

# The Zeta Potential in Healing and Wellness

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Blood is a colloidal solution of suspended negatively charged particles. All blood cells have a very slight negative charge which repel each other. This charge is called the Zeta potential. It is a measure of the electrical force that exist between atoms, molecules, particles (cells are considered particles) in a fluid.

The ability of a fluid such as blood or lymph to carry material such as nutrients or wastes is determined by the strength of the Zeta potential. Increasing the electrical force in the solution allows the fluid to dissolve and hold more material. In this way, more nutrients can be carried throughout your body and accumulated deposits of waste can be removed.

Blood will coagulate if the zeta potential is too low. Blood as sludge is difficult for the heart to pump and is ineffective at performing the usual functions of blood such as providing nourishment for the body and the removal of metabolic or toxic waste products. This is a condition known as intravascular coagulation. Intravascular coagulation is clearly visible in the blood vessels of the eye when viewed under relatively low level (60x) magnification. When blood aggregates are forced through the smaller vessels, called capillaries, damage occurs and is observed as ruptured capillaries.

Blood is in constant motion at a constant body temperature and the pH of blood is maintained at 7.35 to 7.45, but its concentration of electrolytes is not fixed, and the electrolytes directly affect the zeta potential. Thomas M. Riddick wrote an extensive treatise on the zeta potential of colloidal fluids. His work is sited in all discussions zeta potential in the body. "So long as the Zeta Potential (ZP) of the system remains constant, the fluidity (viscosity) of the system will also remain constant. But if the ZP of the system is progressively lowered by the introduction of cationic electrolytes or polyelectrolyte's, then the stability of the system will undergo progressive changes — from simple agglomeration to fluid gel formation — and finally to a rigid gel." - Thomas M. Riddick

## **BE AWARE AND BEWARE OF IMPROPER USE OF THERAPEUTIC COLD PACKS:**

Inflammatory changes do to cellular exudates, degrade the zeta potential and cause gel formation in tissue. There are many physical therapy modalities that assist the body by heating tissue, e.g.. lasers, ultrasound diathermy, microwave diathermy, etc. Their purpose is to liquefy the gels that form with inflammatory processes, so they may be removed by the blood. A good example of this gel or sol state is a food product called Jell-O. Jell-O is a colloidal suspension that turns to a gel when it is cooled or back to a sol when it is heated. This also is the case in the body. Inflammation in the body is accompanied by elevation of temperature, either locally or systemically. It is beyond comprehension that cold therapy would be used to treat inflammation. Cooling encourages gel formation and stasis by degrading the zeta potential. This potentially creates stasis of blood and lymph flow and results in increased scarring. Many injuries become complicated with scarring because of improper use of cold therapy.

## **MINERALS SHOULD BE TAKEN WITH WATER:**

Intravascular coagulation is a common problem for many people. Random studies suggest it is seen in as many as 40-50% of the population. This is due in part to not drinking enough water and having diets that are too high in sodium. Intravascular coagulation can be reduced by drinking 8 glasses per day of water with a mix of potassium citrate and potassium bicarbonate added sufficient to raise the pH of the water to 8.0 to 8.4. The minerals **MUST** be taken with the water in order to be effective. Use table salt that has a mixture of 60% potassium chloride and 40% sodium chloride (Morton Lite) to better reflect the potassium/sodium balance found in foods.

## **AVOID ALUMINUM IN DIET, MEDICINES, AND ANTIPERSPIRANTS:**

To increase your zeta potential you must avoid aluminum. Aluminum is used in water treatment plants to cause materials to settle out of solution. It does this by reducing the zeta potential. In your body aluminum does the same thing, causing coagulation of your blood, and deposits and plaques in your arteries, brain and throughout your body. Aluminum is found in municipally treated water, cooking utensils, vaccinations, non-clumping salt and baking powder, antiperspirants, antacids, drugs (read the label carefully), and soft drinks and other canned goods where the plastic liner has cracked during sealing. It is even in polluted air.

If you have accumulated aluminum in you body it can be detected with laboratory testing and if elevated, removed by IV chelation.

## **AVOID EXCESS CONSUMPTION OF ALCOHOL:**

Consumption of alcohol produces intravascular coagulation by a loss of the zeta potential. Loss of zeta potential produces a rigid gel and circulation is disrupted. The damage this coagulation causes is seen as broken capillaries in the sclera of the eyes, nose, and cheeks, of people who abuse alcoholic beverages. What is not seen but is apparent as well is the brain damage that also occurs. Other organs in the body are destroyed by this same process.

## **AVOID 60 CYCLE ELECTROMAGNETIC FIELDS:**

Certain electromagnetic radiation frequencies decrease the nutrient carrying capacity of blood and lymph. People are exposed to 60 cycle radiation by being in magnetic induction fields (transformers) such as AC electric motors (air conditioning, refrigerator, and spa pumps), heating pads, metal detectors used in security screening devices, and old televisions and computer monitors that use cathode ray tubes (CRT), and ballast of fluorescent lights.

## **ALUMINUM CAN DESTROY THE ZETA POTENTIAL IN AGRICULTURE:**

Soil is a colloid suspension of nutrient particles the same as blood in the body. Aluminum can destroy the zeta potential in agricultural soils, rendering the soil colloidal solution incapable of supporting plant life. It makes no difference how much nutrient is added to the soil, if water cannot carry it into the plant. Aluminum enters the colloidal solution when it is dissolved by excessive acidity in the soil. The usual response by the farmer is to add lime to the soil, increasing the pH sufficiently to remove the aluminum from the soil solution thereby restoring the zeta potential.

The discussion and concern about acid rain in the northern forests is not an acid rain problem, but rather a problem of lowered pH from acid rain that leaches aluminum and other heavy metals into the soil which reduces the zeta potential. Heavy metal ions such as aluminum, get into surface water, reduce the carrying charge (zeta potential), and increase the surface tension creating a devastating effect on forests as well as crops.

## **IV THERAPY CAN BE USED TO INCREASE ZETA POTENTIAL IN THE BLOOD:**

As zeta potential decreases, the heavy metals that we accumulate from environmental pollution, generally come out of suspension first. Many degenerative disease are associated with this disruption in blood circulation. Aluminum is not required by the body as a nutrient, and has an effect on zeta potential  $60 \times 100 = 6,000$  times greater than sodium.

Osteopenia and some elements of osteoporosis are related to the inability of blood to carry nourishment and mineral suspension to bone tissue. The bone wanes and becomes weakened. Spontaneous or stress fractures can then occur.

EDTA chelation therapy is used to increase zeta potential and remove toxic heavy metals from the body. The increased zeta potential allows toxic deposits in the body to re-enter solution so that they can be removed by the kidneys, liver, and in the sweat, etc. A study in Switzerland found that people who had chelation therapy to remove lead from their body also had less cancer in later years.

Increasing your zeta potential increases effectiveness of red blood cells, allows the heart to pump more easily, provides better nourishment and removal of metabolic and toxic products in blood and lymph.

### **Mineral ions should be balanced in fluids:**

Dr. Gerson's use of potassium in the treatment of cancer patients is validated when the zeta potential of ions in solution is understood. The increased zeta potential provided by potassium is a prerequisite to accomplishing detoxification in the body.

McDaniel, M.D. treated thousands of patients for many conditions by increasing their zeta potential. His book, *Disease Reprieve* discusses many important points regarding the use of zeta potential in healing:

"The body performs at a pH of 7.35 with the range as wide as 6.8 to 9.0. pH is controlled by the Alkaline Reserve formula shown below...Obviously if you are to be of assistance through choices of foods and drinks, you need to be aware how relative alkalinity and acidity is maintained. Therefore, in our office we use a pH tape that can be deposited for a brief second in saliva beneath the tongue or in a sample of urine recently drawn. The pH then is matched by a color sample ranging from a pH of 5.0 to a pH of 9.0...The pH 'dipstick' is an excellent source of dependability in measuring alkalinity, acidity, and any reading between the aforementioned extreme range." - page 43.

"Therefore, it is important to keep pH on the alkaline side for discrete dispersion of plasma formed elements; acidosis and ketosis secondary to hyperglycemia promotes slowed plasma flow..." - page 44.

"Without measuring these additional cationic surfactants that are such a part of the etiology of clot formation, we are sometimes likely to err and not understand how the trace cationic surfactants (Mercury, Aluminum, Copper, Tin and Zinc, to name a few) can produce a hypertonic solution higher than the reading when using only Sodium, Glucose and BUN in the above referenced formula." - page 47. (Editor's note: BUN is "Blood Urea Nitrogen" and is a measure of the efficiency of the kidneys.)

"An understanding of Zeta Potential, the force that maintains the discreteness of particles in a colloidal system, brings order to the study of practical and theoretical colloidal behavior...As we alternate between simple man-made inorganic systems and sophisticated organic natural systems, we find the basic principles apply to both." - page 50.

"Ionic concentration results from the introduction of one or more elements into the system, producing an electrolyte solution. Inorganic elements hydrolyze in solution to dissociation, liberating a radical...The resulting electronegative element is called an anion. The electropositive element of a dissociated molecule is called a cation, and sometimes referred to as a 'free radical'." - page 51.

"The strength of the ionic concentration is measured by its conduction of an electric current called Specific Conductance. The term micromho is generally employed in expressing this conductivity; mho being the reciprocal of ohm, a unit of electrical resistance, times one million (1 one-millionth of an ohm)." - page 52.

"When the concentration of an anionic electrolyte in a dilute colloid system is progressively increased, its Zeta Potential becomes more electronegative until it reaches a plateau; then reverses, and the colloid is eventually 'salted out'. 'Salting out' refers to the agglomerating or flocculating effect of a high reagent concentration in a system." - page 52.

"The valence of the ion can have a dramatic effect on Electrophoretic Mobility, amplifying the Zeta Potential of the colloid in varying degrees. According to the Schulze-Hardy rule, divalent cations are approximately 20 to 80 times as effective as monovalent cations in the agglomeration of electronegative colloids, and tri-valent cations are 10 to 100 times more effective in agglomeration of electronegative colloids." - page 52. (Editor's note: This is why we are concerned about the consumption of aluminum. It is not required by the body as a nutrient, and has an effect on zeta potential  $60 \times 100 = 6,000$  times greater than sodium.)

"Knisely, Bloch and associates at the University of South Carolina demonstrated that Intravascular Coagulation could readily be seen in the venules and arterioles of the sclera and/or conjunctiva of the human eye, and that a high degree of fluidity of the blood (without clumping of the formed elements) was characteristic of good health. Conversely, a high degree of coagulation was inevitably associated with morbidity and death." - page 55.

"The principles of Zeta Potential, once clearly understood by a Physician, should be effectively incorporated into a patient education program that places a clear emphasis on self-reliance and individual responsibility for maintaining good health." - page 56.

"Zeta Potential values less than -14mv usually represent the onset of agglomeration. A plateau region, marking the threshold of either agglomeration or dispersion, exists from about -14 to -30mv. Values more electronegative than -30mv generally represents sufficient mutual repulsion to result in stability." - page 56.

"Electrolyte solutions that produce the desired Ions serve as surfactants. The ions of both anionic and cationic electrolytes may carry from one to four charges and are accordingly designated mono, di-, tri-, or polyvalent type electrolytes." - page 57.

"When the electrolytes are negatively charged, they are written as 1:1, 1:2, 1:3, or 1:4 to indicate the ratio and their respective ionic strength relating to successive increase in Zeta Potential and degree of dispersionary effect on the colloid." - page 57-58.

"When the electrolytes are positively charged, they are written as 1:1, 2:1, 3:1 or 4:1 to indicate the ratio and their respective ionic strength relating to successive decrease in Zeta Potential, which allows van der Waals Forces to come into play, resulting in agglomeration." - page 58.

The information in the following table comes from page 58:

<b>ANIONIC ELECTROLYTES</b>	<b>CATIONIC ELECTROLYTES</b>
1:1 Potassium Chloride KCL	1:1 Sodium Chloride NaCl
1:2 Potassium Sulfate $K_2SO_4$	2:1 Calcium Chloride $CaCl_2$
1:3 Potassium Citrate $K_3C_6H_5O_7 \cdot H_2O$	3:1 Aluminum Sulfate $AlCl_3$
1:4 Tetrasodium Pyrophosphate $Na_4P_2O_7$	4:1 Polyvalent Cations

"Non-ionic surfactants can adsorb onto the colloids, creating Steric Hindrance, which interferes with ionic mobility and thus with Zeta Potential. Sugar and alcohol are non-ionic surfactants." - page 60.

"If the ionic concentration of the plasma increases to more than 290 milliosmhos, one half of the excess cations will migrate into the Extracellular Fluid (ECF) where they are stored in an effort to relieve the Hypertonicity. When the plasma returns to normal osmolarity, the extra electrolytes, which were stored in the Extracellular Fluid, will re-enter the plasma, eventually to be removed by the kidneys. If, however, the ionic concentration of the plasma remains elevated, the cationic migration will continue until the Extracellular Fluid is also hypertonic. At this point, the body will make water available to flow into the area of high concentration in an effort to dilute the solution. Edema is the accumulation of Interstitial Fluid resulting from high ionic concentration." - pages 62-63.

"Urine is the result of continuous filtration of blood through the kidneys. The primary objective is to save essential electrolytes." - page 63.

" $Na^+$ ,  $K^+$ ,  $Ca^{++}$  and  $Mg^{++}$  are all cationic, totaling approximately 3.6 grams.  $Cl^-$ ,  $HCO_3^-$ ,  $HPO_4^-$  and  $S_3O_4^-$ , are all anionic, totaling approximately 5.5 grams for a combined ideal total of approximately 9 grams per liter of blood...Selective tubular resorption assures recycling of these essential electrolytes and the minor minerals,

whose total weight approximates 11 to 12 mgs." - page 63. (Editor's note: the anions listed above are chlorine, carbonates, phosphates, and sulphates.)

"One of the major uses of Zeta Potential is to study the interaction between colloids and electrolytes." - page 64.

"The mineral content of the daily input of foods and liquids is of the greatest importance in maintaining health. This, after all, is the source of all the anions and cations, which, as electrolytes, power the electrophoretic activity of the blood system...Through careful selection of food and drink relative to mineral content, it is possible to manipulate and control to a high degree the dispersion or coagulation of the formed elements." - page 69.

"When viewed in the light of Zeta Potential, the crux of the present epidemic of Cardiovascular-Renal Disease seen in this country appears to result from three major sources:

- 1) The excessive input of mineral salts into the human system.
- 2) The inversion of normal Sodium/Potassium ratios in foodstuffs through processing.
- 3) The gradual overloading and eventual overwhelming of the kidneys due to ingestion of excessive mineral salts." - page 69.

"The only hope we have to minimize the ill effects of this needless inversion is to avoid as much as possible these processed foods and to increase the daily intake of Potassium. Frequently prescribed forms include Potassium Gluconate, Acetate, Bicarbonate, Citrate and Chloride. The use of these supplemental Potassium salts improves the electrolyte balance essential to cardiovascular renal function." - page 70.

"In excess of 90% of all drugs listed in the Physician's Desk Reference (PDR) have the potential to divert homeostasis. The culprit: the cation." - pages 91-92.

"Distilled or quality Reverse Osmosis water is used exclusively by our patients." - page 93.

"The smallest mass, the atom, has a positive charge in its nucleus and the anion (electron) orbiting the proton." - page 98. (Editor's note: We are intrigued with the description of the electron as an anion. By this definition, electro-medicine devices offering a flow of electrons through the blood are providing a flow of anions.)

"I have also long known that the number one problem in venous stasis relates to inadequate liquid intake. I also recalled that in the 1950's, Ivy League colleges found that we are usually two liters low in blood volume before we become thirsty enough to think about drinking." - page 110.

"We tell our patients repeatedly that the number one problem of disturbance of antegrade flow is hypovolemia, not enough water." - page 111.

"We teach that the common problem in American's circulatory disorders is the pollution that comes with high amounts of cationic electrolytes, primarily aluminum, tri-valent in power, a critical element in the use of precipitating the particles in water so that the water we drink would be potable, generally meaning that we will drink it though unaware that we are still polluting ourselves." - page 111.

"The greatest single invention of the 20th Century in my opinion is the development and effectiveness of a Reverse Osmosis water unit that will remove these toxic substances in part responsible for Intravascular Coagulation, Deep Venous Thrombosis, Pulmonary Emboli and Kidney Stones, all components of The Wheel of MisFortune." - page 111.

### **High Potassium Foods**

Fruits	Vegetables	Other Foods
Apricot , raw (2 medium) dried (5 halves)	Acorn Squash Artichoke	Bran/Bran products
Avocado (¼ whole)	Bamboo Shoots	Chocolate (1.5-2 ounces)
Banana (½ whole)	Baked Beans	Granola
Cantaloupe	Butternut Squash	Milk, all types (1 cup)
Dates (5 whole)	Refried Beans	Molasses (1 Tablespoon)
Dried fruits	Beets, fresh then boiled	Nutritional Supplements: Use only under the direction of your doctor or dietitian.
Figs, dried	Black Beans	
Grapefruit Juice	Broccoli, cooked	
Honeydew	Brussels Sprouts	Nuts and Seeds (1 ounce)
Kiwi (1 medium)	Chinese Cabbage	Peanut Butter (2 tbs.)
Mango(1 medium)	Carrots, raw	Salt Substitutes/Lite Salt
Nectarine(1 medium)	Dried Beans and Peas	Salt Free Broth
Orange(1 medium)	Greens, except Kale	Snuff/Chewing Tobacco
Orange Juice	Hubbard Squash	Yogurt
Papaya (½ whole)	Kohlrabi	
Pomegranate (1 whole)	Lentils	

Pomegranate Juice

Prunes

Prune Juice

Raisins

Legumes

Mushrooms, canned

Parsnips

Potatoes, white and sweet

Pumpkin

Rutabagas

Spinach, cooked

Tomatoes/Tomato products

Vegetable Juices