

## GLOSSARY

### **Acid-Alkaline Balance<sup>1-4</sup>**

The balance between acids and bases exerts “a major impact on biochemical reactions and on a variety of physiological processes that are critical for the homeostasis of the entire body and individual cells,” writes Walter F Boron in the textbook *Medical Physiology*. Among the amazing qualities of the human body is that the acid-base balance appropriately maintained is different for different cells (in other words, different cells have differences in their resting pH). It is the role of the kidneys and lungs to maintain a healthy balance between acids and bases in the body’s fluids.

Acidosis is a condition in which these fluids hold excessive acid. It results either from a buildup of acids or a loss of a bicarbonate (a base), or a combination of these. Healthy lungs help prevent acidosis through the adequate removal of carbon dioxide, an acid: as we breathe out our body is removing excess acids. The kidneys also remove excess acid from the body.

In this book we are concerned primarily with fine-tuning the acid-base balance. Nevertheless, we can learn a great deal about acidosis by looking at disease states associated with more extreme states of acidosis, states in which symptoms are prominent. Thus, recent research suggests that panic attacks, or some panic attacks, may reflect a response by chemosensitive nerve cells attuned to respiration and arousal within the context of acute brain acidosis: Research has shown that carbon dioxide inhalation is capable of provoking panic attacks in some people and carbon dioxide is an acid. Another relevant line of research finds elevated D-lactic acidosis levels in people with chronic fatigue syndrome. Cumulatively these findings suggest acidosis may have an impact on the functioning of the nervous system.

Alkalosis is the opposite condition, in that it occurs when there is too much base in the body fluids. Alkalosis is far less common than acidosis.

## **Adrenaline**

*See* epinephrine.

## **Aloe Vera**<sup>5-7</sup>

Used medicinally in ancient Egypt, aloe is a common household plant in many parts of the globe. It looks like a cacti, but is softer and more flexible.

Aloe vera -- the best known species of aloe -- produces two substances used for medicinal purposes, gel and latex. The gel is a clear, jelly-like substance found in the inner part of the aloe plant leaf. The latex, which is yellow in color, originates just under the plant's skin. Aloe products formulated from the whole crushed leaf contain both gel and latex. Aloe medications can be taken by mouth or applied to the skin.

According to the U.S. National Library of Medicine, aloe gel is sometimes taken by mouth for osteoarthritis, bowel diseases (including ulcerative colitis), fever, itching, and inflammation, and as a general tonic. In addition, it has been used for stomach ulcers, diabetes, asthma, and as a treatment for some side effects of radiation treatment.

More frequently, the gel is used topically for such skin conditions as burns, sunburn, frostbite, psoriasis, and cold sores, as well as for the healing of surgical wounds and bedsores.

Aloe latex taken my mouth is considered likely unsafe, especially at high doses, according to the US National Library of Medicine. Whole-leaf aloe may be carcinogenic.

There are preliminary studies in laboratory animals suggesting that some of the chemicals found in aloes may have beneficial effects on the immune system. It is important in Oxidative Stress relief.

The US National Center for Complementary and Alternative Medicine and the US National Library of Medicine at the National Institutes of Health caution that people with diabetes who use glucose-lowering medication should be cautious about oral aloe as it may affect blood glucose levels. Further, all types of oral aloe products may be unsafe for children and for pregnant or breast-feeding women, although the evidence is not definitive. There are reports of people who have taken aloes orally for a few weeks or longer who have developed hepatitis. Aloe injections may be implicated in some way in the deaths of several people.

Side effects of oral aloe may include abdominal pain, nausea and vomiting, diarrhea, and electrolyte (chemical) imbalance in the blood; the

## STRESS PANDEMIC

use of high doses of aloe appears to increase the likelihood that such side effects may occur.

Much remains to be learned about aloe vera and there may be great benefit hidden here, but at present excessive use is not guaranteed to be benign.

### **Cortisol**<sup>8-12</sup>

Sitting on top of the kidneys, the adrenal glands secrete many hormones, cortisol being among them. Cortisol is beneficial in that it helps the human body use sugar and protein for energy, and in this way empowers our bodies to recover from infections, surgical procedures, and physical and emotional stress.

However, when stress is prolonged, excessive cortisol secretion may occur. This may lead to a condition of sustained and chronic elevation of cortisol levels, with harmful consequences. For example, exposing the human brain to elevated cortisol levels over extended periods of time may adversely affect the connections between nerve cells. For another example, the prolonged, stress-induced secretion of cortisol may lead to abdominal obesity and metabolic changes that increase insulin secretion as well as levels of harmful blood lipids.

Relaxation techniques and other helpful approaches to stress management benefit us by reducing cortisol levels, while at the same time lowering blood pressure levels, strengthening the immune system, and alleviating anxiety and depression.

### **Dopamine**<sup>13-17</sup>

Dopamine levels in the brain strongly affect our feelings of pleasure, reward, and reinforcement, while also playing an important role in movement (and the coordination of body motion), attention, and memory. Dopamine exerts wide-ranging effects, having important homeostatic functions and being active in establishing global brain states. Several different parts of the brain are particularly sensitive to the effects of dopamine, including the midbrain, the cerebral cortex, and the hypothalamus.

Natural, healthy living with adequate sleep creates dopamine levels without harmful effects. However, understanding how drugs that cause damage to the human body create positive feelings and cause addiction can help us grasp the power of dopamine. The effect of elevated dopamine levels is illustrated by how attractive cigarette smoking has proven to be, as

## PAUL HULJICH

nicotine causes the release of dopamine in the brain. Drugs such as cocaine, methamphetamine, and amphetamine also affect dopamine levels, while causing great damage to the body.

An extreme example of the effects of low dopamine levels appears in Parkinson's disease, an illness characterized by the death or damaging of dopamine-producing brain cells.

### **Endorphins**<sup>18-21</sup>

The US Centers for Disease Control and Prevention describes endorphins as “the natural ‘feel-good’ chemicals in the body, because they leave you with a naturally happy feeling.” Endorphins are active in such natural activities as eating, drinking, exercise, sports, sex, and maternal activities.

Endorphins are created primarily in the pituitary gland in the brain. Recent research suggests that certain cells of the immune system also produce endorphins. They exert their pain-reducing effects primarily at mu-subtype opioid receptors, which are located not only in the central nervous system but also throughout the peripheral nervous system. That endorphins and norepinephrine function in the gastrointestinal tract is related to why in stressful situations a person, may feel ‘a tightening in the stomach’ while when tension is released the gut relaxes. In the central nervous system they participate in a cascade of chemical reactions that leads to increased production of dopamine, a hormone associated with pleasure.

Understanding how endorphins were discovered, a few decades ago may help us understand what they are and what they do. Scientists asked themselves the following question: Why did the nerves of the human body evolve to have a way of receiving the chemicals in opium and using those chemicals to generate feelings? That question led scientists to the discovery of the specific binding sites in the brain occupied by opiates. The next question posed was why would there be opium receptors unless there were natural substances produced by the human body that would have morphine-like properties? These substances with their pain-relieving properties are what we now call “endorphins.”

### **Epinephrine/Adrenaline**<sup>22-25</sup>

Epinephrine, also known as adrenaline, is released by the body in stressful situations. For example, if you were going to take a test or walk up to the plate to bat while playing baseball, your adrenal glands would release epinephrine. It would speed your heart rate, which would increase

## STRESS PANDEMIC

the amount of oxygen available to your muscles, permitting your body to react faster and better; it would act on your lungs to enable increased ventilation; it would act in the liver to maintain the supply of glucose in the blood needed for your muscles to contract and for your brain to direct your activities; and would decrease insulin levels, which would also help to maintain blood sugar levels.

Furthermore, epinephrine appears to play a role in the secretion within the brain of the hormones oxytocin and vasopressin. Vasopressin has numerous functions, ranging from stimulating the contraction of capillaries and arterioles to raise blood pressure, to promoting contraction of parts of the intestines, to helping to contract the uterus, to affecting the collecting tubules of the kidneys. Oxytocin functions during labor and the expression of milk.

While epinephrine, norepinephrine, and serotonin are all neurotransmitters, epinephrine functions at a lower level in the brain than the others and acts upon fewer of the nerve cells of the brain.

A relatively limited number of nerve cells in the medulla of the brain convert norepinephrine into epinephrine.

### **Genetically Modified (GM) Products<sup>26-27</sup>**

Genetic modification involves the application of a specialized toolbox using recent technologies to alter the genetic makeup of animals, plants, or bacteria. (Other phrases used to describe such products are “genetically engineered” or “transgenic.”) A genetically modified product contains genes from SEVERAL different organisms. At present, genetic modification has been applied to create new medicines and vaccines, foods and food ingredients, feeds, and fibers. In 2006, 252 million acres of transgenic crops were planted in 22 countries by 10.3 million farmers. Among the crops most likely to be genetically modified are soybeans, corn, cotton, canola, and alfalfa.

Most GM crops possess advantages not found in conventional plants: in particular, herbicide resistance and insect resistance. But while some of the advantages of genetically modified crops are readily seen, there may be unknown or unforeseen risks. A swirl of controversy surrounds GM foods, and it seems unlikely that all the important questions will find speedy resolution.

None of this says GM Foods are unsafe and yet none of it provides proof that they are safe, either.

### **Hormones**<sup>28-30</sup>

The human body's chemical messengers, hormones are produced in the glands and sent out through the bloodstream. Hormones function as an array of regulatory molecules that transmit specific information among cells and among organs. Such molecular communication takes place in humans with a considerable level of complexity, with hormones, neurotransmitters, immune-system components and other parts of us all interacting.

Some hormones regulate the immune system. Some act within neurons, where they function as neurotransmitters. No surprise then that hormones affect numerous processes and illnesses. For example, as is fairly well known, hormonal changes appear to influence both the triggering and frequency of migraine headache attacks in women.

"Hormones are powerful," the US National Library of Medicine at the National Institutes of Health explains. Even small amounts of a hormone are capable of generating large changes in the cells of the body, or even in the entire body.

### **Lavender**<sup>31-33</sup>

Yes, the beautiful lavender plant is an herb. And both the lavender flower and the oil of lavender are used in formulating medicines.

According to the US National Library of Medicine, lavender is used for restlessness, insomnia, anxiety, nervousness, and depression. In addition, there are a number of digestive illnesses for which people look to lavender: for example abdominal swelling from gas, loss of appetite, vomiting, nausea, intestinal gas (flatulence), and upset stomach.

Among the additional uses for which some people find lavender helpful are migraine headaches, toothaches, sprains, nerve pain, sores, joint pain and acne. Some use it to promote menstruation. Some use it during cancer therapy.

Lavender may be applied to the skin and is sometimes used for hair loss (alopecia areata) and pain, as well as to repel mosquitoes and other insects. Lavender may be added to bathwater and some people are doing so to treat circulation disorders and to improve mental well being. Aromatherapy with lavender is used for insomnia, pain, and agitation related to dementia.

Lavender oil has sedating effects and may encourage muscle relaxation, the National Library of Medicine explains. Using lavender oil in a vaporizer overnight may benefit people with mild insomnia. Similarly, bathing in

## STRESS PANDEMIC

water to which 3 mL of a mixture of 20 percent lavender oil and 80 percent grapeseed oil has been added may benefit mood.

Notably, related plant species are sometimes permitted to contaminate pure lavender.

The US National Library of Medicine points to studies suggesting effectiveness for lavender but also points to potential side effects. “Lavender is likely safe for most adults in food amounts and possibly safe in medicinal amounts.” Known side effects of oral lavender include constipation, headache, and increased appetite. Lavender oil products applied to the skin have been known to cause abnormal breast growth in young boys.

In adults, the power of lavender to slow down the central nervous system may be a factor relevant to surgical procedures: Lavender may cause harm if used in combination with anesthesia and other medications administered during surgery. Thus, lavender use should be stopped at least 2 weeks prior to scheduled surgery. Another caution is that lavender should not be used with the following medications, as adverse effects may result: barbiturates, chloral hydrate, and such sedatives as clonazepam (Klonopin), lorazepam (Ativan), phenobarbital (Donnatal), zolpidem (Ambien), and others.

### **Melatonin**<sup>34-37</sup>

Melatonin, a hormone that promotes normal sleep, is produced by the pineal gland in the human brain, the production being synchronized with the light-dark cycle. A considerable body of research on melatonin as a sleep aid has shown that its impact on insomnia is real but relatively small. Studies with elderly persons suffering from insomnia indicate that melatonin can help them fall asleep faster; for younger people with insomnia there may also be benefit, although this is not as certain.

For those whose sleep problems involve an inability to sleep during the nighttime, that is, people with what is known as a circadian rhythm abnormality, melatonin shows greater effectiveness. Such people might take 3 mg of melatonin 4 to 5 hours before the time they wish to start sleeping.

Other groups of people who may benefit from melatonin therapy are those with jet lag and those engaged in shift work. Thus, for example, people who travel across five or more time zones, and particularly people who so travel in an eastward direction, may benefit from melatonin (3 mg at 4 to 5 hours prior to the time they wish to start sleep).

The safety of melatonin for short-term use seems relatively certain. However, there are two types of melatonin available: natural and synthetic

(man-made). As the natural melatonin derives from the glands of animals and can be contaminated with a virus, the American Academy of Family Physicians recommends the synthetic form. Also, while melatonin is relatively safe there have been reports of excess sleepiness, headache, stomach discomfort, depression, a “hung-over” feeling, and a “heavy-head” feeling.

Dietary supplements with melatonin “precursors,” L-tryptohhan and 5-HTP, appear not to be safe. Nor have they proven effective for insomnia. [L-tryptophan is an amino acid that the body converts to 5-HTP, and this, in turn, is converted to serotonin and then to melatonin.] Furthermore, they appear not to be safe. Both of these products may be linked to a complex debilitating systemic condition known as eosinophilia-myalgia syndrome (EMS).

### **Neurochemicals<sup>38</sup>**

A nerve cell has a central cell body and various arms that perform a variety of functions. The cell body contains an extremely sophisticated biosynthesis apparatus that forms enzymes and other chemicals necessary for the proper functioning of the nerve. As nerves activate, the substances produced by the biosynthesis apparatus serve to replenish those molecules and other substances secreted by the nerve cell and those inactivated during neural activity.

Thus it is important to understand that the numerous neurotransmitters active in the nerves are no more than a portion of the substances that must work together for the healthy functioning of the nerves.

### **Neurotransmitters<sup>39-41</sup>**

Nerve cells communicate with one another across a tiny space called a synapse: that is where signals move from one nerve cell to another. The chemical messengers released at the synapse to permit communication between nerve cells are called neurotransmitters. There are more than fifty neurotransmitters, and perhaps many more than that.

Thus, a minute sac of chemicals at the end of one arm of a nerve releases neurotransmitters into the space (the synapse) between two nerve cells and these chemicals – the neurotransmitters -- cross the synapse and attach to receptors on the neighboring cell, changing properties in this cell.

Some neurotransmitters make other cells more excitable; these neurotransmitters help make muscles contract and glands secrete

## STRESS PANDEMIC

hormones. Other neurotransmitters exert an inhibitory effect, making cells less excitable; these neurotransmitters help to control muscle activity while also playing an important role in the human visual system.

An important example of what neurotransmitters do is how they help control sleep and wakefulness, which they accomplish by acting on groups of nerve cells. Serotonin and norepinephrine are among the neurotransmitters that ensure that certain parts of the brain are active when we are awake.

### **Norepinephrine**<sup>42-45</sup>

Norepinephrine is a neurotransmitter that plays a key role in communication among brain cells. Notably, norepinephrine exerts both excitatory and inhibitory effects on various portions of the central nervous system as well as on more peripheral nerve cells, with effects on such factors as the firing rates of nerve cells.

Norepinephrine functions prominently in the sleep-wake cycle; affects sensory processing, movement, mood, memory, and anxiety; and has a key role in regulating blood volume and blood pressure. The midbrain, cerebral cortex, and hypothalamus are among the parts of the brain that are particularly sensitive to norepinephrine levels.

Low levels of norepinephrine may be associated with depressed mood. It is revealing that the effect of many antidepressant medications is to increase levels of norepinephrine and/or serotonin and other neurotransmitters in the brain. These same medications that affect norepinephrine and serotonin levels are used to treat anxiety disorders. That cocaine, methamphetamine, and amphetamine affect norepinephrine levels illustrates some of the power norepinephrine and these other neurotransmitters possess.

A major illness that is characterized by inadequate norepinephrine levels is Parkinson's disease, where the nerve endings responsible for producing norepinephrine suffer impairment.

### **Serotonin**<sup>46-53</sup>

Serotonin is an inhibitory neurotransmitter. According to the US National Institute of Neurological Disorders and Stroke, it is present throughout the body and brain; seven subtypes of serotonin receptors have been identified in the brain. Serotonin strongly affects the functioning of the midbrain, cerebral cortex, and hypothalamus.

Serotonin levels influence our mood, sexual desire, and appetite. It has a role in constricting blood vessels, lowering the pain threshold, and

## PAUL HULJICH

in regulating both body temperature and sleep. It plays an important role in headache, vomiting, alcoholism, and pain disorders. Deficiency of serotonin underlies depression and other mood and behavior disorders, as well as associated sleep disorders. It is notable that serotonin functions as a precursor for the synthesis of melatonin by the body.

Knowing that several antidepressant drugs influence levels of serotonin, norepinephrine, and dopamine tells us something about what serotonin's effect on us. And when doctors prescribe antidepressants for people with obsessive-compulsive disorder, the only medicines found to work well are those that affect serotonin levels. The power of serotonin is illustrated by the fact that such harmful drugs as cocaine, LSD, and ecstasy (MDMA) alter serotonin levels, as do medicines used to treat acute episodes of migraine headache.

### **Stress**<sup>54-56</sup>

"For some time it has been clear that psychosocial states such as stress, social isolation, and depression alter the risk of developing chronic illness and increase the risk of adverse outcomes," writes Mary Charlson in a leading standard textbook of medicine. A large body of medical research has demonstrated the impact of chronic stress on the structure and function of the brain, particularly upon those parts of the brain called the hippocampus, amygdala, and prefrontal cortex. Important in threat recognition, in fear, and in emotional learning, the amygdala and prefrontal cortex are associated with the affective and attentional responses to stress.

Thus, for example, chronic stress may interfere with problem solving. And as the hippocampus serves several types of memory, severe stress may affect memory and impede a person's ability to evaluate the seriousness of a potential threat. And while stress can actually reduce the size of the hippocampus, there is evidence that exercise and enriched environments have the potential to lead to the appearance of new cells. Recent research has demonstrated that chronic stress has a negative impact upon telomere length (Telomeres being specialized DNA sequences that serve as tiny caps located at the end of chromosomes).

It is important to remember that stressful events occur in the life of every person and that how each of us views those events and how we address them and how we seek social support influences their impact on us. None of us responds to stressful events outside the context of how our society and, more specifically, how our own social network views such events.

## STRESS PANDEMIC

Reducing levels of stress is a healthy approach to many of life's problems. As this book shows, people can learn how to better handle stress.

### **Tea Tree Oil**<sup>57-59</sup>

Centuries ago, sailors who made tea from the leaves of a tree on the southeast coast of Australia named the tree the "tea tree." It is oil derived from those leaves that is now called tea tree oil.

Tea tree oil is applied to the skin as a treatment for acne and other infections, and is used for infections of the nail (onychomycosis), for lice, scabies, athlete's foot (tinea pedis) and ringworm; for cuts and abrasions, burns, insect bites and stings, and boils. It is also used for vaginal infections, recurrent herpes labialis, toothache, infections of the mouth and nose, sore throat, otitis media, otitis externa, and other ear infections. Some people add tea tree oil to bath water to treat cough, bronchial congestion, and pulmonary inflammation.

According to the US National Library of Medicine there is some scientific evidence that application of a sufficiently strong preparation carries some effectiveness for athlete's foot (tinea pedis), for fungus infections of the nails, and for acne.

Applying tea tree oil preparations to the skin is likely safe for most people, according to the US National Library of Medicine, although there have been reports of skin irritation and swelling. Used for acne, it may cause skin dryness, itching, stinging, burning, and redness.

TEA TREE OIL SHOULD NOT BE TAKEN BY MOUTH. There are reports of oral use leading to confusion, inability to walk, unsteadiness, drowsiness, confusion, hallucinations vomiting, diarrhea, stomach upset, blood cell abnormalities, weakness, rash, and coma. When ingested, tea tree oil can be toxic.

### **Trans Fats**<sup>60-62</sup>

Certain foods contain trans fat, a type of cooking fat that, through a process called hydrogenation, combines hydrogen with vegetable oil. Trans fats increase the shelf life of foods and make foods taste less greasy. Foods more likely to contain trans fats are chips, crackers, cookies, muffins, sweet rolls, deep-fried food purchased commercially, microwave popcorn, shortenings, and stick margarine.

Trans fats have an unhealthy impact on the fats circulating through your blood. In addition, there is some evidence that trans fats may damage the

cells lining blood vessels and may increase inflammation; and both of these processes may lead to blockages of the blood vessels of the heart. Because of the harmful and potentially harmful effects of trans fats, the US Food and Drug Administration now requires food manufacturers to list trans fat on the Nutrition Facts panels appearing on many foods

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