional peers regarding their own practices, even stating that they refuse to add ethanolic alcohol to any of their therapeutically intended blends for the very reasons conveyed in this white paper, but instead 'cut' (i.e., dilute) their essential oil(s), whether for topical or internal use, with a fixed oil such as olive oil, almond oil, hemp oil, etc., and for internal use, glycerin.

Regarding glycerin and its use in the flavorings, beverages, and confectionery industries. The aforementioned industries all utilize glycerin not only for its emulsion quality, adding body and humectant properties, but also for how it captures flavor components and keeps those flavor components in a 'captured' stable state. This flavor-capturing quality is the result of a phenomenon in chemistry called 'protective solvent caging,' hereafter referred to as 'protective caging.' This property is totally lacking in alcohol. In herbs, glycerin's protective caging properties not only protectively cage and stabilize aromatic and flavoring components but also capture, protectively cage, and stabilize almost all other constituents and components of an herb, which is one of the factors that contribute to a multi-condition-based serialized multi-step, multi-dynamic processed liquid herbal glycerite concentrate's astounding stability and shelf life, provided the percentage concentration of glycerin in a finished product is high enough.

Time to Question and Rethink Outdated Assumptions

Given the above evidence, the time has come to recognize that the longstanding status of alcohol as the 'preferred' extractive medium for herbs is outdated and no longer supported by either scientific or intrinsic (evidence-based) criteria, especially when the multi-condition-based glycerin-water process described herein is factored in. The clinical considerations regarding the denaturing and inert-rendering effects of alcohol on diminishing the therapeutic potential and nuances of constituents and components extracted from botanicals must also be more seriously considered. For almost a century and a half, a premise that was outdated within a short span of decades after its peers' acceptance has been dogmatically held, even to this day, despite clear evidence to the contrary.

Glycerin Has Greater Solvent Capacity and Versatility Than Alcohol

Even with the denaturing and inert-rendering effects of alcohol being an indisputable fact, the point of

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glycerin having greater solvent capacity than alcohol is difficult for alcohol aficionados to accept, especially those who have difficulty looking beyond a mono-condition-based 'tincturing' (i.e., cold process-based) approach. This white paper's author has observed that cognitive dissonance prevails when facts are demonstrated, or a cognitive bias-driven stubbornness prevails, where a dogmatic stance continues. Either way, continuing to deny well-studied and chemistry-proven evidence to the contrary. But consider that following the eclectic era's zenith, and their published works, glycerin was later further researched by the food, medical, and manufacturing industries, and thereafter listed in food ingredients and industrial texts as possessing the greatest solvent powers known for a naturally sourced solvent, exceeded only by water itself (only because water can take on the three states of matter). According to research from scientific studies and across multiple industries, ***glycerin has greater solvent properties and capacity than alcohol!*** Not the other way around. This is why glycerin (not ethanolic alcohol) is called a 'universal' solvent, second only to water!

Consider the following. Researchers comparatively measured the extraction potential for polyphenols, flavonoids, and chlorophyll using glycerin-water and alcohol-water extractions. They found that glycerin-water mixtures frequently produced higher concentrations than conventional solvents such as water and ethanol. This lends further credence to the author's argument that glycerin has greater broad-spectrum extraction potential and capacity than alcohol because the study evaluated several chemically distinct classes of compounds.

Of note, however, the study did not measure every constituent in the plants, and though the results did not establish glycerin as a be-all-and-end-all extractive agent, they did show that glycerin has broad-spectrum extractive potential for botanical constituents previously believed impossible to extract with glycerin. The broader conclusion is that glycerol-water extraction, especially when subjected to a multi-condition extraction process, can provide a favorable combination of solvent properties for recovering multiple classes of phytochemicals, including a broader spectrum of phytochemicals that alcohol cannot extract to the same degree as glycerin. (See REFERENCES, citing scientific studies establishing glycerol's broader spectrum constituent extractive potential than alcohol possesses.)

The problem in the past, and presently besetting many alcohol-aficionado-oriented herbalists, and in the liquid herbal products industry at large, has been that accepted glycerin-extractive processes typically utilize one of two methodologies in their making: 1. Alcohol-type mono-condition-based passive liquid tincturing macerate or percolate cold process techniques for fluid-extracting herbs, which makes these particular glycerite preparations done in this manner very limiting, dilute, and not all that much more potent or any more efficacious than alcohol based herbal products, – often being less so. And 2. Subjecting the glycerite solution to a mono-condition-based sustained high heat decoction-type method, by itself, alters and destroys components, and inadvertently or purposefully, reduce the fluid to a state of caramelizing and even scorching (i.e., burning), with the over-concentrated glycerite often being disingenuously passed off as being a more potent product because of its darker color or stronger over-cooked taste, but still, one that is heavily denatured and rendered inert and of highly limited therapeutic potential as a result, unless taken in large heroic 'effective' teaspoon and tablespoon doses, which typically taste awful and don't sit well in the stomach.

In other words, glycerin being treated in a tincture-like fashion, as if it were alcohol, or a mono-condition-based supercritical reducing process, as if it were a metal-oxide, is, where a broad-spectrum poly-constituent-based, synergies-intact glycerite of liquid herbs is concerned, allegorically speaking, akin to treating and using sugar and honey the same way in a baking recipe, but resulting in different mixed outcomes. Since baking recipes are typically sugar-based, using honey in the same way will result in a baked item that is less sweet, has higher moisture content, does not bake through, and often differs substantially from the original sugar-based recipe. It is not too dissimilar to making the proverbial claim that both are apples when, in fact, it is comparing apples to oranges. Such has been a large part of the glycerin versus alcohol narrative regarding liquid herbs. Lots of distracting straw-man inflections have been added to the narrative that are out of context and miss important points and facts.

As of this writing, coming onto 45 years ago, the original 1st generation multi-condition-based serialized multi-step, multi-dynamic alcohol-free herbal glycerite process for making totally alcohol-free liquid herbs that the writer conceived of, realized that to obtain the full solvent extractive potential of glycerin as

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an extractive medium, it needed to be subjected to a series of multi-condition steps that involved much more than a mere mono-condition-based alcohol 'cold' tincture or percolate technique or a sole high heat super-critical decoction process, of which both result in finished products that are denatured and/or rendered inert. This multi-condition-based, serialized, multi-step, multi-dynamic glycerin-based process technology represents a "Thinking Outside the Box" approach that challenged many prior hard-and-fast industry-standard beliefs and notions about alcohol-type-dominated fluid-extraction processes. This multi-condition serialized multi-step, multi-dynamic extraction technology consistently yields finished products that often leave practitioners, retailers, other herbal product companies, and the food, beverage, and confectionery industries scratching their heads in wonderment. And it's all because of ***how*** glycerin is worked in this proprietary, serialized, multi-step, multi-dynamic process. This unique process is more than a TINCture and more than an exTRACT – but combines the best of both without the downsides of either; hence, it's being called the TincTract® process.

Glycerin's Many Other Pluses

• Unlike alcohol, glycerin is not only a food ingredient in thousands of foods, beverages, and confectionery products, but is also listed as a nutritive for both humans and animals! Unlike alcohol, glycerin's nutritive qualities are astounding! Though it has caloric value, the calories are not *simple* carbohydrate-based calories like sugar or alcohol, which spike blood sugar levels and are metabolized too quickly, causing blood sugar crashes and excess fat. Instead, glycerin is processed slowly in the body, using a specialized enzyme pathway in the liver called the 'gluconeogenic cycle,' which doesn't stress or damage liver function or tissues and has a beneficial effect on the liver, while not stressing the pancreas, thyroid, or adrenals. Alcohol cannot claim any of these features or resultant benefits, and in fact, stresses the liver, pancreas, thyroid, and adrenals, and is an endocrine disruptor, even in small amounts for some. Alcohol possesses no nutritive benefits.

• Unlike alcohol, which has a potentially deleterious effect on the liver (and cannot be adequately metabolized by children or by animals at all), glycerin possesses detoxifying attributes that are non-stimulating (especially important for challenged livers). Dr. Edward Shook, the eminent physician, biochemist, and phytotherapist who specialized in liquid herbal glycerites, taught that glycerin possesses the distinct quality of aiding the removal of sequestered toxins from the body's tissues, especially liver tissue—a quality not shared by alcohol. This is especially important in today's environmentally polluted and chemically laden world.

• The low glycemic index is the same for glycerin and alcohol. However, the glycemic 'load' for alcohol is high, whereas for glycerin, it is very low. Alcohol's high glycemic load stimulates the pancreas to overproduce insulin while suppressing the liver's ability to convert alcohol into glucose to balance the high insulin levels, potentially leading to hyperinsulinemia and eventual pancreatic failure (diabetes). Glycerin, on the other hand, possesses both a low glycemic index and a low glycemic load. Many physicians, dietitians, clinical nutritionists, and clinical herbalists consider the glycemic load factor more important than the glycemic index in dealing with blood sugar imbalances. This is especially important for individuals already experiencing diabetic, hypoglycemic, or hyperinsulinemia problems, as well as those on special 'low carb' diets.

Though the FDA requires that glycerin be listed on a food or dietary supplement product label as a *carbohydrate* source of calories, due to the National Academies of Science only recognizing fats, proteins, and carbohydrates as sole macronutrient sources of calories, the FDA also allows glycerin to be listed as having a 'o' (zero) Net Carb Count, meaning that it does not act the same way in the body as a sugar- or starch-based carbohydrate does. Therefore, due to its chemistry, and not being derived from sugar/starch carbohydrate sources, but from fats (i.e., triglycerides), it possesses a different effect on the body's biochemistry than a typical carbohydrate per se.'

(*Of note: Since alcohol is not classified as a food or dietary ingredient per se, the FDA currently allows for the insidious exemption of not requiring it to be listed as a calorie/carbohydrate source on labels, even though alcohol is clearly a verified source of calories derived from carbohydrates!*)

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• For children who don't have well enough developed enzyme systems to convert or metabolize alcohol into glucose, and for pets who don't have the enzyme ability to process alcohol, glycerin is a perfect ingredient for liquid herbal products for children and pets, and it makes the more bitter and astringent herbs taste better, a real plus for children (and parents too!). The ever-present problem and reputation for which liquid herbal products, especially alcohol-made products, are typically known – a bad taste – is not a problem for a serialized, multi-step, multi-dynamic processed liquid herbal glycerite product, especially for its formula blends.

• Glycerin does not drive oxidation (i.e., REDOX) and is therefore non-micro-corrosive to certain constituents in its effects. It does not drive the oxidation of metals, minerals, and mineral-bound constituents of botanicals that are susceptible to reduction-oxidation (REDOX) processes when in a fluid suspension, making it an excellent preservative medium for foods and herbs that are particularly high in REDOX-sensitive minerals, constituents, and components. This is due to glycerin possessing a unique *protective caging* property that also has a REDOX-staunching and buffering effect in liquid formulations where highly REDOX-sensitive minerals and/or bitters-rich herbal extracts might be mixed with other herbal extracts of high tannins and/or organic acid content, which would, in a solution, accelerate REDOX activity substantially, whereas glycerin retards and/or arrests REDOX activity of essential REDOX-sensitive constituents, compounds, and certain minerals in a fluid extract of botanicals. This same REDOX moderating effect of glycerin also applies to lipids and the aromatic constituents susceptible to REDOX-driving effects of 'turning' or going rancid.

• Unlike other solvent-water-based solutions, glycerin-water-based solutions do not become *inverted* after a period of time, meaning that glycerite solutions remain pure and limpid and maintain their suspension quality long after many other solutes have inverted (of which alcohol solutions are very susceptible over time).

• Another little-known fact concerning glycerin's positive effect in and on solutions has to do with the fact that old wines kept in barrels and having a greater market value than new wines are characterized by a higher proportion of naturally occurring glycerin content, which may explain why these wines typically possess a lower REDOX value and hence, retain a smoother finish and more mature and mellow character over a more extended period of years. (Many experienced wine vintners maintain that monitoring glycerin content is as important as managing alcohol content for producing premium quality fine wines.)

Preserving Botanical Constituents & Micronutrients

The distinction between *extracting* a constituent and *preserving its original structure or biological activity* is important. A solvent may extract a compound efficiently while also altering some other compound in the same plant material. Similarly, a compound can remain chemically detectable while losing biological viability. These outcomes differ and should be known and understood accordingly.

For example, different botanical-based micronutrients and phytochemicals behave differently in glycerin than in alcohol. The following chart presents some examples of this:

Constituent class	**What can be concluded**
Polyphenols and phenolic acids	Aqueous glycerin outperforms alcohol for particular compounds and extraction conditions.
Flavonoids	Comparative studies demonstrate favorable glycerin extraction potential results for certain botanicals.
Proteins	Biochemical research supports glycerin's protein-stabilizing properties and its non-denaturing propensity relative to alcohol's intrinsic denaturing propensity.

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Constituent class	What can be concluded
Enzymes	Glycerin stabilizes enzymes viability and potentials, with the potential depending on the enzyme and conditions, whereas alcohol staunches and destroy enzyme viability and potentials.
Vitamins	Depending on the individual vitamin, pH, temperature, oxygen, and light, the solvent composition of glycerin is more conducive to extracting and preserving biological viability than alcohol is.
Minerals	Their removal and stability depends on their chemical form, post-extractive soluble-condition, pH, oxidative stress, and binding interactions with a botanical's proteinaceous matrixes.
Flavoring Components	Glycerin removes flavor components without altering their delicate chemistry profiles, and stabilizes and preserves flavor components through its 'protective caging' property, thus preserving a botanical's complex flavor components.

Safer and Preferred for Veterinary & Pet Care

In veterinary medicine, glycerin is listed for medicinal and nutritive uses. Except for critical, life-saving, short-term, dose-monitored use by an animal health care specialist, alcohol should not be used in any form with animals, as they do not have the enzyme systems to convert or metabolize alcohol. Heart, nerve, and liver damage, and chronic digestive problems are just a few of the potential problems a pet can have when given alcohol-based products, especially over long-term use. Glycerin's use in the serialized, multi-step, multi-dynamic, glycerin-based processed pet liquid herbal products line is a significant advantage, as it also tastes good to even the most finicky pets.

A Glycerite's Superior Absorption.

There is a popular but unproven notion that an alcohol-based liquid herbal product's constituents and compounds are the most readily absorbable of all herbal preparations. Some say it is absorbed immediately, with some incorrectly stating it is absorbed even more so than herbal glycerites. This is an incorrect assumption based solely on personal opinion and conjecture rather than scientific, clinical, or physiological facts. Such assumptions have never stood up to scientific scrutiny or clinical review and are contrary to the known effect of alcohol on tissue contact responses.

Consider this: Medical students know that alcohol is not the best medium for quickly introducing something onto (topical) or into the body through ingestion (oral) if immediate absorption is the goal. Basic tissue physiology shows that alcohol initially causes tissues to pucker and contract (i.e., astringe) and also dries and dehydrates tissues—*actions that distinctly block immediate absorption!*

On the other hand, serialized, multi-step, multi-dynamic processed liquid herbal glycerites, due to the succulent nature of glycerin, have high absorption and bioavailability, especially when taken orally. One indicator of this is that glycerin initiates an immediate salivation response that draws blood and lymph vascularity to the surface and activates enzymes essential to absorption, a tissue physiological effect completely opposite to alcohol's effect on tissues. Another indicator of glycerin's superior absorptive-enhancing properties is its distinctive moistening quality due to its intrinsic humectant properties. In veterinary medicine, glycerin is a preferred carrier for many medicines over alcohol. No wonder more and more veterinarians and pet care specialists like the serialized, multi-step, multi-dynamic-processed herbal glycerite pet products.

Glycerin's Antimicrobial-Based Preservative Qualities in a Multi-Condition-Based Serialized, Multi-Step, Multi-Dynamic Processed Liquid Herbal Glycerite.

A serialized, multi-step, multi-dynamic-processed herbal glycerite product also has a well-established and

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3rd-party lab-proven preservative and stability quality unmatched by any other company's totally alcohol-free glycerite-based liquid herbal products in the industry at large. How is this so? Because, along with the serialized multi-step, multi-dynamic process enhancing effects on preservability and stability, the appropriate glycerin-to-water ratio for each specific herb processed is used – it is one of the reasons why the serialized multi-step, multi-dynamic processed liquid herbal products pass an independent 3rd party lab real-time safety/stability analysis now validating an astonishing 6-year BBD (Best By Date) on product labels, the longest label listed BBD for a liquid herbal product in the industry (it's actually in its 10th year of real-time testing), that is indicative of astounding stability! In the beverage industry, a number of serialized, multi-step, multi-dynamic-processed botanical glycerite concentrates are even rated as acceptable for 'cold fill' purposes. (For nay-sayers of glycerin's clean and preservative qualities, read the previous sentence again.) This quality is naturally present in all of the specific manufacturing company's liquid herbal products that use the proprietary multi-condition-based serialized, multi-step, multi-dynamic process for making them, which uses a high glycerin-to-water ratio in production.

It should be noted further that alcohol does not 'preserve' per se, but sterilizes through its vitality-zapping disinfecting and denaturing actions. To *preserve*, in the actual meaning of the word, a medium must capture and *maintain* the prior, original, ratio-intact, synergies-driven, biologically active state and integrity of an herb's extracted components. Glycerin does this with constituent-maintaining stability, which alcohol cannot do. Therefore, alcohol is not a *true* preservative in the biological viability-preserving sense.

Also, though both glycerin and alcohol help keep a finished product pure and safe, the ways they do so differ. Alcohol possesses an antiseptic action upon microbes, via a direct chemical action upon the fluid medium and its components (the 'disinfecting' factor), being bactericidal, whereas glycerin possesses a 'static' action via its dehydrating action on microbes, wherein microbes are deprived of moisture – the culprit in reproduction, spoilage, decomposition, etc. – being bacteriostatic. Alcohol is bactericidal, whereas glycerin is bacteriostatic. Even so, both actions are considered antimicrobial. However, in glycerin's case, the concentration of glycerin must be high enough to result in an ongoing antimicrobial effect.

The exclusive manufacturer of the multi-condition-based serialized, multi-step, multi-dynamic-processed (i.e., TincTract®-made) liquid herbal products also manufactures bulk ingredients for other dietary herbal supplement companies, the beverage industry, cosmetic/personal care product manufacturers, food product manufacturers, and confectionery manufacturers. These 'bulk ingredient' customers require ingredients from this producer that are not only 100% alcohol-free and flavor-rich, but are often required to be 'cold filled' or 'cold packed.' This means the serialized, multi-step, multi-dynamically processed ingredient must possess, before being added to other ingredients that make up its finished product, a high degree of antimicrobial activity, which it does.

All of this should put to rest, once and for all, the concerns and arbitrary or misguided misinformation regarding glycerin as a poor antimicrobial and preservative medium, when in fact the opposite is true, especially for the serialized multi-step, multi-dynamic processed liquid herbal glycerites described herein. Of course, along with the process technology used, the glycerin-to-water ratio in both the processing of an herbal glycerite and the finished product must be high enough to maintain glycerin's intrinsic antimicrobial properties.

Identifying The Actual Problems of Traditional Mono-Condition-Based Tincture/Macerate/Percolate Passive Cold-Processed Glycerites

To be accurate and fair to the industry and herbal glycerite-averse herbal practitioners, it should be recognized that there is a justification, albeit limited, for prior concerns and doubts of glycerin's extractive potential, potency outcomes, and antimicrobial/preservative quality regarding efficacy, shelf-life, and ingredient stability, which also explains a large part of the basis for the prevalent and overstated misinformation regarding glycerin and its use in making liquid herbal glycerites, especially regarding the serialized multi-step, multi-dynamic glycerin-based process.

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The following information relates only to 100% 'true' alcohol-free based glycerite products, not to the alcohol processed, then alcohol removed, then replaced with glycerin products (more accurately, truthfully, and legally referred to as 'dealcoholized' or 'alcohol-removed'), or products of low glycerin percentage content that have had alcohol post-process added for boosting aseptic quality, which only serves to introduce the denaturing and inert rendering effects of alcohol to the product. (Just keeping things apples-to-apples here.)

Other companies that make glycerin-based liquid herbs typically contain 50% to 60% glycerin in their finished products, with some even lower. This is more economical, to be sure, but does not result in the extractive potential, potency outcomes, consistency, stability, and quality of liquid herbal products that a high glycerin-to-water ratio that also utilizes the multi-condition-based serialized, multi-step, multi-dynamic process for liquid herb can result in, especially as regards extractive potential and the *antimicrobial* preservation quality the serialized multi-step, multi-dynamic processed (i.e., TincTract® made) product possesses to which glycerin is intrinsically known to possess – again, provided glycerin is used in high enough percentage of the extractive solvent and finished product accordingly.

Past texts on the subject state that, in general, preservative stability can be achieved with liquid herbs at a minimum glycerin content of 60% in an herbal glycerite. However, decades of personal and manufacturer-based experience of this white paper's author utilizing the multi-condition-based serialized multi-step, multi-dynamic process for making liquid herbal concentrates has decidedly shown, in innumerable instances, that this 60% (glycerin)/40% (water) ratio only works in two instances, and on a limited basis at that.

First, depending on the herb, the finished 60% glycerin-containing glycerite product sometimes needs to be hot (i.e., pasteurized) in its entirety upon being bottled and sealed, and no – based on decades of research and experience regarding this kind of product, Flash UV sterilization doesn't work. Secondly, once this finished glycerite product is opened by the end-user, only in very few instances, with specific herbs or certain types of formulas, will the opened product remain contaminant-free throughout a bottle's usage. In all cases, this minimal stated glycerin content is best refrigerated after opening, which only slows, but does not stop, contaminant growth and spoilage at this low glycerin percentage.

The situation becomes even more critical regarding quality, potency, contaminant-free preservation, and bacteriostatic activity if the minimal threshold for glycerin's preserving action (i.e., 60%) is lower in the finished product, as is the case for many other glycerine-made liquid extracts on the market. And Again, No! Adding a chemical preservative would not be acceptable to herb-consuming customers for a 'natural' whole-herb-based product.

What follows is an actual encounter between this white paper's writer and the owner of a small, niche-marketed company that makes herbal glycerites. As a niche-based competitor, they were at a trade show when the owner was asked about their product. They admitted that they use a 50/50 glycerin/water ratio across the board and do not use a viable antimicrobial *finishing* process anywhere along the way. There were even indications that they used an even more dilute glycerin concentration in their products to cut costs, which can only reduce their product's preservative (i.e., antimicrobial) potential and substantially reduce their product's potency and quality. In the years since this admission, this white paper's author has learned that many other makers of herbal glycerites are at a 50/50 glycerin/water ratio. Most claim to be totally 'cold processed,' with no sterilizing heat (i.e., 'pasteurization') applied to the finished products, with some producing what this white paper's author calls a 'dirty' herbal glycerite, meaning that they do not thoroughly filter the spent herbal roughage residue (called the 'marc') from the finished liquid extract (called the 'menstruum'), resulting in a product that is potentially contaminated by the unfiltered marc particulates, especially for mono-condition-based 'cold' only processed herbal glycerites.

This means that many herbs and formulas that are especially susceptible to microbial growth in dilute glycerin solutions (i.e., 50/50 ratio or less), such as the mucilage-rich and very alkaline pH single herbs and herbal combination blends, would not have strong enough antimicrobial properties to counter these contaminants once in a liquid form, as well as increased post-process REDOX in the bottle due to too little glycerin to staunch REDOX, further compromising the quality. To counter this, some, according to their own published admission, use flash UV sterilization to disinfect their finished products at the point of

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bottling/sealing. However, using flash UV radiation disinfection technology for liquid herbal products has three main drawbacks.

First, UV sterilization, which typically uses UV-C rays, has a limiting factor regarding UV 'penetration' into a liquid medium. UV rays have limited penetration potential. For instance, UV-A and UV-B rays have limited penetration through glass. UV-C, the type used for UV sterilization, also does not penetrate through glass. Additionally, UV penetrates only a very short distance into water, provided the water is clear, not colored, and not particle-dense. Typically, a UV sterilizing unit for fluid sterilization consists of a transparent tube through which the fluid passes, with the UV generator aimed at the tube to bombard the contents coursing through it with UV rays. If the tube is made of glass, UV-C will not pass through the glass. If a transparent non-glass material is used, such as a polymer-based material, it must also be ascertained that the non-glass material is not degraded by the high UV exposure and that there is no micro-contamination of the fluid with residual byproducts or toxins coming from a UV-degraded tube material, and, if the fluid is highly colored or of dense constituents causing opacity, the UV rays will only touch the exposed surface of the fluid passing through the tube, while the larger mass of fluid is not UV treated. If the fluid passes through the tube too quickly, it may not receive sufficient UV sterilization; if it passes too slowly, the UV can cause oxidative effects on susceptible constituents. There are additional considerations, but the key point is that UV sterilization is typically a 'Not-Fit-for-Use' protocol for sterilizing an herbal glycerite.

Second, once the product is opened and exposed to air, airborne microbes are immediately reintroduced into the product, where the medium has so little antimicrobial potential that they quickly multiply, thereby accelerating perishability and posing serious health and safety risks for consumers. Here's where the claim that alcohol is a better *sterile* medium might apply and be preferred, regardless of alcohol's denaturing and inert rendering effects on an herb's constituents and components.

The third problem with UV sterilization presents a significant product quality issue related to the intrinsic nature of a product's constituents and phytochemicals, particularly when a cold extraction process is used to preserve heat-sensitive components. It is well known that UV alters and/or destroys many of the components that a liquid herbal cold process intends to remove and preserve in their stabilized, bioactive state. It can be safely surmised that even flash UV sterilization could similarly alter components, akin to the denaturing and inert-rendering effects of alcohol, and that UV rays can potentially initiate and accelerate REDOX reactions and the byproducts they produce in a substandard glycerin content setting.

Enzymes, certain vitamins and cofactors, many phytoconstituents, active components, and certain aromatic compounds are altered or destroyed by both sustained and intense (flash) UV radiation – in many instances, like that of alcohol's denaturing and inert-rendering actions. It has been observed that finished quality, such as color consistency, texture, and even taste, varies dramatically from batch to batch when flash UV radiation sterilization is used for herbal glycerites, due to its uneven sterilizing effect, which can be influenced by factors as simple as the depth and density of color in the fluid being UV-treated.

This is not to say that flash UV sterilization does not have its place, even in our industry, especially where safety and purity are concerned, such as sterilizing or disinfecting working surfaces. However, if it is used for 'finishing' liquid herbal glycerite products, it is essential to recognize that its application is limited in its scope and effectiveness, to the point of being 'Not Fit for Use.'

A company that claims its liquid herbal glycerite products are UV sterilized is a strong indicator that the manufacturer is using a dilute amount of glycerin in the liquid extract medium, thereby necessitating, in their minds, the need for using UV sterilization and, hence, a distinct indicator of potentially low quality, minimal potency, inconsistent efficacy, and questionable safety. It is upon these latter points that the industry and herbal glycerite-averse practitioners have been justified in their assessment of the safety of traditional, low-glycerin-to-water-ratio tincture/macerate/percolate-style cold-processed herbal glycerite products. However, to say that all herbal glycerites don't meet adequate extractive potential, decent potency, efficacy, and antimicrobial/preservability quality standards is not only an unfounded premise, but it is also patently not true, especially where multi-condition-based serialized, multi-step, multi-dynamic herbal glycerite-processed products are concerned. The following paragraph explains why.

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All of the trade secret, multi-condition-based serialized, multi-step, multi-dynamic-processed (i.e., TincTract®-made) liquid herbal products are processed in a proprietary, pre-prepared glycerin-water base at a specifically established glycerin-to-water ratio for each herb and herb part being processed. However, in all cases, the finished liquid herbal products are standardized to a glycerin content of +/- 70%, resulting in exceptional extractive qualities and remarkable antimicrobial preservative properties. Stringent 3rd-party real-time lab analysis of the purity and safety of this process's finished products has consistently verified this, with the latest, as of this writing, confirming a 6-year BBD (Best By Date) listing on its product labels, the longest in the industry, and no refrigeration required after opening.

This white paper's author, as the developer of the multi-condition-based serialized, multi-step, multi-dynamic glycerin-based process (i.e., the TincTract® process), has liquid herbal samples he made during the first generations of the process back in the early 1980s that, every 7 years or so, are opened for organoleptic testing (i.e., color, taste, tactile sensation, microbial activity, etc.). None of those samples have degraded, with color remaining stable, no inversion, precipitates, or scaling. All show continued preservative quality and have remained as aromatic, flavorful, and stable as the day they were made – over 40 years ago as of the writing of this White Paper. And no – the 45-year-old serialized multi-step, multi-dynamic glycerin-based processed finished products have no additional preserving additives or flavorings and are not pasteurized, irradiated, or flash UV sterilized either, yet are astoundingly stable. Products made using the current generation of this unique process, now in its 12th generation of enhancements and refinements as of this writing, continue to exhibit the same astounding stability.

The multi-condition-based serialized, multi-step, multi-dynamic TincTract® processed liquid herbal products possess a higher vegetable glycerin-to-water ratio, which is more costly, but pays off in greater extractive potential, more consistent quality, stability, higher potency, and efficacy as a result of extracted ratio-intact constituents and the broad-spectrum components' intrinsic synergies and benefits remaining intact and biologically viable – all from enhancing the intrinsic properties and qualities of glycerin.

The Multi-Condition-Based TincTract® Serialized Multi-Step, Multi-Dynamic Process – 100% Alcohol-Free – An Industry Setting Standard for Over Four Decades!

Multi-condition-based serialized, multi-step, multi-dynamic processed 100% *true* alcohol-free liquid herbal products possess one of the highest degrees of extractive potentials and qualities derived by a 100% 'true' alcohol-free all-natural glycerin-water solvent base there is, that also results in extracting a broad-spectrum of constituents and compounds in their stabilized ratio-intact poly-constituent and biologically active synergies state, and is non-disassembling and non-destructive (i.e., non-denaturing and non-inert rendering) in its effects and preservative powers of recovered constituents, is super-absorbed into the body to a degree unmatched by alcohol, is highly nutritive, possesses important yet gentle detoxifying actions, does not trigger glycemic problems or provoke alcoholic addiction reactions, and has a fabulous flavor-enhancing quality that doesn't alter the benefits of the herbs used. The serialized, multi-step, multi-dynamic-processed products developed by this white paper's author are the most differentiated liquid herbal products in the industry. So much so that they are considered Liquid Herbs Reinvented™.

Does alcohol possess ALL the stated qualities and benefits of glycerin? Does alcohol even possess a simple majority of these qualities? No, it does not. Alcohol lacks the aforementioned qualities and benefits of glycerin. Though it calls into question and challenges one of the most tenaciously held dictums of herbal lore – alcohol being the preferred solvent for extracting botanicals – the evidence clearly shows that glycerin, when utilized and worked from a standard different than that for mono-condition alcohol-type tincture/macerate/percolate-based passive cold processes, is in many instances superior to that of alcohol as a broad-spectrum constituent-based extractive solvent agent both generally and specifically, for many herbs and botanical constituents, and potentially matches alcohol in safeguarding finished products if used at appropriate glycerin percentage levels, which places a serialized multi-step, multi-dynamic processed 100% 'true' alcohol-free liquid herbal glycerite products as one of just a few *premium* herbal products of its kind available in the industry. And again, not to be forgotten, glycerin does not contain the denaturing and inert-rendering effects of alcohol on many botanical constituents and compounds.

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The fact is, multi-condition-based serialized, multi-step, multi-dynamic-processed herbal glycerites, as developed by this white paper's author, are unmatched by anything else of their kind in the herbal products industry and have remained so for over four decades as of this writing, and have proven that glycerin is an extractive solvent that, on the whole, is more versatile and possesses greater extractive potential than alcohol on numerous points of consideration and use. And the science bears this out.

In conclusion, glycerin is a scientifically well-supported alternative to ethanol for botanical extraction and can be a preferred overall solvent when a viable extraction technology is applied, and the extraction objectives include broad-spectrum-based phytochemical recovery, reduced solvent volatility and instability, favorable hydrogen-bonding interactions, dielectric enhancements, and comparatively low denaturing and inert-rendering potential. Three findings are particularly important to all of this.

First, glycerin is not merely an inert carrier. Its molecular structure permits extensive, non-altering, non-disassembling/destructive interactions with dissolved compounds, and experimental and computational studies show it can provide favorable solvation of a broad spectrum of numerous botanical constituents.

Second, glycerin has documented stabilizing properties, as seen with protein conjugates and aromatic compounds. Research directly comparing the protein-denaturing effects of different cosolvents places glycerin substantially below ethanol in denaturing propensity under the conditions investigated.

Third, comparative botanical extraction studies show that glycerol-water systems can recover higher concentrations of selected phytochemicals than ethanol-based systems. This finding has been demonstrated across several plant materials and extraction methods.

Overall, the research supports glycerin as a preferred 'overall' botanical extractive solvent where broad-spectrum poly-constituent-based extraction, complex protein matrix compatibility, low volatility, high stability, and favorable consumer safety characteristics are prioritized.

It is understood that glycerin is not superior, in and of itself, for extracting every constituent to that of alcohol. There are specific botanical constituents that alcohol, on a process-to-process parity basis, extracts better than glycerin. However, for broad-spectrum botanical extractions, glycerin-based extractions appear to be the preferred choice for non-denaturing, non-inert rendering extractions that preserve constituent integrity, taste, efficacy, and long-term shelf stability. These claims are based on substantive scientific findings, not simply arguments based on glycerin's reputation as a food, pharmaceutical, or a novel botanical product extractive ingredient.

In the final analysis, the views presented herein, which include chemistry fundamentals, are not that ethanol invariably destroys all botanical constituents; it doesn't, but that glycerin offers a demonstrable and scientifically validated combination of broad-spectrum extraction capability, especially when coupled with the multi-condition-based serialized, multi-step, multi-dynamic TincTract® process, and its comparatively non-disassembling/denaturing, non-inert-rendering solvent behavior that makes it particularly attractive for potent broad-spectrum-based botanical preparations that also possess a uniquely high level of nutrient and micronutrient factors.

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Ancillary Segments

Regarding Use of 'Alcohol-Free' On Product Labels

The question often arises about the proper designation to list on product labels and in print/media regarding whether alcohol is used, not used, or removed.

Some companies in the past used alcohol in the production of their liquid herbal products, then removed it, replacing it with a carrier agent such as glycerin, and listed the product as "Alcohol-Free" on their labels. Some still do so.

However, in the aforementioned description, from a technical, scientific, and legal point of view, the product is not 'alcohol-free'. From a Federal regulatory policy basis, where alcohol is used at any time, it is not allowed to claim outright being 'alcohol-free,' as regulatory policies clearly state otherwise.

The American Herbal Products Association (AHPA), a trade organization representing manufacturers and marketers of herbal products, published a Guidance Policy on "Labeling of Alcohol-Removed Products," which the AHPA Board adopted in March 2016.

That Guidance Policy refers to both FDA policy and the Department of the Treasury's Alcohol & Tobacco Tax and Trade Bureau policy and positions on the issue:

- U.S. Federal law defines a product with 0.5 percent or more ethanol by volume as an alcoholic beverage. [27 U.S. Code § 214(1).] Though alcohol-based tinctures of liquid herbal products that often contain 25% - 30% alcohol are not pursued by TTB, due to coming under the FDA.

- The U.S. Food and Drug Administration (FDA) does not consider the terms "non-alcoholic"* and "alcohol-free" to be synonymous when applied to wine and malt beverages, and this Agency takes the position that the term "alcohol-free" may be used only when such products contain NO detectable alcohol. FDA considers such products containing less than 0.5 percent alcohol by volume as "non-alcoholic." But not 'alcohol-free!' [FDA Compliance Policy Guide (CPG) Sec. 510.400: Dealcoholized Wine and Malt Beverages – Labeling.]

- In its regulations on labeling and advertising of malt beverages, the Department of the Treasury's Alcohol and Tobacco Tax and Trade Bureau (TTB) allows, unless otherwise prescribed under State law, the term "non- alcoholic" on such products but only provided the statement "contains less than 0.5 percent (or .5%) alcohol by volume" also appears on the label. This regulation also limits use of the term "alcohol free" only to such products that contain NO alcohol. [27 Code of Federal Regulations § 7.65 (e) and (f).]

As is clearly shown and stated by two Federal regulatory agencies, TTB and FDA, the use of the term and wording "Alcohol-Free" can only be used on product labels and print/media where products contain no detectable alcohol or no alcohol at all, meaning NO alcohol is or was used in the making of a product at any time.

Regarding no 'detectable' alcohol, this is not a point that can be circumvented on the premise of a company taking the means and effort to remove alcohol and then claiming no alcohol exists in the product, as that is a chemical impossibility, since there is ALWAYS a residue of alcohol that remains in alcohol-removed, or dealcoholized, products; in the instance of some liquid herbal products, it can approach 5% detectable residual alcohol remaining depending on the herb(s) used.

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Regarding the regulatory statement, "… a product with 0.5 percent or more ethanol by volume as an alcoholic beverage." Alcohol-made or alcohol-containing herbal products are exempt from this clause because, according to TTB and FDA, they are not 'alcoholic beverages' but are listed as 'dietary supplements' used as herbal products.

The point being that if any alcohol is used in the making of a botanical/herbal product, even if an effort has been made to remove said alcohol, it cannot be considered or called an 'Alcohol-Free' product because alcohol was used, and 100% of the alcohol cannot be removed short of vaporizing the product itself into oblivion, AND the definition for being 'alcohol-free' clearly implies, both chemically and analytically, that no alcohol comes into contact at any time with the product, either pre-production, production, or post-production.

A dietary supplement product, including liquid herbs, made using alcohol, with an effort to remove alcohol, can only be listed on a product label and in print/media as "non-alcoholic," "alcohol-removed," or "dealcoholized." This means only products that never use alcohol can be listed on a product label and in print/media as "alcohol-free." The term "true" Alcohol-Free, as used to describe products made with the proprietary serialized alcohol-free glycerin-based TincTract® process, is indicative of this. Even so, due to the slippery nature of this issue, the wording of regulatory policies, etc., the best assurance that a product has never at any time come into contact with or been subjected to alcohol is to be Halal certified, as Halal certification is the only certification in the industry that guarantees NO alcohol has come into contact with the certified product at any time. All TincTract® made products are Halal certified and are the first and, as of this writing, the only liquid herb products in the industry and marketplace to hold this certification.

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Glycerin and Alcohol's Antimicrobial and Preserving Mechanisms Described

Whereas Alcohol's antimicrobial action is by way of a sterilizing and disinfecting mechanism, Glycerin's antimicrobial action is by way of its hygroscopic action, which retards and arrests microbial activity by depriving microorganisms of water, which in turn causes dehydration and death of microorganisms.

Put another way, alcohol has bactericidal activity, whereas glycerin has bacteriostatic activity. Although both actions stanch microbial activity, the mechanisms by which they do so differ markedly. Alcohol's bactericidal action works by directly killing microbes through chemical means, whereas glycerin's bacteriostatic action works by depriving the *microbe* of water, achieved by caging the pathogen and dehydrating it via glycerin's hygroscopic (i.e., water-depriving) action, ultimately inhibiting its growth.

Both have their distinct advantages and 'fit-for-use' constraints, especially where long-term preservation of the biological integrity of constituents is concerned, and most interestingly, the two different ways of bactericidal versus bacteriostatic activity also metaphorically relate to the two major philosophical models of health and medical care upon which allopathic/pharma drug and naturopath/homeopathic/herbal-based practices are based and approached. It is imperative that these two philosophical models be understood in terms of both the generality and specificities inherent in the glycerin-versus-alcohol subject as it relates to their microbial-stanching natures.

The two philosophical models being referred to are monomorphism, to which modern allopathic and drug-based science owes its existence, and pleomorphism, on which traditional (i.e., traditional medicine systems, naturopathy, homeopathy, etc.) and herb/nature-cure approaches are based. Whereas monomorphism is a fairly new premise that can only claim a formal existence of just over a century since it was proposed and accepted, and is still at the stage of a 'hypothetical' theory on many aspects, pleomorphism is based on a premise that reaches back thousands of years and is an integral part of some of the most successful and still practiced traditional medicine and healing systems from around the world, many of which still stand up to the test of time, scientific scrutiny, and results. Not to be ignored, pleomorphic phenomena, not monomorphism, are also the basis of life and its evolutionary processes.

Monomorphisms rose in medicine as a result of being embraced by the Pasteurian (Louis Pasteur, MD) school of thought, which operates on the premise that it is first a pathogenic agent that causes and renders the subject (i.e., terrain) diseased and, therefore, leaves the body's terrain in a state of crisis.

Pleomorphism, on the other hand, was embraced by the Bechampian (Antoine Bechamp, MD) school of thought, which basically operates on the eons-long-held premise that it is first the condition of a subject's terrain (the body's tissues and fluids) that determines if a pathogen is able to take hold and have any effect and thereby increase a sub-clinical state into a clinical state of crisis by further toxifying the terrain. Pleomorphic examples abound in nature, including soils, trees, and waters. They are not shifted directly into imbalanced or diseased states by pests, pathogens, or such, but are first affected by imbalances in soil biome and chemistry, hydro and mineral imbalance stressing of trees and plants, and shifting chemistry of waters, which are terrain-based events that happen before pests, pathogens, and such are able to take hold.

Monomorphic approaches typically directly target and kill a pathogenic agent with a prophylactic (i.e., an active remedy, usually a synthetic-derived drug), or chemical pesticides where nature and agriculture are concerned, and typically, especially in orthodox medicine and conventional agriculture, don't consider or address the pleomorphic-driven terrain aspect of the imbalances that made the incursion of pathogenic agents and pests possible. Alcohol has both a metaphorical and actual relationship to monomorphism.

Pleomorphic approaches directly affect and change the terrain a pathogenic agent has gained a foothold in or on, altering it to the point that the pathogen must change its form to accompany it, leave it, or be overcome and therefore perish. However, unlike a monomorphic approach, with its aim for quick results in killing or suppressing a pathogen or pest (while typically ignoring the rebuilding and revivifying of the terrain), the pleomorphic approach is a measured and more deliberate way that seeks to adjust or change terrain back to its healthy state that is not conducive to pathogenic or pest incursions. Glycerin has both a metaphorical and actual relationship to pleomorphism.

Integrative medicine and preventive health practices, with which this white paper's writer aligns, are healthcare approaches that are more eclectic, combining allopathic and holistic modalities and medicines into a single framework. Integrative medicine, coupled with preventive health care, has shown that, from a biological perspective, monomorphism and pleomorphism may be more interconnected than previously recognized. But that is for another presentation. That said, to better understand how monomorphism can couple with pleomorphism, a paraphrased Buddhist saying goes: "Walking the sides of a path solves no problems, but walking the middle of a path is where better clarity and solutions are to be seen and found."

As previously stated, alcohol is metaphorically related to monomorphism in how it deals with microbes or vectors of contamination, whereas glycerin is likewise metaphorically related to pleomorphism due to its more terrain-directed actions.

With alcohol, when a microbial agent is directly killed or destroyed outright, a decidedly monomorphic effect, it results in endotoxins. Often these endotoxins can be quite toxic to surrounding tissues, or when ingested, sometimes more so than the microbe itself, except that the denaturing and inert-rendering action of alcohol, in most cases, exerts the same actions on the endotoxic byproducts as alcohol's intrinsic antiseptic action on the microbe itself. However, there are instances where the endotoxins of a denatured and inert-rendered microbe may still cause problems in a biological system, such as allergic or sensitivity reactions that a practitioner needs to be aware of.

With glycerin, when a microbial agent is contained within a terrain, as a result of glycerin's solvent caging property and hygroscopic-based dehydrating actions, a decidedly pleomorphic effect, those effects are akin to something being in a desert, with the water being sapped from the body where dehydration takes place, and the thing dies, but it still remains contained in its shell, having only had water removed from it, thereby minimizing the endotoxic flush as happens when something is destroyed outright, and thus rendering the spent microbe less harmless while it, as a byproduct, is flushed from the body. It's a process that's in line with normal and healthy biochemical and physiological functions.

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Nevertheless, in both cases regarding alcohol and glycerin, they each exhibit distinct antimicrobial actions for stabilizing and controlling the vector of contamination that could potentially be caused by microbes, and they each do so in their own unique and highly effective ways.

Still in doubt as to glycerin's antimicrobial and preservative actions? Consider the following. When a reverse osmosis cartridge is tested (as all are before being packaged for sale), it will leave a residue of water in the membrane. If this residual standing water is not treated with a safe antimicrobial preservative, the residual water will culture and multiply microbes, and the resultant microbes will destroy the membrane, not to mention the danger to human health and safety. Alcohol cannot be used as the antimicrobial preservative agent for a reverse osmosis cartridge's membrane for two reasons. First, it will quickly make the RO membrane and rubber seals brittle; second, it will evaporate from the cartridge due to alcohol's diffuse aromatic nature, eventually leaving the RO cartridge with less or no antimicrobial protection. So, glycerin is used in newly manufactured and tested RO cartridges for its excellent antimicrobial and preservative action, and because it keeps an RO membrane pliable and within specifications while remaining fully acceptable for human health and safety.

Any further question as to glycerin's intrinsic antimicrobial and preservative actions and qualities can no longer be called into question, given the above facts that are supported by science and industry. Fact is, glycerin is every bit as good an antimicrobial and preserving agent as alcohol is where finished botanical extracts are concerned, and where the constituent integrity preservation factor is concerned, better. The important thing to remember is that the two antimicrobial mechanisms are distinct and therefore applicable to different applications. The key to retaining antimicrobial and preservative qualities in a given application, whether alcohol or glycerin, is again ***how*** they are used and what they are used for, and if they are 'fit-for-use' for a given use, not if one is arbitrarily intrinsically better than the other.

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Negative Impact of Alcohol on Nutrients, Minerals, and Enzymes

The following information concerning the effects of alcohol upon certain nutrients, minerals, and enzymes was taken from multiple sources. Please note the references. They're from government, medical, scientific, and professional sources. Of special note was the fact that, as of this writing, dry red wines appeared to be exceptions (aka the French paradox) to alcohol's negative effects when taken in moderation, and in fact have been shown, when consumed in low amounts, to be healthy for digestive and cardiovascular well-being, due to the kind of high antioxidant content of red wine.

[… – LCR] are inserted comments by this white paper's author/compiler.

Effect of Alcohol on Nutrient Absorption and Mineral Depletion Generally

Alcohol interferes with the metabolism of most vitamins and with the absorption of many nutrients. Alcohol stimulates both urinary calcium and magnesium excretion.
{Dept. of Health and Human Services, Report to Congress 1990} *[Glycerin does not do this. In fact, it possesses re-mineralizing uptake qualities and aids in the absorption of many nutrients. – LCR]*

It is best to hold off on that alcoholic drink for four hours after taking your vitamins. Alcohol may hasten a supplement's breakdown in the stomach, perhaps interfering with absorption.
{"Health Check," by Nancy Snyderman, MD, Good Housekeeping, Jan. 1998} *[The 'breakdown' spoken of here deals with the dissociation and inert rendering action of alcohol on many vitamins. – LCR]*

Alcohol reduces the absorption of food through the lining of the small intestine and interferes with the absorption of amino acids, glucose, zinc, and vitamins.
{"Alcohol and Tobacco, America's Drugs of Choice." Information Plus, 1999} *[A 1st year medical student is taught that alcohol reduces and interferes with oral and mucosal absorption in the digestive tract. – LCR]*

Alcohol hampers the efficient metabolism of fatty acids.
{"Get Health Now," by Gary Null, one of America's leading health and fitness advocates, 1999}

The presence of alcohol in some beverages may lessen their health-giving properties.
{American Journal of Clinical Nutrition, 2000}

Despite an adequate diet, alcohol can contribute to the entire spectrum of liver diseases. Alcohol interferes with nutrient activation, resulting in changes in nutritional requirements.
{'Alcohol and Nutrient Interaction," Nutrition Hints by Betty Kamen. Source - the Annual Review of Nutrition 2000} *[In fact, alcohol uses the same secondary enzyme pathway that pharmaceutical drugs do, which results in many toxic byproducts getting into the system that further compromise and damage liver tissues and function. – LCR]*

If alcohol is your soother, stress will hike your nutritional needs, and alcohol will reduce nutrient availability.
{"6 Steps for Handling Stress," Lauri Aesoph, ND, Health World Online - June 2001}

According to USDA surveys, fewer than two percent of Americans are following a diet with the recommended amounts of fruits, vegetables, and whole grains.
{Eating Right columnist Lawrence Linder, executive editor of the Tufts University Health & Nutrition Letter, Washington Post Health, October 24, 2000} *[This implies that fewer intake of nutrients are happening, and the use of alcohol negates availability of the already deficient intake of vitamins and nutrients, so if you are already taking in fewer nutrients, as 98% of the population are doing, and the Tufts University Health & Nutrition Letter points out, then alcohol consumption is even more of a risk for challenging deficient nutrient uptake, thus resulting in health problems. – LCR]*

Food in the stomach will compete with ethanol for absorption into the bloodstream. It is well known that alcohol competes and influences the processing of nutrients in the body.
{"Alcohol, Chemistry and You," Kennesaw State University, chemcases.com - August 2002} *[And the mouth is part of the digestive system. Where did the alcohol based liquid herbal tincture industry ever come up with the erroneous idea that their alcohol-based products are 100% absorbed immediately? This is not true, as science has clearly shown. – LCR]*

Effect on Vitamin A Requirement

More vitamin A is needed by those who drink alcohol because faulty liver enzymes are dissipated more quickly. Rats tested could not deal with vitamins because of the toxic by-products when combined with alcohol.
{New York Times, Oct. 20, 1985} *[Even if you disagree with linking rat research to human health, the fact remains that a rat, like a human, possesses the liver enzymes to metabolize alcohol, with the point being that alcohol is clinically shown to negatively affect vitamins. – LCR]*

Although five times the daily vitamin A requirement has no detectable adverse effects when given alone, when combined with alcohol, there is a leakage of a cellular enzyme into the bloodstream. Vitamin A supplementation then might hasten rather than alleviate the development of liver disease.
{Lieber CS. Biochemical and molecular basis of alcohol-induced injury to liver and other tissues. New England Journal of Medicine, 1988}

Recent research has found that the presence of alcohol increases the amount of vitamin A in some tissues, depletes it in others (such as the liver), and speeds up or alters the process by which the vitamin is converted into metabolic by-products. Alcohol can promote extra insulin release from the pancreas in response to glucose, causing hypoglycemia, and at the same time, alcohol depletes the liver's glycogen stores and impairs its capacity for formation of new glucose.
{The Nutritional Effects of Alcohol, Mount Sinai School of Medicine Complete Book of Nutrition} *[The reason for the high hypo-glycemic load of alcohol has just been described. On the other hand, glycerin,*

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which possesses a low glycemic load, actually does the opposite of alcohol in these cases. In fact, it is possible that glycerin loads up glycogen stores in the liver – a real plus indeed. – LCR]

Alcohol interferes with zinc and vitamin A metabolism in the liver and can exacerbate the effects of night blindness.
{"Eye Signs Can Reveal Your Nutritional Health," alternativemedicine.com - June 2001}

Continued alcohol use can create changes in the digestive system which make nutrient absorption difficult. Alcohol may interfere with the body's ability to use vitamins. Breakdown of vitamin A also accelerates and may lead to vitamin A depletion in the liver. Sometimes acetaldehyde, a byproduct of alcohol oxidation, will bind with an amino acid, leading to reduced glutathione, an important substance in the liver. Glutathione helps scavenge toxic free-radicals.
{"Alcohol's Effect on the Liver," Charles Leiber, MD, Director of Alcohol Research and Treatment Center, professor of medicine and pathology, Mt. Sinai School of Medicine of the City University of New York, September 2002 - www.health20-20.org}

Effect on B Vitamins

Alcohol destroys B vitamins. This is a list of minerals and vitamins that you will need to supplement if you drink alcohol: calcium, potassium, magnesium, zinc, copper, vitamin C, thiamine, and riboflavin.
{"The Complete Guide to Your Emotions and Your Health," Editors of Prevention magazine. 1986} *[Thus, alcohol also destroys most vitamins, especially the B vitamins, including vitamins in liquid herbs that have been made with or come into contact with alcohol. – LCR]*

You can guard against folic acid deficiency by making sure that your diet is balanced. Avoiding alcohol will lower your risk for this deficiency.
{American Medical Association, 1994}

Alcohol is known to promote folic acid deficiency and has also been linked to an increased risk of colon cancer.
{Vitalcast.com - HealthNotes on line. Klatsky A. L., et al., "The relations of alcoholic beverage use to colon and rectal cancer," American Journal of Epidemiology, 1998} *[Unlike any alcohol based herbal tincture, an herbal glycerite can be used for enemas and colonic irrigation purposes, with surprising benefits. – LCR]*

Even in small amounts, alcohol will destroy vitamins B12, B6, and folic acid, which causes an increase in susceptibility to homocysteine, a greater predictor of heart disease than cholesterol.
{"The Ultimate Anti-aging Program," Gary Null, 1999}

Alcohol can lower levels of both folic acid, a B vitamin that may prevent polyp formation, and methionine, an amino acid that appears to block carcinogenesis. The more you drink, the higher the risk of colon cancer.
{Self Healing newsletter, Dr. Andrew Weil, Jan. 2000}

Folic acid, a B vitamin, is important. The brains of nuns in a study who had high levels of folic acid in their blood deteriorated more slowly. Alzheimer's is a brain-wasting disease, and the last thing you want to do is to nutritionally deprive the brain tissue. The body is rusting, and you have unstable oxygen that tears down the tissues and joints, causing oxidation. Depression may make the symptoms appear earlier.
{The Nun's Study," June 23, 2001, People's Pharmacy, Public Radio. Guest: Dr. David Snowden, author of "Aging with Grace."} *[Alcohol is a major contributor to depriving brain tissues of nutrients. – LCR]*

Ten to thirty percent of older people may be unable to absorb natural B12 from food.
{"Women's Health Advisor," Weill Medical College of Cornell University, June 2001} *[Alcohol use contributes to this depletion. – LCR]*

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A new study in the journal Epidemiology reported that women whose diets were lowest in folate faced no greater cancer risk than women with higher-folate diets - if they were nondrinkers. But if they drank more than two alcoholic drinks a week, their breast cancer risk increased almost 60 percent. JAMA earlier reported similar findings from the Nurse's Health Study (cited as a 40% risk). It is too early to know, however, if simply getting sufficient folate is enough to prevent alcohol's damaging effects.
{"Alcohol Worse for Some Women," Karen Collins, R. D., msnbc.com/news - Dec. 2001}

Avoiding alcohol can minimize already depleted nutrients. 10% to 30% of older people may be unable to absorb natural B12 from food.
{The Center for Women's Healthcare newsletter, June 2001}

A fifty percent increased risk of early miscarriage is linked to the lack of folic acid, says a Swedish-American study.
{HealthScout.com - October 2002} *[And, alcohol ingested during pregnancy interferes with folic acid and its utilization. – LCR]*

Every drink you take causes thiamine loss, impaired B6 activation, folate loss, and increased magnesium excretion.
{from the book "Hormone Replacement Therapy: Yes or No," by Betty Kamen - 2002}

Alcohol's Effect on Minerals as Coenzymes

The use of alcohol lowers magnesium at a faster rate. Magnesium is important in over 300 identified enzymes in the body, and a deficiency can result in a host of problems. Blood test results can show it to be normal when levels are actually low. Calcium is used to make a muscle contract, while magnesium makes it relax. The two must be in a specific ratio to each other.
{from the book: "Tired or Toxic," by Sherry A. Rogers, an expert on chemical sensitivities, and how low levels of vitamins/nutrients can cause serious health problems, 1990} *[As stated before, alcohol denatures, renders inert, and destroys numerous water-soluble nutrients and active constituents that previously possessed a complete bio-active nature. Nowhere is this more evident than in what alcohol does to an herb's water-soluble and aromatic components when that herb is tinctured in a fluid base (i.e., menstruum) containing even small amounts of alcohol. – LCR]*

Even a small amount of alcohol can drain magnesium reserves.
{from the book, "Preventing Arthritis," by Donald Lawrence, MD, PhD, specialist in the study of pain, 2000}

GABA

Alcohol lowers GABA, which makes it more likely that those who consume alcohol will develop panic disorders. A Yale study showed that low GABA levels are linked to panic disorders. GABA is a major inhibitory neurotransmitter, a brain chemical.
{About.com - July 2001} *[Consider the potential 'triggering' effect alcohol based liquid herbal tinctures have, even those that have been processed with alcohol and had the alcohol removed and replaced with glycerin. The alcoholic 'trigger,' an energetic phenomenon, is still present, as many dry alcoholics, who may deal with panic disorders, will attest to. – LCR]*

Lowered inhibitions accompany even low-dose use of alcohol. The neurotransmitter GABA, which serves as an inhibitor, is most affected by alcohol. For some who consume alcohol, lowered inhibition can result in being heavily involved in anti-social behavior, such as aggression, violence, and sexual assault. When GABA receptors are activated by alcohol, they change over time to become less sensitive not only to ethanol but to GABA, benzodiazepines, and other GABA agonists as well.
{Valenzuela & Harris, 1997};{alcoholmd.com - October 2001}

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Aging and Alcohol

The older population is already malabsorptive, so the risk is even greater when using alcohol. As you get older, a common problem is low stomach acid and diminished secretion of digestive enzymes. Lack of hydrochloric acid and digestive enzymes can lead to malabsorption of nutrients, plus the growth of putrefactive bacteria and gas-producing yeasts in the intestinal tract.
{Richard P. Huemer, MD, "Poor Digestion in Elderly," Let's Live magazine, Nov. 1999. In 'Your Health Column.'}

Osteoporosis

"For 28 million Americans (80% women), osteoporosis is a major public health threat. Ten million already have the disease, and 18 million more have low bone density. Limit alcohol because it is a risk factor. "
{National Osteoporosis Foundation, 2000}

Oxidative Stress

Alcohol hastens the breakdown of antioxidants in the blood, speeding their elimination from the body.
{CNN.com - July 2000} *[The same effect has been observed in alcohol based liquid herbal tinctures with a high ascorbic content (a water-soluble component) and polyphenol-based flavonoids, evidenced by the fact that these liquid extracts, with these compounds, darken with time as the oxidative reduction process (REDOX) ensues for both REDOX of antioxidants and many mineral components. (Often, other, less antioxidant and/or mineral-rich alcohol herbal tinctures lighten ('bleach') over time, not darken, as REDOX can go both directions – in either case, indicative of REDOX activity of an alcohol based product.) – LCR]*

In patients who had oxidative stress from alcohol-induced liver disease, antioxidant therapy (2,500 mg a day of vitamin C for 10 days) accounted for over a 50% decrease in stress. This would be a wise supplement for anyone drinking significant amounts of alcohol, but even wiser to avoid the alcohol.
{www.mercola.com - May 10, 2001}

The by-products of alcohol metabolism generate free radical oxidants that can contribute to cell damage. An imbalance between oxidants and antioxidants can create oxidative stress, a state marked by continued production of free radical oxidizing agents and escalation of cell damage.
{Alcohol Research & Health, Vol. 25, No. 4, 2001}

Alcohol, Nutrients, and Anti-Social Behavior

There has been evidence dating as far back as 1942 linking nutritional deficits to antisocial behavior. A study in the British Journal of Psychology (2002) states that young adults who consume adequate amounts of essential nutrients are less likely to engage in antisocial behavior, including violence.
{"Nutrients and antisocial behavior," Betty Kamen, PhD, and Michael Rosenbaum, MD, "Nutrition Hints," August 2002} *[The use of alcohol negates the essential effects of needed nutrients. – LCR]*

Summation

This '*Negative Impact of Alcohol on Nutrients, Minerals, and Enzymes*' segment, along with the '*Glycerin's Antiseptic and Preserving Mechanism Described*' segment, is to convey that glycerin, not alcohol, as also detailed in the beginning GLYCERIN VERSUS ALCOHOL segment – Concerning Herbal Liquid Extracts, enjoys the higher station of not only being a more versatile broad-spectrum-based fluid extractive solvent and constituent integrity preserving agent but also possesses distinct biochemical tissue cleansing and physiological building properties. Alcohol does not possess many, and oftentimes none, of the positive biological qualities attributed to glycerin. One example (of many) is its purported immediate

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oral absorption: alcohol initially inhibits oral absorption (and distorts flavor components), whereas glycerin triggers and enhances it.

Among the food processing and flavorist industries and a very small cadre of herbal practitioners and liquid herbal producers, it is now accepted that alcohol is a denaturing and inert rendering extractive agent on many important botanical constituents, and is not capable of removing many herbal constituents in their intrinsic integrity-retained form to the degree previously believed, and that glycerin is actually capable of doing so, provided it is *worked* properly to do so. The key, and one that the early Eclectics and followers of Eclectic alcohol dogmatism continue to miss, is that 'how' glycerin is 'worked' makes the difference. It's that simple!

Glycerin has a much higher volatility and flash index versatility, has a lower REDOX index, possesses a protective caging quality upon constituents, has a decidedly higher colloidal/solvate dispersion-enhancing index while imparting modulating, facilitating, and stabilizing effects to a glycerin/water-based solvent in the multi-condition-based serialized, multi-step, multi-dynamic process, and it is much more stable in maintaining the intrinsic synergies and poly-constituent-based biological integrity of the broad spectrum of constituents, colorings, flavors, etc., of an herb's liquid extracted parts than alcohol is intrinsically capable of doing. These observations are not speculative or hubristic; they are rooted in science, fundamental fluid chemistry, and comparative product-features feedback.

Unlike alcohol and the harsh chemical solvents that have come to be used extensively by the pharmaceutical and phytopharmaceutical industries (i.e. acetone, benzene, ethyl acetate, hexane, propane, toluene, etc.), USP grade, Kosher certified, Halal certified, GMO-Free vegetable glycerin is all natural, nutritive, and a phenomenal safe extractive solvent accompaniment when used in the 'Think Outside The Box' way it's used in the TincTract®'s muti-condition-based serialized multi-step, multi-dynamic process for making totally 100% 'true' alcohol-free premium liquid herbal concentrate products.

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