

Why We Study Medical Botany & Pharmacognosy

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It is an amazing story if not a depravity that the planetary medical school curriculums would eliminate the study of medical botany and pharmacognosy in favor of a sterile and largely synthetic pharmacology. To take a queer notion that fossil fuels developed from animals dead more than 300 million years old could be excavated from the bowels of the earth and be magically transformed into therapeutic drugs escapes any naturalist with common sense. Since most synthetic drugs and plastics rely on petroleum-derived starter chemicals, the environmental situation around the world today is in crisis, from social, medical and ecological perspectives, and we must *sound the alarm* and compel an effective response from humanity, in time to save life on Earth from otherwise almost certain destruction. So let's start with some definitions:

Medical Botany

The study and use of plants in biomedicine. Includes the effect on human health of dietary, remedial, poisonous, psychoactive plants, fungi, and microorganisms. Medical botany includes medical ethnobotany, how people of a particular culture and region make use of indigenous plants and explain complex relationships between cultures and plants.

Pharmacognosy

The branch of pharmacology that deals with drugs in their crude or natural state and with medicinal herbs or other plants.

It would seem queer that one who sets out to study medicine, defined as - *the art or science of restoring or preserving health or physical condition* - would not make a study of biology and botany as human life cannot subsist let alone survive without a food source upon which to sustain the frame. The interconnectedness of the survival to the human frame to plant life is as vital as the recycling of atmospheric carbon dioxide into oxygen. The fact that the human frame is vitally dependent on minute food substances known as vitamins and minerals which must be obtained from plant sources makes this study mandatory for our School. Reciprocally, when these food substances are in deficiency, considerable suffering is experienced which would make this study vital to future medical practice.

Regarding the so-called non-nutritive factors as found in herbs, grasses, tubers, and leaves - that classified as *deviant energies* to the Orientals, and deviant practices to allopaths - we have here a bounty of intrigue and mystery. Actually, a practitioner could spend an entire career exploring the unique properties of just a small collection of herbs, which some of our Fathers (and Mothers) of herbology have done in the eras past.

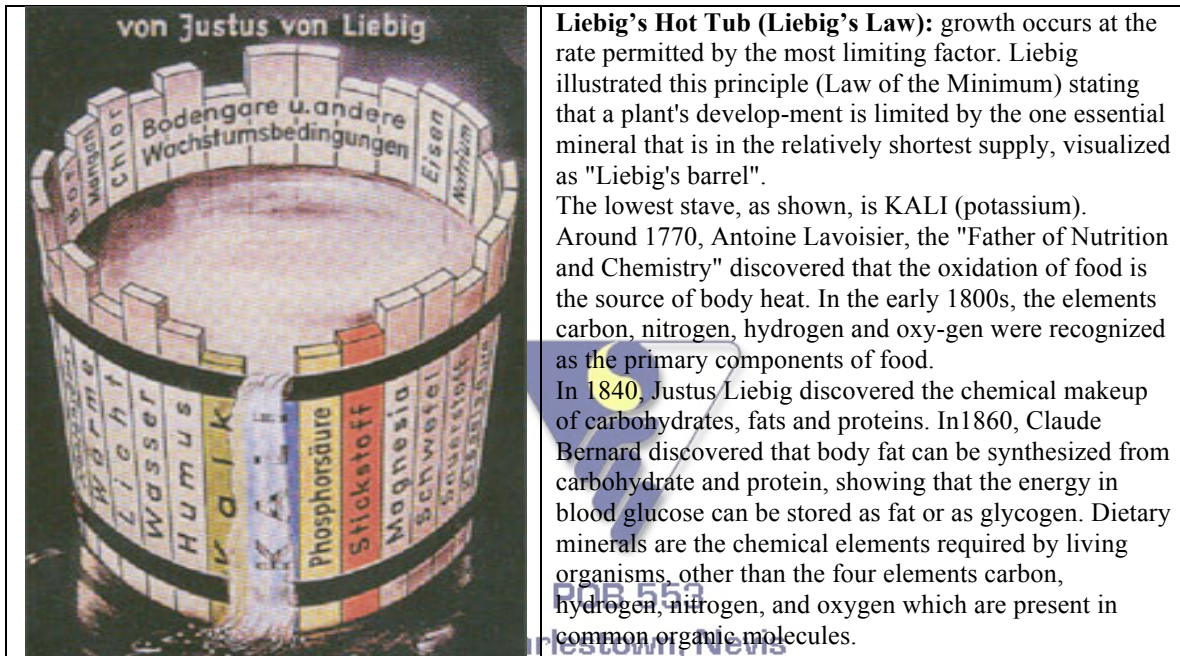
But let's get down to basics, as it was actually agriculture that opened the door to nutritional therapies and improvements in the human diet. That door was Justus von



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Liebig who worked on applying chemistry to plant and animal physiology and nutrition which was especially influential. Liebig's *Law of the Minimum* was a principle which states that growth is controlled not by the total of resources available, but by the scarcest resource as the limiting factor. This concept was originally applied to plant or crop growth, where it was found that increasing the amount of plentiful nutrients did not necessarily increase plant growth. Only by increasing the amount of the limiting nutrient, the one most scarce in relation to "need", was the growth of a plant or crop improved.



Liebig's Hot Tub (Liebig's Law): growth occurs at the rate permitted by the most limiting factor. Liebig illustrated this principle (Law of the Minimum) stating that a plant's development is limited by the one essential mineral that is in the relatively shortest supply, visualized as "Liebig's barrel".

The lowest stave, as shown, is KALI (potassium).

Around 1770, Antoine Lavoisier, the "Father of Nutrition and Chemistry" discovered that the oxidation of food is the source of body heat. In the early 1800s, the elements carbon, nitrogen, hydrogen and oxygen were recognized as the primary components of food.

In 1840, Justus Liebig discovered the chemical makeup of carbohydrates, fats and proteins. In 1860, Claude Bernard discovered that body fat can be synthesized from carbohydrate and protein, showing that the energy in blood glucose can be stored as fat or as glycogen. Dietary minerals are the chemical elements required by living organisms, other than the four elements carbon, hydrogen, nitrogen, and oxygen which are present in common organic molecules.

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Now let's compare Liebig's Law to the dietary food industry: growth is controlled not by the total of resources available, but by the scarcest resource as the limiting factor. School lunch would be a good example of the violation of Liebig's Law. In order to qualify as a federally reimbursable school lunch, meals must meet specific guidelines. School lunches must:

- Provide variety of foods from My Pyramid and meet one-third of children's daily calorie needs.
- Provide one-third of children's daily needs for "problem nutrients" — protein, vitamins A and C, iron and calcium.
- Limit the amount of fat to 30 percent or less of calories and saturated fat to 10 percent of calories when averaged over the course of a week.
- Offer a variety of milk options, including fat-free, low-fat and reduced-fat milk. Schools can also offer flavored milk and lactose-reduced fat milk.

In the year 1873, Dr. Wilhelm Heinrich Schuessler came to the conclusion that missing inorganic mineral salts will cause disruption to the living processes and therefore create illnesses. This results in an inhibition of the cell metabolism. If the missing mineral is supplied the disrupted cell metabolism starts working properly again. He provoked great excitement amongst his colleagues. Human mineral nutrition was now born.



The Biochemic method of healing according to Schussler: The inorganic plant substances (agricultural biochemics) have already found their use in agriculture. "Accordingly my therapy is an analogy to the agricultural chemistry. It is exactly the same, and every farmer knows, if sick plants, when fertilized with a solution of the appropriate mineral salt can be brought to thrive, I cure the sick tissues by supplementing molecules of an inorganic salt which is homogen to that, that caused the questioned illness through its functional disorder."

Thus we come now to understanding trace minerals. The limiting factors in body metabolism that will control the entire range of metabolic events. Deprive the cell of one of the essential trace elements, and it will dysfunction, die, or ferment and turn to cancer.

Electrical Properties of Living Tissue

The primary unit of living tissue is the single cell. Its primary function is to produce energy in the forms of electrons or potential energy. For example, metabolism involves action by enzymes to produce essential substances for organism requirements; i.e., anabolism causing oxidation or cell breakdown by catabolism into waste matters all of, which is the process for transforming food into protoplasm and electron energy as products of electrolytic decomposition.

As an electrically alive entity, the cell can be represented simply as an electrolyte (ionic salts) containing a variety of subcellular structures necessary for metabolism, repair, and reproduction that are enveloped totally by a membrane exhibiting low electrical leakage in the resting state. Generally speaking, an aggregation of cells of differing shapes bonded together are called glands and tissues that are surrounded by electrolyte fluids, which is characteristically known as the *volume conductor* (blood and lymph). The volume conductor allows us to take transdermal readings for heart (ECG) and brain (EEG) monitors.

Minerals, or more specifically *ions*, are the source of life. They convey electrical energy to cellular reactions. They conduct electrical energy through the body allowing the heart to beat, muscles to contract, and the brain to think. They catalyze numerous enzyme reactions controlling many metabolic functions.

Let's take magnesium as an example. Magnesium is needed by every cell in the body including those of the brain and is one of the most important minerals when considering supplementation because of its vital role in hundreds of enzyme systems and functions related to reactions in cell metabolism, as well as being essential for the synthesis of proteins, for the utilization of fats and carbohydrates. Magnesium is needed not only for the production of specific energy production enzymes but is also important for energy production related to cell detoxification. A magnesium deficiency can affect virtually every system of the body.

Hydroponics and Human Nutrition

Hydroponics (from the Greek words *hydro* water and *ponos* labor) is a method of growing plants using mineral nutrient solutions, without soil. Terrestrial plants may be grown with their roots in the mineral nutrient solution only but better in an inert medium, such as perlite, gravel, or mineral wool.

Plant physiology researchers, beginning with Liebig, discovered in the 19th century that plants absorb essential mineral nutrients as inorganic ions in water. In natural conditions, soil acts as a mineral nutrient reservoir but the soil itself is not essential to plant growth. When the mineral nutrients in the soil dissolve in water, plant roots are able to absorb them. When the required mineral nutrients are introduced into a plant's water supply artificially, soil is no longer required for the plant to thrive. Almost any terrestrial plant will grow with hydroponic solutions. Hydroponics is now also a standard technique in biologic research and teaching.

Without advancing an argument for or against hydroponics, the author made a long study of nutrient solutions, grew vegetables hydroponically, and found rather amazingly how they parallel human nutrition needs. The essential differences between plant nutrition and mammalian nutrition is:

1. The nitrogen source in plants is largely from nitrate whereas mammals require amino acids (which plants provide).
2. Plants generally require an abundance of carbon dioxide (which mammals generate), whereas mammals require an abundance of oxygen (which plant life generates).
3. Sodium (Na⁺) at high millimolar concentrations in soils is toxic to most higher plants and severely reduces agricultural production worldwide. This is why we cannot water crops with seawater.

With the exclusion of these three factors, nutrient solutions in terms of ions for both plants and animals are rather parallel. First to understand is the vital ingredient of both forms of nutrition rotates around water. It should be no surprise, that water is involved in the Animation of All Three Kingdoms of Life.

Minerals Plants Animals

**Magnesium
Sulfate
Crystals
51% Water**

**Average
Plant
80-90%
Water**

**Human
Animal
85% Water**

Water Transports Electrically Charged Atoms in ...

**Mineral Solutions
Acid Battery Cells**

**Plant Sap
Plant Cells**

**Blood
Body Cells**

Cells are specialized environments for electrical activity to both plants and animals. The electrical properties of most aqueous solutions is generally influenced by

colloids. A colloid is a type of chemical mixture where one substance is dispersed evenly throughout another. These are particles that can be large molecules like proteins, or solid, liquid, or gaseous aggregates that remain dispersed indefinitely. All living matter contains colloidal material, and a colloid has only a negligible effect on the freezing point, boiling point, or vapor tension of the surrounding medium. Minerals, ions, proteins and amino acids are held in suspension in liquids as colloids. The material within which the thyroid gland stores its hormones is a protein colloid containing iodine. It is this *bioelectric world* that allows ions to activate the form of the molecules of life.

Since colloids in suspension form chemical compounds with ions in solution, the suspension characteristics of colloids are generally ignored in biology. Colloids are held in suspension by a very slight Electro-negative charge on the surface of each particle. This charge is called Zeta Potential. Like charges repel each other, so *particle domains* with negative outer regions will move away from each other — as in nature's anti-collision (colloid) system.

The ability of a liquid to carry material in dynamic suspension is a function of these minute electrical charges. As the electro-negative charge (which is alkaline) increases, more material can be carried in suspension. As the charge decreases, (i.e. increasing toxic acids) the particles move closer to each other and the liquid is able to carry less material. There is a point where the ability to carry material in suspension is exceeded, and particles begin to clump together with the heavier particles materials dropping out of the liquid and coagulating. This is what happens to particles of platelets in blood, when they lose their electronegative charge, they clump, and when a lot of them clump, you develop a blood clot as in stroke, heart attack, or embolism.

This is why we use high frequency electrotherapy for lymphatic drainage. When lymph fluid proteins lose their electronegative charge, albumin clumps with sodium and other tissue acids, causing lymphatic stasis. If we irradiate the fluid with high frequency, electronegative voltage, we can more easily move the lymph by manual massage and copious quantities of alkaline water intake.

So, plant cells and animal cells have colloidal properties, within which ions act as the activator of life, allowing electrical charges to carry on metabolism. Animals eat plants for their nutrition, so it is not surprising there would be parallels in colloidal properties. So consider these interesting comparisons:

- **Calcium:** The need in adult human nutrition is approximately 1,000 mg. per day, of which the average person obtains up to 500 mg. from eating plants. Seawater, which has amazingly similar compositions to human blood contains 400 mg. per liter, while hydroponic nutrient solutions contain 200 mg. per liter. Of the 1000 mg. per day suggested dietary intake, at least one third is excreted in the feces and urine daily, even more so if gastric hydrochloric acid is deficient.

- **Silica:** In the oceans, silicon exists primarily as orthosilicic acid (H_4SiO_4), and its geochemical cycle is regulated by the group of algae known as the diatoms. These algae polymerize the silicic acid to biogenic silica, used to construct their cell walls (called frustules). Silicon present in plants is almost equivalent to macro nutrient elements like calcium, magnesium, and phosphorus. Plant takes up silicon as silicic

acid, the bio available form of silicon, which is transported to the shoot and surface of leaves and stems. Orthosilicic acid is the form predominantly absorbed by humans and is found in numerous tissues including bone, tendons, aorta, liver and kidney. Compelling data suggests that silica is essential for health although no RDI has been established. However, deficiency induces deformities in skull and peripheral bones, poorly formed joints, reduced contents of cartilage, collagen, and disruption of mineral balance in the femur and vertebrae. The same is true for plants, yet silica is not listed as one of the 13 essential elements for nutrient solutions. However, as in humans, recent studies with greenhouse grown tomatoes and cucumbers have shown that with adequate silicon, plants are more vigorous and unusually resistant to fungus disease attack. Best growth is obtained when the nutrient solution contains potassium silicate in 10 parts per million (10 mg. per liter) of silicic acid (H_2SiO_3). Human nutrient supplementation is quite similar.

- **Boron:** Boron is an essential nutrient for the transport of photosynthates, especially important during flowering and fruiting. As an ultratrace element, boron is necessary for the optimal health of mammals, though its physiological role in animals is poorly understood. In hydroponic solution it is adjusted to around 2 mg. per liter. Boron is a natural constituent of the diet and human consumption is not trivial, on the order of 1+ mg/day. Gastrointestinal absorption of boron approaches 100% and has a low order of toxicity. For adults, the Tolerable Upper Intake Level (UL) for boron is 20 mg/d. The Institute of Medicine has not set any Dietary Allowance (RDA), yet there are several lines of evidence that suggest boron depletion prevents growth and completion of the life cycle in animals. Some victims of arthritis report benefits by taking boron in 3 mg. doses. It has also shown to prevent bone loss in osteoporosis.

- **Monopotassium phosphate** – KH_2PO_4 – is a soluble salt which is used as a fertilizer, a human food additive, and a fungicide. It is a source of ionic phosphate and potassium, and is a buffering agent. When used in fertilizer mixtures with urea and ammonium phosphates, it minimizes escape of ammonia by keeping the pH at a relatively low level and is often used as a nutrient source in the greenhouse trade and in hydroponics. It is one of the components of Gatorade.

- **Zinc:** Zinc is part of specific enzymes and growth regulators. Zinc sulfate ($ZnSO_4$) is a colorless crystalline, water-soluble chemical compound typically used in hydroponic solutions as well as plant foliage sprays. It is used to supply zinc in animal feeds, fertilizers, and agricultural sprays. In hydroponic solutions it is generally used around 0.25 mg. per liter whereas the recommended dietary is around 15-30 mg. per day. Zinc sulfate is the solution used in the *Mineral Taste Test* which a significant percentage of patients cannot taste, indicating deficiency.

So, in terms of nutrition for plants and animals, there are many parallels regarding mineral elements. Healing waters in many parts of the world are partially hydronutrient solutions since they contain mineral ions. When salts are added in proportions similar to hydroponic solutions, many parallel human nutritional needs. The Gators football coach, Ray Graves, in 1965 was frustrated with the performance of his players during the hot summer football practices, and asked the team doctor, one of Cade's associates, for his insight. Cade and his research team came across the unique mix of water, sodium, sugar, potassium, phosphate, and lemon juice that is

now known as Gatorade in honor of the football team. Intended for consumption during physically active occasions, Gatorade beverages are formulated to rehydrate and replenish fluid, carbohydrates and electrolytes. If the producers understood nutrition better, trace minerals would enhance the value of the product.

Deviant Energies

If we can imagine some 425 to 500 million years ago, i.e. The Ordovician Period, marine invertebrates were still the dominant life form, although a few plants managed to gain a foothold on land. Plants as their method of survival and adaptation had to struggle against a myriad of soil bacteria in order to survive. Seedlings when dropped on the ground had to produce *antibiotics* in order for their sprouts and roots to survive and dig into the soil.

So now we come to a focal understanding: all plants by their very nature contain some form of antibiotic! Essential oils are some of the most potent forms of antibiotics found in plants. Let's examine one of the more ubiquitous antibiotics, one which we should drink everyday, tannins.

Tannins are astringent, bitter plant polyphenols that either bind and precipitate or shrink proteins, like mucus. The astringency from the tannins is what causes the dry and puckery feeling in the mouth following the consumption of red wine or an unripened fruit. The term tannin refers to the ancient use of tannins in tanning animal hides into leather; however, the term is now widely applied to any large polyphenolic compound containing sufficient hydroxyls and other suitable groups (such as carboxyls) to form strong complexes with proteins and other macromolecules.

Tannins are distributed all over the plant kingdom. They are commonly found in both gymnosperms as well as angiosperms. In terms of location of the tannins in a plant, they are mainly located in the vacuoles or surface wax of the plants. These sites are where tannins do not interfere with plant metabolism, and it is only after cell breakdown and death that the tannins are active in metabolic effects. Tannins are found in leaf tissues, bud tissues, seed tissues, root tissues and stem tissues.



The tea plant (*Camellia sinensis*) is an example of a plant said to have a naturally high tannin content. When any type of tea leaf is steeped in hot water it brews a "tart" (astringent) flavor that is characteristic of tannins as is the brownish color. This is due to the catechins and other flavonoids. Tea "tannins" are chemically distinct from other types of plant tannins such as tannic acid and flavorful tea extracts and should contain no tannic acid. Tea we could say is the *wine* of the Orient.

Tannins in grape skins and seeds (the latter being especially harsh) tend to be more noticeable in red wines, which are macerated (soaked with skins and seeds) and sometimes fermented while in contact with the skins and seeds to extract the colour from the skins. The stems of the grape bunches also contain tannins, and will contribute more tannins if the bunches are not de-stemmed before pressing, maceration, and fermentation. Tannins extracted from grapes are condensed tannins, which are polymers of proanthocyanidin monomers. Hydrolysable tannins are extracted from the oak wood the wine is aged in. Hydrolysable tannins are more easily oxidised than condensed tannins. Red-wine tannins contain procyanidins, which protect against heart disease. Moderate consumption of wine (especially red) cuts the risk of colon cancer by 45 percent, 32 percent less likely to get cataracts, 30 percent less risk than nondrinkers of developing type 2 diabetes, 50 percent less risk of developing a stroke, and 34 percent lower mortality rate than beer or spirits drinkers.

Pomegranates, which some believe was the fruit in the Garden of Eden, contains a diverse array of tannins, particularly hydrolysable tannins. The most abundant of pomegranate tannins are called punicalagins. Punicalagins have a molecular weight of 1038 and are the largest molecule found intact in after oral ingestion and were found to show no toxic effects. Punicalagins are also found to be the major component responsible for pomegranate juice's antioxidant and health benefits. Pomegranate rind is an effective anti-parasitical for tapeworm and is highly toxic to all intestinal worms.



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The pomegranate (*Punica granatum*) is a fruit-bearing deciduous shrub or small tree growing to between five and eight metres tall. The pomegranate is native to the region from Iran to the Himalayas in northern India and has been cultivated and naturalized over the whole Mediterranean region and the Caucasus since ancient times. Pomegranate aril juice provides about 16% of an adult's daily vitamin C requirement per 100 ml serving, and is a good source of vitamin B5 (pantothenic acid), potassium and antioxidant polyphenols. Other phytochemicals include beta-carotene, [citation needed] and polyphenols catechins, gallocatechins, and anthocyanins such as prodelphinidins, delphinidin, cyanidin, and pelargonidin.

Most legumes contain tannins. Red-colored beans contain the most tannins, and white-colored beans have the least. Chickpeas have a smaller amount of tannins, as do cloves, tarragon, cumin, thyme, vanilla, and cinnamon.

Tannins have been employed medicinally by physicians for centuries as anti-diarrheals, hemostatics, vermifuges and anti-hemorrhoidal compounds.

The anti-inflammatory effect of tannins help control gastritis, esophagitis, enteritis, and irritable bowel disorders as tannins inhibit growth of many pathogenic

organisms. Diarrhea is also treated with this effective astringent medicine as it controls the irritation in the small intestine, slowing down the peristalsis and colic.

Tannins not only heal burns and stop bleeding externally as a tea wash, but they also stop infection while they continue to heal the wound internally. The ability of tannins to form a protective layer over the exposed tissue keeps the wound from being infected even more. Tannins are also beneficial when applied to the mucosal lining of the mouth, i.e. as a gargle in stomatitis, aphthous ulcer, canker, etc. One study in China found that by rinsing the mouth with strong tea was as effective as any mouthwash. So you can save money and save face by stopping the morning coffee habit and drink your tea!

Tannins are also effective in protecting the kidneys, preventing urinary tract infections when drunk daily. Tea drinkers will have less UTI's than coffee drinkers. Tannins have been used for immediate relief of sore throats, diarrhea, dysentery, hemorrhaging, fatigue, skin ulcers and as a cicatrizant on gangrenous wounds. Tannins are used indirectly as molluscicides to interrupt the transmission cycle of schistosomiasis. They have also reported to have anti-viral affects. When incubated with red grape juice and red wines with a high content of condensed tannins, the poliovirus, herpes simplex virus, and various enteric viruses are inactivated.

Tannins as strong tea can also be used to pull out poisons from poison oak or from bee stings, causing instant relief. The tannins help draw out all irritants from the skin because tannin is an astringent that tightens pores and pulls out liquids.

There are currently ongoing studies on another antioxidant which is available in green tea which can potentially cure cancer. Epigallocatechin gallate or EGCG found in green tea diet has been discovered to destroy cancer cells while keeping surrounding healthy cells unharmed. By simply drinking green tea, one can also reduce the risk of cancer.

So there you have it, drink you tea and study medical botany! There is no end to nature's bounty.

Links

<http://www.alternatehistory.com/discussion/showthread.php?t=104516>

<http://employees.csbsju.edu/ssaupe/biol106/lectures/intro.htm>

<http://www.angelfire.com/on/GEAR2000/gear.html>