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# DEPRESSION
## PART II: EXPLORING THE DEPTHS
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Depression is a major and very complex health problem. It involves physiological, behavioral, psychological, social, cultural, and spiritual aspects. Cross-nationally, younger populations are experiencing more depression than their older cohorts -- the depression epidemic is worsening. The trend in medical treatment is use of drugs. A combination of counseling and medication has been shown to be more effective, yet there may be a multiplicity of other factors involved. Unfortunately, quick and easy solutions are sought for complex and difficult problems – a fast-food kind of mentality.

Pessimism. Hopelessness. Despondency. Sadness. A feeling that life is not worth living. Such bleak emotions identify depression. Still, there are a constellation of other symptoms that may accompany the "blues." Although virtually everyone falls into the doldrums at times or indulges in a bit of self-pity or melancholy, depression is more, different. It saps the energy, warps the mind, unbalances normal rhythms of the body, robs vigor and hope, alters the psychological picture into one that is gloomy and despairing.. It is a dark cloud that tightly envelopes and invades the whole person.

Depression is usually accompanied by various aches or pains without evidence of disease, irritability, restlessness, difficulty concentrating or remembering or making decisions, fatigue, lethargy, stomachaches or digestive complaints, increased or decreased appetite, decreased or increased sleep, loss of interest or pleasure in activities, feelings of anxiety, helplessness, worthlessness, guilt, phobias, irritability, and much more. Perhaps the worst torment is the belief that things will never change. Depression has a whole spectrum of symptoms. No two people experience it exactly the same way. It may accompany many illnesses or diseases (such as hypothyroidism, cardiovascular disease, chronic fatigue syndrome, etc.). It can be an actual disease in itself. Or it can be an overwhelming feeling of being trapped or caught, of being a total failure, feeling unworthy, without purpose. It can bring on, complicate or worsen any number of physical ills. Studies show that depression kills – there is a cause-and-effect relationship between depression and functional decline, disease, death.

Many more women than men experience depression. The female preponderance is evident from puberty onwards. There may be physiological causes such as hormonal imbalances, social factors including working outside the home (when it creates difficulties with housework and childcare) or childhood sexual abuse or low self-esteem or battering or lower economic status or differences in coping style, ethology (not having equal opportunities), neurobiology including the interaction of neurotransmitters with hormones, psychological factors such as differences in how men and women learn to deal with emotions, and so on.

Depression is a kind of feedback, signaling something is out of kilter, out of balance – whether it is one's physical health, toxic load, lifestyle habits, relationships, difficult life experiences, one's belief system, habitual perceptions, lack of spirituality, or something else. The emotional pain carries a message. It is the body/mind/spirit expressing itself. Sometimes depression can be a natural part of a healing process which needs to be experienced and worked through (with guidance) for growth, a mental and emotional maturing, or physical detoxification. But when individuals "get stuck" in this process, more intensive work and help are required.

True healing is not simply a matter of relieving, manipulating, or adjusting symptoms. If the only purpose of treatment is to stop pain, then it is impossible to hear or understand the message the body is trying to communicate. Magic bullets – whether pharmacological, herbal, or nutritional – are not the answer. True healing involves discovering, understanding, and treating the cause(s) of the depression. Since depression is usually not solely a psychological problem, the numerous biochemical or physiological causes must also be explored. A human is multifaceted with every feature and element inter-reacting and affecting all others. Thus a psychological component can affect the biochemistry. The biochemistry can affect the emotions. Which came first, the chicken or the egg? There is

often no way to tell for sure. So each aspect must be considered and compassionately approached. A person's experiences interact with his or her biochemistry to produce emotional illness such as depression. This article cannot encompass possible psychological and spiritual causes, so it will only touch upon some of the physical ones.

Some of the potential causes and cofactors include a vitamin B complex deficiency syndrome, almost any nutritional deficiency, food and chemical sensitivities, endocrine imbalances (thyroid, adrenal, ovarian, testical), immune dysregulation, toxic reactions and side effects, anemia, blood sugar fluctuations, genetic predisposition, and many more. Prolonged physical illness can cause depression. A sequence of physical and psychological conditions can create a spiral, a whirlpool, that feeds on itself and sucks one down. A deficient diet – a nonfood diet – depletes energy, leading to lack of activity and isolation and eventually depression. The depression leads to loss of appetite or compulsive eating and even less activity, both of which feed depression. It may seem that depression is insidious and almost impossible to 'fix.' Yet finding pieces to the puzzle can quickly help to form a picture. For the clinician, the importance of a comprehensive evaluation is obvious. Sadly, relatively few people deal with depression holistically. A holistic approach, though, is exactly what is needed.

Many scientists think depression results from an interaction of psychological, biochemical, and genetic factors, sometimes accompanied by a change in the individual's circumstances (such as a failure of a relationship or the loss of a job). Other scientists stick to the notion that depression is only a disruption in brain chemistry that drugs can cure. But there are many questions about the **assumed** link between isolated brain chemicals and mood. For example, if a person jogs, serotonin and norepinephrine are released and a good feeling results. When a person falls in love, other changes in chemistry take place. But does the individual feel better because specific chemicals have increased? Or are these chemical changes a **result** rather than the cause of the good feelings? Numerous activities and lifestyle changes can naturally alter the exact same chemicals that popular drugs do. But, people on medications cannot achieve the same levels of intimacy (with others, themselves, and their God or Nature) as people using natural methods can. The only "side effects" from natural measures are things like improved energy, a more relaxed style, better digestion, improved cardiovascular function, stronger sexual function, better skin tone, and similar improvements. [i]

## SOME CAUSES

Depression, in some ways, can be a brain disease. The brain can be a reactive target organ for environmental toxins and nutritional imbalances or disruptions. The brain does not cough, sneeze; or break out in a rash. Instead, it can present a depressive mood along with a multiplicity of other subtle or not-so-subtle symptoms. The average person these days has at least a few -- usually many – **subclinical nutritional deficiencies**. The brain is not an isolated object so the deficiencies can have dramatic effects on moods and cognitive abilities. The difficulty is that there is no "scientific" way to ascertain exactly what subclinical deficiencies a person has – each individual has different requirements and different abilities to absorb and utilize the various nutrients -- biochemical individuality.

Food sensitivities or food allergies are prevalent causes of emotional or mental symptoms, especially depression. Other dietary factors can be causative such as excessive consumption of refined carbohydrates, alcohol, tobacco, altered fats, food additives or preservatives, residues of pesticides or drugs or hormones in foods, etc.

One often overlooked but significant cause of depression is **drugs**. It is a possible side effect of some prescription drugs including steroids, hormone replacement therapy (progestins, etc.), oral contraceptives, beta blockers, tranquilizers, and others. A side effect of all antidepressants is depression. Some antibiotics (particularly the quinolones such as Cipro, Floxin) can produce a variety of symptoms in the brain, frequently depression. Cholesterol-lowering drugs may cause depression, sometimes so severely that suicide causes death. Medications that block secretion of stomach acid (such as Tagamet, Zantac, Pepcid) can slowly bring on depression.

**Hormonal imbalances and disorders** cause depression. Subclinical hypothyroidism is an important cause of depression. Depression can accompany changes or imbalances in sex hormones including inadequate endocrine function, pregnancy, premenstrual syndrome, perimenopause, and others. In women, any imbalance of estrogen and progesterone legendarily leads to mood swings. Adrenal gland enlargement or hyperactivity is common in depressed patients. Such individuals experience an increased release and drive of cortical hormones from the adrenals – often a result of excessive stress. Hyperactivity of the

hypothalmic-pituitary-adrenal axis in depressed people is well documented. Some researchers find that a flood of hormones are released when a person is "stressed out." Thus, in their view, "depression is the archetypal stress-related illness." Many depressed patients have high levels of stress hormones circulating throughout their bodies, affecting neurotransmitters and creating biochemical changes that set up an individual for depression. Many scientists assume that a shortage of serotonin or other neurotransmitters cause depression. But do lowered neurotransmitters cause depression or do stress hormones which lower the neurotransmitters cause depression? Prolonged stress is the problem. Nutritional deficits make it more difficult to handle stress. There is no one answer as to what triggers depression. The answer is individual, multifaceted, and complex just like the people who suffer with the disorder.

**Inactivity** – both physical and mental – can cause depression. One study showed that exercise sessions and "reminiscence" sessions conducted in a nursing home significantly improved mental status of participants. **Artificial lighting** under which most everyone spends most of their time has been connected with depression. Full-spectrum light therapy, especially natural sunlight, can work wonders. Persons diagnosed with SAD (seasonal affective disorder) find this particularly true.

Numerous **toxic environmental chemicals** are invisible brain poisons. Since most chemical sensitivities develop gradually over a period of weeks, months, or even years as the detoxification system is slowly damaged, an immediate reaction may not be noticed. Occasionally there may be a dramatic sudden onset of depression – for example, when new carpeting is installed or the home or office is renovated or freshly painted. Generally, chemical-caused depression is accompanied by other chemical-induced symptoms. These can include mood swings, inability to concentrate, headaches, phobias, fatigue, and many other symptoms – symptoms which are also common with nutrient deficiencies. Formaldehyde or tricholoroethylene or toluene (out-gasses from paints, construction materials, plastics, fabrics, home furnishings, glues, auto exhaust, etc.) can cause depression and intermittent "brain fog." So can benzene (gasoline, auto exhaust, room fresheners, adhesives), styrene (plastics), aluminum (municipal waters, juice boxes, canned foods and drinks), and fluoride (municipal water and foods or beverages made from it, drugs such as Prozac, toothpastes, etc.) – all have damaging effects on brain chemistry. Pesticides were originally designed as nerve gasses for chemical warfare. Offices, schools, and public buildings are *pesticided* after hours. Supermarkets are saturated with them to prevent insect infestation. People use pesticides such as Dursban or Aspelin inside and outside their homes, on their pets. These poisons are used on golf courses, gardens, on cattle and in their feed, for foundation termites, in plastics, textiles, restaurants, and so on. Pesticides inhibit enzymes such as *acetyl-cholinesterase* (controls the metabolism of acetylcholine, an essential neurotransmitter), or *ATPase* (needed for the chemistry of energy), or *cholesterol ester hydrolase* (essential in cholesterol metabolism). Some pesticides are taken directly into the nervous system where they become even more potent. If the body cannot break down or excrete the total pesticide load, it stores it in various tissues and organs, and it is slowly mobilized weeks, months, or years later. Pesticides cause delayed behavior changes, memory loss, depression, loss of problem solving ability, irritability, social withdrawal, anxiety, numbness, tingling, poor coordination, weakness, cramps, and much more. Commercially grown or raised foods can contain a number of pesticide residues; animal products may have hormone and drug residues as well. One home chemical that causes a significant amount of depression is natural gas – a leak or malfunction may result in depression, nausea, stomach or intestinal symptoms, body aches, headaches, rashes, or other complaints.

Heavy metal poisoning is a cause of depression. **Lead** (auto exhaust, paint, cooking utensils), **aluminum** (soda cans, aluminum-lined juice boxes, cosmetics, baking powder, salt, some antacids, municipal water supplies), **mercury** (hemorrhoid preparations, dental fillings), **cadmium** (tobacco smoke, auto exhaust, welding, plastics, paints, batteries, tires), **fluoride** (water supplies, toothpaste) all damage important enzymes. [ii]

## MOVING AWAY FROM DEPRESSION

There are hundreds of natural things which engender health of mind and body and produce contentment, peace, and joy. Perhaps the least expensive, most readily available, and extremely effective "antidepressant" is exercise. Physical activity helps to adjust the brain's chemistry, elevating endorphin levels and enhancing optimal neurotransmitter levels. A meta-analysis that looked at 80 studies of the depression/exercise connection showed that exercise decreased depression with long-lasting effects. This research found that exercise over an extended period of time is more effective

than short-term exercise; exercise combined with psychotherapy is more effective than therapy alone. A study of 1,500 persons revealed that depression in the group that did NOT exercise was two times greater than in a group that exercised occasionally and three times greater than in the group that exercised regularly. A study of 5,000 college students showed that anxiety and depression are reduced with physical activity, the beneficial effects persisting for the entire seven years the participants were followed as they continued regular exercise. Another study concluded that exercise "can make improvements in depression similar to some types of psychotherapy." One researcher commented that exercise is like a form of meditation. "It allows for a quiet time, working out aggressions, increases alertness and creativity, releases energy, enhances sleep, and may cause positive changes in brain chemicals."

In 1999, study researchers stated that an exercise training program could be an effective alternative to antidepressant medication to treat older individuals. The drugs produced a quicker initial response, but after 16 weeks of treatment, exercise was equally effective in reducing depression. Mounting evidence points to "the prescription of exercise as an alternative treatment" in depressed persons, including the elderly. A 2000 study stressed that exercise programs of greater duration than 16 weeks have the greatest benefits as far as psychological health is concerned. Aerobic exercise, weight training, and flexibility activities all have value. Yoga workouts leave people with less nervousness, more energy, less depression, more calm. Dancing, gardening, or any other activity that involves movement will help. The key is to participate in activities that are enjoyed. Exercise (regular and deliberate movement of the body) "offers the possibility of cracking the shell of inertia" in depressed souls.

Massage and other types of bodywork are effective in treating depression, lowering stress hormones and blood pressure, and boosting the immune response. Massage works in various ways, encouraging both emotional and physical changes. "In virtually every study, we've found that depression diminishes in response to massage therapy." Meditation, breathing exercises, craniosacral therapy, acupuncture, mindfulness (checking in with oneself), and companionship (support groups) have all been shown to aid people with depression, providing relief, improving mood, initiating introspection, and promoting relaxation. The goal is to teach the body to respond to emotional and spiritual burdens with greater ease.

Any therapy program is incomplete unless the individual explores his/her depression in order to understand it, explore energy blocks or chains of trapped feelings. This provides perspective and helps the person reason with his/her inner self, begin the process of breaking free, allow the feeling that one has some kind of control, get in touch with moment-to-moment signs of tension or sadness, start to disentangle oneself. Usually this should be done with the assistance of a trained therapist or spiritual counselor, although some people have done it on their own. If despair is serious, seeing another person to serve as a helper or guide is critical. [iii]

## FOOD AND MOOD

Foods can have powerful and profound effects on moods. No single food or dietary change by itself will end depression. However, some general principles need attention as well as ascertaining some specific choices for each unique individual. Foods are not drugs – they do not unnaturally stimulate or suppress something in the biochemistry to merely cover over or relieve a symptom. The aim is to support the biochemistry so it can work towards the natural balance the body consistently seeks.

One factor that seems to affect mood are levels of various neurotransmitters in the brain (and elsewhere). Serotonin, norepinephrine and dopamine tend to be low in people with depression. Foods "rich in protein" (such as meat, fish, poultry, beans, nuts, seeds) "boost dopamine and norepinephrine" according to some researchers. Alertness, assertiveness, and speed of thought are believed to be increased. Carbohydrate-rich foods (the complex type like whole grains, NOT the simple type like refined sugars) are touted as raising serotonin levels and producing feelings of well-being, confidence, ability to concentrate, and relaxation. Other foods may imbalance or lower levels of certain neurotransmitters. For example, eating refined sugars can result in an initial elevation of serotonin with a subsequent precipitous drop. Conversely, whole grains result in a slow and steady release of serotonin into the bloodstream. Altered (overheated, refined, processed) fats may reduce circulation to the brain and eventually adversely affect brain function.

Specific amino acids are believed to elevate specific neurotransmitters: tryptophan produces serotonin, phenylalanine and tyrosine produce norepinephrine and dopamine. But foods are far more than one substance and their effects result from a combination of all their intricate,

interrelated components, many of which are not yet known or understood. For example, whole foods rich in protein boost mood and energy due to more than the tryptophan or phenylalanine or tyrosine content. It is the whole package that works. Whole, natural, intact foods contain other amino acids; essential fats; choline; B vitamins; other vitamins; minerals and trace minerals like magnesium, zinc, manganese, iron; enzymes – catalysts, live principles that allow foods to work as true sources of nutrition. Nevertheless, the usual view of scientists (quantitative, mechanistic, inert, linear) is to measure the level of one chemical in the body soon after administration. "We rarely have enough change in tyrosine levels with normal food…" The drug-effect is perpetually sought. At the same time, single substances are approached with caution: "You can't use their safety as a food constituent to say that they are safe as a drug." A medical merry-go-round.

Some people feel happier when they consume a diet rich in natural carbohydrates including whole grains, beans, vegetables, etc.; others feel better on a diet which includes animal products. Dietary needs change with seasons, circumstances, age, and other factors. Relearning the body's instincts, getting back in touch with innate indicators, will provide the details of what to eat. Raw, intact, foods should be emphasized. Since food influences mood, each individual needs to adjust food specifics to his/her advantage.

Sadly, when the brain is "hungry" for needed nutrients, people often seek out sweets such as chocolates, candy, ice cream, cake, soda, or other refined foods (white bread, pasta, etc.) to provide relief. Refined, processed, denatured "foods" – actually nonfoods – may aggravate or even generate negative moods. The deceptive "lift" immediately felt sets the stage for an addictive-type of behavior and a cycle of eating nutrient-devoid foods (that disrupt biochemistry) in an effort to cope or function. Consumption of refined carbohydrates provides an immediate energy boost, but the "longer term effect is one of decreased energy."

Large amounts of refined sugar contribute to depression. As Dr. Sherry Rogers writes, "if I had to choose the number one food that has caused the most depression, it would be sugar." Studies show that "some depressed individuals experience a tremendous lift in their depression by eliminating consumption of sugar." Other people need to do more – there may be nutrient deficiencies, psychological aspects, or other contributors. Refined sugars and other refined nonfoods rob the body of nutrients and can cause blood sugar fluctuations, disturb glucose tolerance and balance. Scientific evidence indicates "cerebral activation might be affected by diet." The greatest alteration in brain waves occurs in response to refined sucrose challenge. Clinical, experiential evidence leaves no doubt that refined sugars affect mood and brain chemistry. Those who experience relief by eliminating such nonfoods "also experience a return of the depression when sugar is reintroduced into their diets."

Some people enjoy improvements in mood when caffeine is eliminated from the diet. Caffeine stimulates the central nervous system, having the behavioral effect of arousal. Yet studies demonstrate that caffeine can depress sensitive individuals. So some people experience a stimulant effect whereas others experience a depressive effect. A few feel a calming effect. People who receive a lift from depression by eliminating refined sugars and/or caffeine also find there is improvement in other symptoms such as inertia, overeating, mood reactivity, increased or decreased sleep, rejection sensitivity, and more.

Food sensitivities may greatly contribute to depression. Wheat is a common culprit. Yet, is it whole wheat or years of consuming pesticide-laden, refined, "enriched" (with factory-produced chemicals), overcooked wheat products? Mold-containing foods (contain yeast, have risen, have been aged, dried, pickled, or fermented) are another common reaction category. Again, most of these foods are altered nowadays into denatured concoctions aberrant from original natural processes. Sensitivities to milk products are often a result of pasteurized, homogenized, chemicalized, and otherwise altered milk from cows fed unnatural diets containing unnatural additives and administered drugs and hormones. Alcohol (with current mass-production methods including pesticide-drenched raw materials, chemical additives and by-products) can cause abnormal chemistry and 'brain' allergy. Alcohol is initially a stimulant but becomes a depressant, particularly affecting those prone to depression. People differ in their tolerance levels. Alcohol affects moods, sensations, and behavior. It depletes the body of nutrients such as B vitamins, vitamin C complex, and many others.

ANY alteration, refining, processing, cooking – anything that disrupts the wholeness Nature put into a food – accelerates its nutritional deterioration, denaturation, and potential for disrupting biochemistry. "Poor diet can have a disastrous impact on memory, coordination, concentration, powers of reason, behavior, and

above all, mood." Improved nutrition – consumption of whole natural foods abundant in energy and dense with nutrients – can relieve depression and enhance general emotional health, mental capacities and performance. The solution often lies in the hands that purchase, prepare, and put food on the plate.

Chlorine chemicals used in most municipal waters can contribute to many ills including depression in the vulnerable person. Irradiation of foods changes food components: among the travesties are formation of *trans* fatty acids, damage to or destruction of vitamins, alteration of protein structures, production of mutagens and carcinogens, formation of radio-resistant fungi and carcinogenic mycotoxins. Virtually any food additive (of which there are thousands) can bring on or worsen depression (among a plethora of other ills), particularly if there is a hypersensitivity. One of the most popular additives that can cause depression is aspartame – NutraSweet, Equal, Crystal Light. [iv]

## NUTRIENTS

A deficiency of virtually any nutrient can cause or contribute to depression. Various deficits of numerous nutrients are practically epidemic in today's over-fed, undernourished populace. It is extremely rare for anyone to have a deficiency of only one nutrient. One or more may be obvious, but almost always there are multiple deficits of many nutrients. Some commonly found to be lacking in depressed people include the following.

**Vitamin B complex** with its associated nutrients are particularly important to normal brain (mental and emotional) function. A deficiency of any of the B vitamins can result in depression, irritability, apathy, anxiety, loss of concentration or memory, and many other abnormalities. Deficiencies of **thiamin** ($B_1$), **riboflavin** ($B_2$), **pyridoxine** ($B_6$), **cyano-cobalamin** ($B_{12}$), and **folic acid** are frequently found in depression and other affective (mood disturbance, depressive syndrome) changes. A deficit of thiamin is associated with irritability, aggressive behavior, and personality changes. Riboflavin deficiency is associated with depression and affective illness. **Niacinamide** ($B_3$) has been used for decades to help clear cases of depression and anxiety. Deficiency symptoms of $B_6$, including depression, are "widespread and vague" because of the wide variety of this vitamin's functions. Pyridoxine levels are low in persons with affective illness and endogenous depression. There is increased incidence of mental change and affective disorders with $B_{12}$ deficiency. In fact, "metabolically significant vitamin $B_{12}$ deficiency is associated with a twofold risk of severe depression." Lesser states of deficiency may also be implicated. Folic acid deficiency (one of the most common vitamin deficiencies) is linked with depression, organic brain syndromes, and schizophrenia. Since $B_{12}$ and folic acid work in many of the same pathways, a deficiency of one may relate to a deficiency of the other. The average American consumes only 60% of the "normal daily requirement" of folate which does not take into consideration individual needs. There are many drugs that deplete folate levels including anticonvulsants, antituberculosis drugs, alcohol, and oral contraceptives. **Pantothenic acid** or **biotin** levels may be inadequate when depression exists.

Placebo-controlled, double-blind studies have demonstrated that participants receiving B vitamins show a lift in depression and enhancement of cognitive function not apparent in the placebo-supplemented groups. Many B vitamins are cofactors for neurotransmitter synthesis associated with mood and cognitive function. Low levels of B vitamins are associated with increased risk for developing depression. "However, blood parameters may not reflect central nervous system vitamin levels or function." In other words, blood tests will not necessarily "reveal" a deficiency. A thorough case history is imperative. Consideration should be made of the coenzymatic function of vitamins – another reason why Nature provides whole complexes of nutrients.

Tetrahydrobiopterin is a coenzyme that participates in the hydroxylation of the amino acids phenylalanine, tryptophan, and tyrosine by carrying electrons to oxygen. These amino acids are precursors of some neurotransmitters such as serotonin. Many patients with unexplained depression have reduced formation of tetrahydrobiopterin. Vitamin $B_{12}$, folic acid, and vitamin C complex are among the nutrients that enhance production of this coenzyme.

None of the vitamins or other nutrients appear alone in any natural food; they occur in packages or complexes. They are interrelated and interdependent. If an individual is deficient in zinc, for instance, the enzyme *pyridoxal kinase* suffers. Then the $B_6$ consumed cannot properly take part in the next biochemical step that allows it to be used by the body. In such a case, taking large amounts of $B_6$ by itself will not correct a $B_6$ deficiency. Magnesium is also needed for many of those biochemical steps. Manganese, the trace mineral activator of B complex, must be present for the magnesium to function. Explanations of the complexity of the

nutrient pathways could go on and on. Suffice it to say that the best way to obtain nutrients is from whole, real food complexes.

A lack of sufficient **choline** in the diet interferes with nerve-muscle transmission and increases liver transaminases (a sign of liver damage). Choline is converted into the neurotransmitter acetylcholine, involved in concentration and memory. Liver and eggs are two rich sources of choline, both of which are often avoided because of the cholesterol scare. **Inositol**, a natural carbohydrate essential for proper nerve and brain function, can improve mood, hopelessness, insomnia, anxiety, and agitation. Improvements in panic disorders and obsessive-compulsive tendencies are also possible.

Deficiency of **vitamin C complex** – including its bioflavonoids, organic copper, and rutin -- is associated with increased lassitude and depression. Vasculitis (inflammation of a blood or lymph vessel) can cause serious brain pathology including severe depression. Since this inflammation may decrease and increase from day to day or week to week, depression may also ebb and flow. Vitamin C complex is essential to the blood and lymph vessels as well as to the biochemistry of inflammation. One role of vitamin C complex is in recycling or reducing or placing back into a useful form the minerals and vitamin E factors after they have been used in a reaction. Without adequate vitamin C complex, symptoms of mineral deficiencies and/or vitamin E deficiency can materialize. The C complex is also necessary for the breakdown of drugs. It is important to the expression of the acetylcholine receptor of cells where the signal to activate neuro-transmitters is located. A study comparing patients who were suicidal to those who were not suicidal found that there was a vitamin C deficiency in the suicidal individuals.

Intake and plasma levels of **carotenes** may be reduced in depressed people. **Biotin** deficiency as part of a syndrome may cause depression.

**Vitamin E complex** protects cellular membranes and their contents from chemical damage. Proper cellular function depends on adequate vitamin E. At least partial restoration of decreased neurotransmitters has been shown to take place with vitamin E supplementation. Vitamin E decreases the turnover of serotonin – the goal of many antidepressant drugs. This complex decreases damage to the brain from alcohol. It also decreases the drop in brain ATP, glucose, and glycogen (brain energy chemistry) that occurs in response to stress. Among the many other accomplishments of vitamin E complex in brain chemistry is its importance in increasing levels of the enzyme *delta-6-desaturase* which is needed for healthy brain cell membranes and synapses where neurotransmitters are released and function. This enzyme is required for the metabolism of essential fatty acids that control major parts of the brain and the vulnerability to depression. Plasma levels of **vitamin A** may be reduced in persons with a history of depression.

Deficiencies of magnesium, potassium, iron, manganese, chromium, zinc, copper and other **minerals or trace minerals** can contribute to depression and even more serious psychological problems. An excess or deficit of calcium can disrupt brain chemistry. The processing of foods eliminates most or all of many needed minerals and trace minerals. For example, bleached white rice and bleached white flour have lost 75% of the magnesium present in the whole grains.

Decreased **potassium** levels are frequently associated with a dysphoric mood, tearfulness, fatigue, and weakness; in serious instances, a frank organic brain syndrome or suicidal tendency may be found. Plasma **zinc** levels are lower in depressed patients than those without depression. A zinc deficit can also damage hormone receptors; hormone imbalances are a common cause of depression and anxiety. Further, a deficiency of zinc can contribute to the inability to correct other deficiencies such as vitamin A and B vitamins such as $B_6$. Nutrients work together – a deficit of one has a domino effect on other nutrients, enzymes, cellular functions and biochemical reactions. A deficit of **chromium** can lead to blood sugar fluctuations, a craving for refined carbohydrates (which in themselves are a common link in the depression chain), improper regulation of cholesterol metabolism, mood swings, and depression. **Manganese** has several roles in the brain including lifting the mood, memory, and cognition; it is also need in the utilization of other minerals (such as magnesium), blood sugar metabolism, the detoxication pathways in superoxide dismutase, and is the trace mineral activator for the B complex. **Lithium** may be deficient along with other nutrients along crucial brain pathways that relate to depression. **Cesium** evidently has antidepressant effect and shortens the recovery time for the brain from effects of alcohol and drugs that have the side effect of depression. **Vanadium** is important to blood sugar regulation – the primary fuel for the brain is glucose -- and has been shown to help depression. **Selenium** is crucial in the detoxication pathway, protecting cell membranes, aiding the production of thyroid

hormone, participating in the metabolism of essential fatty acids, and more. The lower the level of dietary selenium, the more reports of depression, anxiety, and fatigue, all of which improve following improved dietary intake.

**Amino acids** are building blocks of neuro-transmitters. Tryptophan, an essential amino acid, is necessary to produce serotonin. Tyrosine is the precursor to DOPA, which is the precursor to norepinephrine and epinephrine. GABA (gamma amino butyric acid), an inhibitory neurotransmitter which has a calming effect on the brain, can come from glutamine. Glycine, closely related to the function of GABA, is heavily used in the detoxication system to break down everyday chemicals. Phenylalanine is the amino acid precursor to norepinephrine, also related to mood. A deficiency of the amino acid taurine can lead to depression as well as contribute to chemical sensitivities and a compromised ability to detoxify chemicals.

The list could continue, but to repeat a point, all the amino acids depend on many other nutrients to be produced, accomplish their tasks, and properly function in biochemical pathways. When deficiencies of amino acids exist, there are accompanying deficiencies of vitamin complexes, minerals, trace minerals, fatty acids, and other nutrients necessary to the amino acid metabolism. Also, there is much more to the balanced chemistry of the brain than the levels of various neurotransmitters. In fact, some neurotransmitters will be excitatory in some people while in others will act in an inhibitory manner. Excessive ingestion of one amino acid or another – isolated parts – can disrupt the innate balance for which the brain strives. Taking single or combinations of isolated amino acids can stress the liver and kidneys. Besides, amino acid deficiencies are statistically not the primary cause of depression. If there is a need for amino acids, it would be extremely rare (or nonexistent) for a single amino acid to be deficient. Rather, there are multiple deficits of multiple nutrients.

Patients with major depression were found to have significantly higher omega-6 to omega-3 **fatty acid** ratios in both serum cholesteryl esters and phospholipids. The typical Western diet has had a tremendous increase in the omega-6 to omega-3 fatty acid ratio due to an increased consumption of vegetable oils, total fats, and saturated fats. The fats are processed, refined, cooked, and otherwise altered. Depression is just one symptom correlated to the change from natural and naturally-balanced fats to unnatural, manipulated fats. Omega-3 fatty acids contain alpha-linolenic acid which is metabolized into eicosapentaenoic acid and docosahexaenoic acid (DHA). DHA appears in high concentrations in the brain and plays an instrumental role in brain cell membrane function, thus to transmission of nerve signals. An increase in depression in North American over the past century has been linked to a steady decline in DHA consumption. Low levels of needed fatty acids, particularly those naturally occurring in foods such as fish, organically-raised produce and grains and nuts and seeds, may predispose to mood changes such as depression. Again, the admonition is to "avoid taking nutrients out of balance," including essential fatty acids, because this can have "a negative impact." Deficits of either omega-3 or omega-6 fatty acids can lead to depression.

All to often, depressed individuals make poor food choices, eating foods that contribute (biochemically) to depressive states. Due to the cholesterol scare and prevalent overweight problems, butter, cream, raw nuts and seeds, avocados and other foods naturally rich in essential fats are rejected in favor of margarine, other hydrogenated and partially hydrogenated fats, refined vegetable oils, fried foods, "fake fats," and low-fat foods laden with refined sugars and chemical additives. Such nonfoods wreck havoc on the cells and bodily systems, particularly the brain which is 65% fat. Abnormalities in the polyunsaturated fatty acid composition of the brain can alter membranes and affect brain function. Too little cholesterol can make one subject to depression. Like proteins, fats (lipids) are building blocks of all the body's essential structures. Disturbances in fatty acid metabolism can result in many physical, mental, and emotional disorders.

**Carnitine**, in its naturally-occurring form, plays an essential role in fatty acid metabolism. It also aids in the removal of compounds that are toxic to metabolic pathways. Carnitine is produced in the body from the amino acids lysine and methionine. Acethylcholine – the chemical messenger at nerve synapses -- is made in the body from phosphatidyl choline (PC). Pesticides adversely affect acetylcholine. PC is used up every day in the work of detoxifying the synthetic chemicals that bombard people, and the standard American diet is lacking in the foods rich in PC such as eggs, liver, beans, nuts, cauliflower, and so on. Choline is one of the nutrients necessary to produce both acetylcholine and PC. [v]

## 5-HTP AND SAMe

Serotonin is produced in the body from the amino acid, tryptophan, which is metabolized to

5-hydroxy-L-tryptophan (**5-HTP**) and then, with the aid of pyridoxal-5-phosphate (the coenzyme form of vitamin $B_6$), into serotonin. Tryptophan from food is generally viewed as "not effective in altering serotonin level" because an immediate drug effect (a quick elevation) does not occur. Also, there are other amino acids and other nutrients present in foods that prevent immediate stimulation. Since isolated, high-potency tryptophan is no longer readily available, 5HTP is used in "supplement" form with claimed effects in aiding depression, insomnia, PMS, obsessive-compulsive disorder, fibromyalgia, chronic headaches, attention deficit disorder, obesity, and more.

5HTP is created in the body as an intermediate metabolite in serotonin synthesis, not usually consumed in food. But there are high concentrations in the seeds of a West African legume, *Griffonia simplicifolia*, and two other less common Griffonia species.. It has not been found in any plant other than Griffonia. So the supplement may be "derived" – fractionated, one compound extracted – from the seeds. Sometimes it is synthetically manufactured.

Unlike 5-HTP produced in the body, the supplement cannot be shunted into niacinamide or protein production. It easily crosses the blood-brain barrier and is metabolized to serotonin. "Therapeutic administration" of 5-HTP as a drug can change symptoms, even treat depression. In the 1970s and early 1980s, studies showed 5-HTP to be more effective than placebo in handling depression. Several small studies compared 5-HTP to standard anti-depressant drugs. But many of these 'positive' studies were limited, including small sample sizes, short durations of therapy, open-label trials, no placebo arm, poor definition of depression, and inclusion of people with bipolar depression. There were also studies that used either 5-HTP or L-5-HTP and there may be a therapeutic difference. Both "supplements" are far more pharmaceutical than nutritional, there are side effects, and there is no way to know how much is too much or what biochemical disruptions may occur. Safety in pregnant or nursing women and people with liver or kidney disease has not been established. Additionally, chemical impurities in some 5-HTP products have been found. The contaminants are similar or the same as those that caused an outbreak of the potentially life-threatening disorder eosinophilia myalgia syndrome in people who took contaminated L-tryptophan in the 1980's. Even brands derived from the "seed extracts" contained this contaminant.

**SAMe** (S-adenosylmethionine) is a popular treatment for depression from Europe – as a prescription drug -- that is now available in the U.S. as a dietary supplement or nutraceutical. In its natural form, SAMe is found throughout the body and is naturally formed by the combination of the amino acid methionine and adenosyl-triphosphate (ATP). SAMe donates its methyl group to any of a wide range of molecules and is subsequently transformed to homocysteine. It plays an important role in numerous metabolic pathways and is known to be involved in over 40 biochemical reactions. It requires assistance from nutrients such as folic acid, $B_{12}$, and $B_6$. It is not present in foods to any significant amount; the body produces this metabolite from raw materials.

The drug SAMe is grown in yeast before conversion into tablets when it is extracted from the yeast. In Europe it has been used to treat depression, arthritis, fibromyalgia, migraine headaches, liver conditions, and a wide array of other ailments. Of the research supporting the efficacy of SAMe, studies were short-term, lasting only about four to six weeks, and had far fewer participants than drug trials. The results of the studies are encouraging, though experts are not yet sure exactly how SAMe works. Some of the theories are that it increases the synthesis of neurtransmitters such as serotonin or norepinephrine, increases the responsiveness of neurotransmitter receptors, and increases the fluidity of cell membranes through the production of phospholipids. "Unfortunately, the evidence for any of these hypotheses is scant."

"SAM has a variety of pharmacological effects in the central nervous system…" When prescribing SAMe, it is important to assure that patients ingest sufficient amounts of folic acid, vitamin $B_{12}$, and vitamin $B_6$. The fact that SAMe is transformed into homocysteine raises a safety concern whether administration of this drug will raise homeosysteine levels. Homocysteine is an amino acid derivative implicated in coronary artery disease particularly when an individual is deficient in B vitamins and other nutrients. Persons with bipolar disorder (manic depression) should not take SAMe since it may aggravate the mania. Side effects include headaches, anxiety, and gastrointestinal complaints (nausea, gas, vomiting, stomach upset, diarrhea, etc.). Long-term side effects have not yet been determined. One problem in studying depression is that even a placebo may make people feel better -- one out of three people taking a sugar pill experiences dramatic improvement. So it is difficult in short-term

studies to actually determine the efficacy of an antidepressant drug such as SAMe.

Although a "modest amount of data suggests that the parenteral [intravenous or intramuscular] form of SAMe is probably effective [as a drug], there are minimal data to support the efficacy of oral SAMe." There have been more than 40 trials evaluating SAMe for depression, but almost all have been of parenteral formulations. Only five trials tested oral forms and only three of these were randomized controlled studies; all were very small. All three randomized controlled trials "suffered from serious methodological flaws." SAMe is very poorly absorbed from the gastrointestinal tract and there are very little data to support the efficacy of the oral form. "Oral SAMe cannot currently be recommended for the treatment of depression…"

The promoted "dose" of SAMe is 400 milligrams daily, but there is no way to find a standardized dose. Some oral formulations have been reported to contain no SAMe at all. Raw SAMe degrades quickly unless stored at proper temperatures; there is no guarantee that pills purchased have been properly handled. And it is quite expensive. SAMe is "not a 'natural medicine' and not a 'dietary supplement.'" It is a drug; it makes "significant changes" in the biochemistry. It is a synthetic product that the body cannot recognize as natural food. Indeed, food interferes with its absorption. There is "no convincing evidence" that SAMe is "effective or safe for treatment of depression." How much better to supply the body with the natural complexes in whole foods that provide the basis from which SAMe can be properly produced in the body in the amounts required by the body at the specific times it is needed. [vi]

## CONCLUSION

Depression can be a complex condition with any of a vast number of possible causes involved in the areas of physical, mental, emotional, and spiritual domains. A thorough case history covering all aspects of a person's life will often provide the needed pieces to the puzzle. It should not be assumed that there is one simple answer, one cure-all, that will solve the problem. Drugs or drug-like substances may briefly conceal the underlying causes, but true healing comes gradually as one works with Nature and reestablishes a kind, understanding, instinctive, and positive relationship with the real Self.

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