

Introduction

The Key to Maintaining Good Health

At Zero Point Healers, LLC, (www.zeropointhealers.com) we have worked with hundreds of clients over the past five years who have a wide range of health problems. The focus of our work is energetic. We address the underlying reasons for illness and focus on allowing the body to release all of the trauma that has been trapped deep inside the tissues.

The encouraging news is that after receiving a series of three to six healings -- sometimes more -- a majority of our clients recover and are able to get on with living their lives to the fullest. We noticed over the years, however, that some clients improved, then hit a plateau. For some reason they were unable to move through a blockage that was preventing them from recovering fully.

The truth is that we ambled about for several years trying to figure out how to get some of our clients over the hump so they could recover. We knew the answer was energetic, but did not understand why our hands on approach to energy healing was not enough for some people.

Until one day quite by accident we stumbled onto the solution. For a year, Zero Point Healers in conjunction with Ann Egerton, a top notch healer, had been doing a study evaluating the effects of

energy healing on persons with Parkinsons. Over the course of our study, we met John Coleman, a naturopath from Australia, who had recovered from Stage 4 Parkinsons.

How did John recover? He attributes his recovery to a number of factors including the release of trauma through energy healing. At the top of his reasons for recovery is his daily use of the Aqua formulas. He convinced us that one foundational reason why critically ill people do not recover is because they are dehydrated.

We decided to take his advice seriously. John visited Olympia, Washington and brought us our own personal bottles of the Aqua hydration formulas. We have now been taking them for 5 months.

We each have our own stories about using the Aquas. Robert's story first, then Deborah's.

Robert's Story

It was several weeks after John brought the Aqua hydration formulas and I still had not begun taking them. There was no big hurry after all. I knew the Aquas were energetic interventions and it always takes energetic interventions time to change the physical body. I figured it would take at least a month to feel the effects from taking the Aquas on a regular basis. My elbows felt like the back of an elephant and the skin on my face was scaly but – whatever – I am a man who does not bother looking in the mirror very often.

The day finally came when I took my morning AM bottle of drops. Later that morning I wisped off to my ritualistic run down beside the waters of the Puget Sound. I just happen to have my Superman shirt on that day.

Now, I have been running for years so I know what it feels like to run up hills and what it feels like to pour on the coal. This day, however, was a day like no other I have experienced. For the first time in my entire running life (and for those who are curious I am four decades older than 21), I flew up hills as if I were Superman. The Superman shirt actually fit. It wasn't even a joke. I had never run so effortlessly in my life. The recoil time was rapid and my peak running stints did not create the heavy breathing that sounds like I am about to die (which is my usual daily run experience).

The bottom line is (without all the hyperbole) that hydrating my body using Aquas created an amazing result. My youth had returned at last. I love feeling 18 again. I actually had so much energy that I had to cut down the number of drops I took from 3 drops to 2 drops a day. I could feel the cells throughout my body being nourished and revitalized. My daily productivity increased by at least 50% because of the increased stamina and energy from taking the Aquas.

My elbows converted to the softness of a baby's cheek (well – almost). My wrinkles faded. Daily swings in my weight stabilized. I

lost 10 years off of my age. It makes a huge difference to the age you look when the largest organ in the body – the skin - is soft and tender. Now I do not mind looking in the mirror more than once a month.

I figure if people knew about the Aqua formulas, they would not bother getting face lifts or other plastic surgery. Aquas are much less expensive to use and painless. Better yet, they use a combination of perfectly safe ingredients.

Deborah's Story

I also did not immediately use the Aqua hydration formulas when we received them from John. Too many things to do, too many supplements to take each day, too many things to attend to as a mother of two wild and whacky nearly adult sons... I would get around to the Aquas eventually, as is my style. But, when I witnessed Robert's amazing burst of energy and well-being, how he was getting things accomplished with optimism and enthusiasm, I was encouraged to start.

Now, being as sensitive as I am, I decided to begin with one drop of the Aquas in the AM and one drop in the PM, just to see how my body would respond. After all, all I had to do was to hold the bottles in my hand to experience the essence of the formulas. And, being a woman, it was way too much energy for me to hold

the Male Aqua formulas....wow...I could feel why Robert had become Superman! Holding the Female Aqua formulas in my hand felt much more comforting to me. And so, my intuition paid off. With one drop, I could instantly feel the Aquas working in my body and in my psyche. That first drop started a process in me that has not quit.

I instantly felt a warm rush of well-being spread within and throughout every cell of my being. I felt my energy field quickly expanding so that I felt myself to be a much larger and profound presence in the universe. I continue to have more energy and optimism, and believe that the Aquas could be wonderful to combat anxiety and depression (I've been in the mental health field for over 30 years).

But, one of the most fascinating results of my taking the Aqua Hydration formulas (now that I have stabilized to 2 drops per dosage) is that my 16 year old son, Stefan, has stopped teasing me with his turkey gobbling noises, which were intended to focus on my bagging facial and neck skin. Stefan had to admit that within a few weeks of taking the Aquas, that my few facial wrinkles and more profoundly, my sagging neckline, had disappeared! Even my girlfriends noticed that my "old lady neck" had disappeared, and they, naturally, expressed interest in the Aqua Hydration formulas for this reason alone.

Let me add, my skin is smooth and soft again, and the appearance of my waistline and especially my legs and thighs has improved dramatically. So, I am on my way back to the beauty that I was before Menopause knocked on my door. I am 53 but continue to get carded at the movie theatre so I can get into an R-rated movie. Ha! And my exercise routine had a boost, just like Robert's. I can pedal my bike like a wild woman!

So, my advice to you is....give the Aqua Hydration formulas a try and see what they will do for you! This is the most cost effective product I have ever used in my life! Energy medicine works in mysterious, synergistic ways that nothing else can match!

The Answer

When doctors are asked by their patients what they can do for themselves to get better, they are surprised to hear the answer. The answer most often is “drink more water” or “hydrate your body.” Most people think “I paid this person a ton of money to tell me to drink more water?” The answer is Yes.

More water of course is the obvious answer to our puzzle at Zero point Healers. Our clients who were recovering at a snail's

pace had hit a plateau because the cells in their bodies were dehydrated. It was as simple as that. We now suggest to our clients that they use the Aquas on a regular basis.

Dire Consequences of Dehydration

So what is the big deal about water in the body besides for feeling a little low on energy at times and looking like you are 90 years old when you are really only 50? The big deal is disease. We have been startled and – might I say amazed - at the number of critical and life threatening diseases that are directly related to dehydration in the body.

This e book thus presents a description and explanation of the causes and treatment for major diseases that are directly connected to a lack of water in the body. This is not a comprehensive listing, but a sampler. Consider this an educational opportunity to help you understand why hydration is so critical important to your health and wellness.

If you ever doubt how important it is to take your Aquas, visit some of the chapters in this book and be reminded. Hydration is the key to maintaining your health and happiness. We wish to extend our gratitude to Wikipedia and the many contributors to articles about hydration which we have included in this edited book. We also want to thank Dr. Jaroslav Boubik, for his contributions to this volume.

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Chapter 1: TREASURE OR BACON, Recovery or Cure

By John Coleman ND, MANPA, MBTAV

Neurodegenerative and autoimmune disorders such as Parkinson's disease, Multiple Sclerosis, Chronic Inflammatory Demyelinating Polyneuropathy and Ankylosing Spondylitis (plus many others) are generally considered to be progressive, degenerative and incurable. All evidence to date points to this, yet some people continue to get well. Are they "**cured**" or do they "**recover**"? Is there a difference?

Curing is what we do to bacon; we take a pig, slaughter it, cut it up, smoke it, salt it, preserve it, then serve it as breakfast. We **cure** ham, plastic and concrete ¹. Some disease symptoms can also be cured by cutting (surgery), poisoning (chemotherapy) or burning (irradiation).

When we lose a treasure, we don't **cure** it, we **recover** it. Illness indicates that we have lost our health – surely the greatest treasure of all. So we can work to **recover** our treasure; our health.

In 1995, I developed symptoms of advanced Parkinson's disease with some symptoms of early stage Multi System Atrophy. I was told by Western and Complementary Medical practitioners alike that the best I could do was control the symptoms for a little while; inevitably, I would become more and more helpless and, eventually, require full time care ^{2,3,4}. As I was only 52 and felt that I had yet to fulfill my life, this was not a pleasant outlook. I set off on a journey of discovery to try and find ways to survive each day a little better, with less pain and improved energy. I had no thought of **cure** or **recovery**; I wanted simply to find enough wellness to look after myself. By mid 1998, I found that I was free from symptoms (**recovered**) and set about finding out why I had achieved this when it was thought impossible.

My journey is similar to other, more famous journeys. Petrea King and Ian Gawler both recovered from “incurable” cancer. Each, in their own way, set about making each day more beautiful

and survivable without looking for **cure** or **recovery**^{5,6}. Barbara Brewster, Rachel Breslow and Deborah Spring have all recovered from diagnosed Multiple Sclerosis. Each walked their own journey, yet showed similarities with Petrea King and Ian Gawler in finding peace, coming to terms with their own integrity and honesty, and using meditation as one of the vehicles for this^{7,8}. Four Australians, other than myself, have recovered from Parkinson's disease, including one who was even more debilitated than I was in 1995.

Since my own recovery, I have worked with over two thousand people diagnosed with a variety of neurodegenerative and autoimmune disorders. Each person has told their story with insight and honesty as we worked together; sometimes the full story was revealed at the first visit while, with others, it took many months and several visits to find the details of their descent into illness. Each story included similarities with those of us who have recovered.

With evidence from stories of recovery, plus research from around the world, we now have a much clearer picture of why we experience serious, chronic and degenerative illnesses that may be life threatening, or become life sentences – imprisoned in

frustration, pain, debility and helplessness^{9,10,11}. We believe that the initiating circumstance that begins the long, usually slow decline into a chronic nerve disorder is the suppression of the fight/flight/freeze response early in life; probably between conception and late teens. This creates a redistribution of chemical energy and water from areas not needed during running and fighting (“fight/flight”) into areas most needed for immediate action².

The fight/flight/freeze response is a beautiful, life-saving process required for individual and species survival when it is resolved in reasonable time through action. However, the “dangers” we encounter so often today are very different from the clearly delineated dangers encountered and survived by our hunter/gatherer ancestors 40,000 or more years ago. In those days, our ancestors faced fire, cold, lack of food or water, predators and enemies as basic, easily recognized dangers. Other circumstances were safe and our body reacted accordingly^{2,9,10}. Now we live in a society that may impose dangers on our body even though, intellectually, we feel safe. For instance, there are over 160,000 neurotoxic chemicals in our environment that were not there 50 years ago¹⁰.

Many other traumas are obvious – abuse of various types, loss of a parent, child or sibling, life-threatening disease or accident. Some are not so obvious. For instance, a woman who was implicitly blamed by her Father for her Mother's miscarriage; a woman adopted into a loving family after nine months of bonding to her birth Mother; a man whose Father was a workaholic and was not around for any of his son's activities, or to develop a relationship.

Sometimes it is simply being born at a time or in a place that is traumatic. For instance those born in Europe just before or during WWII, or in Eastern Europe during the Soviet occupation. Their families lived in fear and uncertainty; babies were conceived and born into traumatic circumstances. For those predisposed to neurodegenerative or autoimmune disorders, this may be the initiating stress overload.

Stress can be good for us as it motivates us to activity, and provides the physiological resources for that activity ¹⁰. Trauma need not be physically damaging if it is treated and resolved healthily and holistically ¹⁰; but this is rare in the sorts of trauma mentioned above.

Prolonged stress and unresolved trauma trigger our body into continuous stress reactions that, over a long time, become damaging^{2,10}.

The initial physiological reaction to any type of significant stress or trauma is the fight/flight/freeze response. Simply put, the process is this:

- Some adrenal hormones are directly triggered by stress and trauma
- Stress and trauma stimulate the **hypothalamus** to release Corticotropin-releasing Hormone (CRH).
- CRH stimulates the release of Adrenocorticotrophic Hormone (ACTH) from the Pituitary Gland.
- ACTH regulates excretion of other hormones from the **adrenal glands**.

Major hormones released by the adrenals are:

Adrenaline

Mineralocorticoids (aldosterone)

Glucocorticoids (cortisol)

Adrenal androgens (testosterone)

Adrenaline

- Increases blood glucose
- Increases glycogen breakdown
- Increases intracellular metabolism of glucose in skeletal muscles (ready for action)
- Increases breakdown of fats in adipose (fatty) tissue
- Increases heart rate
- Increases force of heart contraction
- Constricts blood vessels in skin, kidneys, gastrointestinal tract and other organs not needed for fight/flight
- Dilates blood vessels in skeletal and cardiac muscle.

Aldosterone

- Increases rate of sodium re-absorption in kidneys, leading to
 1. increased plasma sodium
 2. increased water re-absorption
 3. increased blood volume
- Increases potassium excretion
- Increases hydrogen ion excretion (leading to acidic urine)

- Changes in sodium/potassium balance can affect
 1. cellular hydration,
 2. cell membrane function and
 3. transport to and from cells.

Cortisol

- Increases catabolism of fats
- Decreases glucose and amino acid storage in skeletal muscles
- Increases glucose synthesis from amino acids in the liver leading to increased blood glucose
- Increases protein degradation (leading to muscle weakness/atrophy, osteoporosis)
- Decreases inflammatory response by decreasing number of white cells and the expression of inflammatory chemicals (leading to a depressed immune system)

Testosterone

- Increases pubic and axillary hair
- Increases sexual drive (but may reduce potency)

Short-term stress is a normal part of life. We need it for motivation, and we need the physiological responses to stress in order to survive. Our forebears faced immediate dangers and stimuli every day in living as discussed above ^{2,9,10}. In all these cases, the stress was resolved quite quickly – they won or lost, caught the prey or waited until the next day, got away or got eaten ^{2,10}.

We have negative feedback systems to adjust levels of adrenal hormones so they do not become damaging. However, **continuous stress can override these negative feedback systems** so that we go on hyper-producing these chemicals ^{2,10}. Evolution, deciding that a response to all stress was necessary, didn't bargain on the long-term stresses of Western society. Furthermore, Western society has developed so quickly that our evolution processes can't keep up; our physiological ability to cope with modern stresses has lagged way behind the development of those stressors ^{2,10}.

Many stresses in this society are not resolved, and many traumas go unrecognised ¹⁰. We live surrounded by noise, pollution, busyness and poisons. Child abuse is the world's best-kept secret; family breakdown is seen as traumatic for the partners, but not

necessarily for the children; the loss of a sibling or grandparent or friend is often borne in silence by the young in our society.

Prolonged and unresolved stress or trauma can result in:

- Increased plasma sodium and decreased potassium, affecting many body functions
- Cellular dehydration through hypothalamic changes
- Chronic heart stress and failure
- Alkalosis and reflux
- Hypertension
- Weak skeletal muscles
- Acidic urine
- Hyperglycemia (diabetes)
- Deficient immune system
- Muscle atrophy
- General weakness and debility
- Osteoporosis
- Weak capillaries
- Thin skin that bruises easily
- Impaired wound healing
- Inappropriate fat distribution

- Mood swings
- Menstrual irregularities

People facing prolonged, unresolved stress or trauma will respond in different ways, possibly dictated by their genetic inheritance and/or environment. Some will develop heart disease, cancer, arthritis, diabetes, skin disorders, depression or other psychological disorders, gastric ulcers or inappropriate behaviours such as substance addictions, addictive gambling or violent behaviour ¹⁰. Some will develop neurodegenerative or autoimmune disorders such as Parkinson's disease.

The reprogramming of the hypothalamus and cellular dehydration, as well as many of the other effects shown above, allow some brain cells to become damaged, inactive, or even die, over many years, ultimately resulting in the expression of Parkinson's disease symptoms. Unresolved stress/trauma is not necessarily the "cause" of Parkinson's disease, but can begin the slow degeneration that leads to cell fragility and damage ^{2,10}. All those I see also have a history of stress triggers throughout life, and a high degree of imposed responsibility for others. This is also a factor in disease development.

Once we recognise that our diagnosed Parkinson's disease is not our fault, and there is a logical development process, we can

create strategies to reverse the process and, perhaps, recover. We can also largely ignore the name (diagnosis) given to our disorder as the process of development is always the same.

The development process revolves around the hypothalamus/pituitary/adrenal axis (the organs and control centres that demand the over-production of the stress hormones). For many years, practitioners sought to relieve the common symptoms of fatigue and anxiety by boosting adrenal strength and activity. However, since 1997, it has become far more helpful to work with the hypothalamus and change the way our body distributes water and energy ².

The important aspect of this change in emphasis is that we have the power to change much of our hypothalamic activity without resorting to practitioners or expensive remedies. Certainly there are no satisfactory drugs to do this, and a only few Complementary Therapies to help us, so it's primarily up to us as individuals to reverse this process of degeneration, thus reversing our symptoms.

Firstly, our hypothalamus responds to thoughts, impressions and perceptions; therefore, changing the way we view ourselves through affirmations, self-talk or similar techniques may begin the

move towards better health. Our hypothalamus may produce less CRH thus reducing production of stress hormones ².

We, individually, provide most of the perceptions entering our hypothalamus as we respond to our environment, relationships and interactions. Our thought processes and “auto-responses” become the trigger for our hypothalamus to produce neuro peptides that instruct our brain, nervous system and body how to behave ^{2,11}.

Most of us are taught from childhood that we should put others first, and give ourselves only what love is left. We also often fail to meet our own expectations, so become dissatisfied with ourselves and our performance in life.

To be truly well, we need to reach a state of complete acceptance of ourselves, loving us with all our faults and weaknesses, recognising all our strengths and beauty. To do this, we may need help from counselors or other therapists of various modalities, and our loved ones. However, our most important and powerful “doctor” is ourselves.

The exercise described below is one that I used often during my recovery journey. I had been taught that I was worthless unless I was helping others or doing what someone else wanted. During

crises in my own life, my family and friends were not available for support or assistance, so I came to believe that I deserved to struggle on my own, and use whatever energy I had for the good of others.

With the help of counsellors and mentors in my spiritual development group, I came to understand that this was ridiculous and damaging, but needed a strategy to change my physiology to be in line with my new beliefs. Try this yourself, no matter how well you feel; you will be surprised at how hard it seems at first, and how rewarding it becomes with persistence:

1. Face yourself in a mirror, and look at your face, into your eyes, see all the features of your face, including all the wrinkles you have worked so hard to achieve.
2. While holding your gaze in the mirror, say, “..... (your name) you are wonderful. You have achieved a great deal in life. I love you completely”. You may wish to vary the words, but the meaning needs to be there.
3. You may find this very difficult at first. We are not used to giving ourselves love and praise. But persist; it gets easier and more rewarding.

4. Do this every day for at least two years.

When we think and speak lovingly about ourselves, we reduce the production of stress hormones from the adrenal glands, and increase production of anandamide, dopamine, serotonin, endorphins and many more useful, healing chemicals. This is not a vague hope; we have many scientific studies to prove that this happens. So, go on, love yourself; the worst thing that can happen is you will get better.

Meditation is another powerful way to change the programme of our hypothalamus and move towards wellness. It is important to note that ***all those who have fully recovered from any neurological disorder have spent a great deal of time and dedication in meditation and personal/spiritual development of some sort.***

Meditation was considered weird, whacky and way out by conservative therapists for many years and most doctors felt it had no place in modern medicine. Studies over the past few years, however, have changed that perception dramatically. We now know that meditation, practiced daily over time, can help us maintain or regain health ^{13,13,14,15}. Controlled trials, open surveys and electroencephalograph (EEG) studies are all showing positive health benefits for those who meditate regularly ^{13,13,14,15}.

Dr Jon Kabat-Zinn, Associate Professor of Medicine in the Division of Preventive and Behavioral Medicine at the University of Massachusetts Medical School, conducts eight-week courses called the Stress Reduction and Relaxation Program in the University of Massachusetts Medical Centre ¹³. Those completing the eight-week programme, and practicing meditation at home daily, find that their illness symptoms reduce by an average of 37 percent without any other change to treatment ¹³. The Stress Reduction and Relaxation Program does not focus on any person's condition or specific symptoms; participants learn to meditate in a certain way, and practice that daily.

Long-term studies have shown that meditation can lower levels of stress hormones such as adrenaline (one of the chemicals implicated in the onset of Parkinson's disease), which can have beneficial effects on blood pressure and cholesterol levels ¹⁴. EEG studies show that meditators may improve blood circulation, lower levels of lactic acid (leading to reduced pain and anxiety), reduce their heart rate and enhance their immune system ¹⁴.

Dr Jill Marjama-Lyons, neurologist from Jacksonville, Florida, says "recent studies in psychoneuroimmunology show that the mind can communicate with the nervous, immune, and endocrine systems;" ¹³ "mind-body techniques are particularly useful in the

stress-reduction areas, helping to reduce blood pressure, pain, headaches, asthma, and other illness with a strong stress component.”¹³

Meditation is simple and rewarding. It requires us to set aside some time each day (5 to 60 minutes) and fill our mind with a thought of beauty and peace. It's like practicing the piano or training for sport; the more we do it, the more natural it becomes. And it's free! There are some very useful guided meditation CD's available from various shops, plus binaural frequency meditation CD's that help our brain produce “meditation frequencies”, enhancing the meditation experience. These cost only around \$30 but need to be played through stereo headphones¹⁶.

Here is a simple way to start meditation (or “contemplation” as I often call it). Find a quiet, comfortable spot in your house or garden. You may sit, stand, lie or walk gently. Set a designated time for your meditation so that you are not distracted by thoughts about what you have to do later in the day (say 5 minutes to start with then, when you are used to it, slowly increase up to 30 minutes). Fill your mind with the most beautiful calming image you can remember or imagine (yes, it may be somewhere you have been, or something you have experienced, or somewhere you want to be). Hold that thought in your mind and really “live” the experience – feel it, hear it, taste it, smell it, touch it; let every fibre

of your body be part of the peaceful experience for the few minutes allocated. If your thoughts start to intrude, just fill your mind again with your peaceful thought until your time ends.

This is very simple and grows easier the more we do it. Your body will respond to this peaceful meditation and you will enhance your wellbeing.

We all know that laughing makes us feel good. We enjoy chuckling, giggling, laughing out loud, a good belly laugh. But we don't always realise why we feel good. Scientists studying the physiology of laughter have found that many of the chemical changes that happen during laughter are the same as those that occur during exercise ^{13,17}. Endorphins (our natural painkillers) and many neurotransmitters are boosted during laughter, while stress hormones like cortisol and adrenaline are suppressed ^{13,17,18}. Laughter also improves our immune system. Cells that produce antibodies, T-cells and natural killer cells increase in number ^{13,17,18} while gamma interferon and immunoglobulin A are preserved or increased in production ^{17,18}. So laughter not only makes us feel good, it IS good for us. ^{17,18}.

Okay, you're feeling pretty down about being diagnosed with Parkinson's disease, you're struggling to do many of the things you used find enjoyable, and you just don't see that there's much

to laugh about. Don't worry about it, PRETEND to laugh; even faking a laugh will bring about the physiological changes that are good for us ¹⁷. Even better, watching humorous movies, hearing jokes or reading funny books without laughing will still bring positive changes ^{13,17}. People recovering from surgery in a Florida hospital who were allowed to watch their favorite funny movies needed less painkillers than those who watched no humor or who had to watch what they were told ¹⁷.

Laughter can boost our immune system, reduce pain, exercise our body and make us feel good. There are no toxic side effects and laughter costs nothing! But we don't do it enough! Children playing in a safe environment laugh between 300 and 400 times each day ^{13,17}. As adults, we laugh, perhaps, fifteen to seventeen times daily ^{13,17}. What a reduction in self-help that is! Just by laughing, or PRETENDING to laugh thirty times each day, we can double all the health benefits.

Stop watching all those news and current affairs shows; they are full of misery and drag us down too. If news is big enough to affect us, we will hear about it quickly enough. We know bad things happen in the world, and we can donate our money, or time and effort to assist, but we don't need to feel miserable every day by watching them on TV. Look for comedy shows or uplifting

documentaries. Find DVD's of comedies, or amusing movies. These will help your body grow stronger and enhance your Love and Meditation.

The **AQUAS**, homeopathic remedies available from many health food stores and pharmacies in Australia or online anywhere in the world, are the only remedies I have found to genuinely reset the hypothalamus to distribute water to cells dehydrated over many years ¹⁹. These remedies are very powerful and need to be used cautiously to achieve the best results (although they are totally safe and non-toxic) ².

Water is absolutely vital for life. Maintenance of water volume, pH and electrolyte concentrations within narrow limits is essential for survival. Water continuously moves through cell membranes, from blood to lymph to plasma, and through the fascia, transporting nutrients and extracting wastes. About 40% of our body weight is composed of intracellular fluid, which is mainly water. Another 20% of body weight is extracellular fluid.

Homeostasis (the efficient balancing of our body's metabolism) requires that our water intake must equal its elimination via kidneys, liver, skin and respiration. This means that we must ingest a relatively large volume of hydrating fluids

during each day in addition to the water we gain from food and cell metabolism. We need between 1.5 and 3 litres of water each day to maintain this balance.

Our water intake depends, to a large extent, on our thirst sensation. This sensation results from an increase in the osmolality of the extracellular fluids and a reduction in plasma volume. Osmoreceptor cells in the hypothalamus detect these changes and initiate activity in neural circuits that give us a sensation of thirst.

We live in a very dehydrating society. Chemicals in our food, air pollution, eating and drinking habits, air conditioning and stress all rob our bodies of vital water. Even the water supplied in many cities is polluted with fluoride and chlorine which rob us of the benefits of water. These same chemicals also reduce our thirst sensation. In fact, the less we habitually drink, the less we feel thirsty – especially if we try to make ourselves feel “better” by nibbling on biscuits or drinking coffee.

For our bodies to operate efficiently, we must both take in adequate quantities of water (at least 6 to 8 glasses daily) and be able to utilise this water effectively. This means that our bodies

must be able to transport that water right into our cells to ensure the proper production of chemicals, disposal of waste products and transport of the chemicals produced to where they are needed; this is why we often need help from remedies like the Aqua Hydration Formulas.

By drinking too little water, we reduce the effectiveness of our physical defenses. Our skin becomes dry, brittle and porous, so allowing intruders (micro-organisms) to penetrate our first line of defense. Once inside our “fortress”, these intruders are faced by a very weakened immune system – weakened by the lack of water. Disease fighting cells are produced less efficiently and are slow to get to where they are needed because our lymph system and fascia transport systems have slowed down.

The **AQUAS** have been developed to improve hydration by increasing both intake and uptake of water via the hypothalamus, thus improving metabolic function and elimination of wastes. The Aquas consist of four separate formulas specific for males and females, morning and evening. They are composed of homeopathics, Bach Flower Remedies, herbals and, in one case, alpha-tocopherol. These formulas are designed to:

- improve the uptake of water under hypothalamic control
- improve the bioavailability of water at cellular level
- improve hydration throughout the body
- work with emotional levels which may effect hydration.

We can reprogramme our hypothalamus using Love, Laughter and Meditation over a long period. The Aqua Hydration Formulas enhance and may speed up this process, provided we do our part.

There is much fine research into the relationship between food, gut function and brain health, and a lot of new knowledge is now being presented to health practitioners. However, one fact stands strong through all the research; we still have a hunter/gatherer body, and need to move as close as possible to a hunter/gather diet (“Paleo eating”). Too great an emphasis on saturated fats and grains creates an chronic inflammatory condition in our body, causing discomfort, pain and suppressing our immune system. We have a great deal of control over what we eat, even though we may struggle to find fresh, organic food.

My own experience indicates that a diet **high in omega 3 fatty acids**, and **very low in saturated fats, sugar and refined carbohydrates**, modified for your individual needs, is probably the most beneficial of all². We require omega 3 fatty acids for cell membrane integrity, and many activities in our body. Omega 3 fatty acids are most easily obtained from fish, flax seeds or flax seed oil, avocado, nuts and other seeds. One or more of these foods should be eaten every day.

Omega 6's (from margarine, common cooking oils, meat - especially organ meat, dairy products, and other animal products) are required for inflammatory responses when needed. However, our hunter/gatherer ancestors ate a ratio of four omega 3's to one omega 6, while we commonly consume only one omega 3 for every eighteen omega 6. Is it any wonder we see so many chronic inflammatory disorders?

One of the best ways to start modifying your diet is to keep a **food diary** for two weeks writing down absolutely everything that you eat and drink each day. Nobody has to see it except you, so you can be completely honest.

We need to base our eating around **fresh vegetables** (raw or steamed), plus fresh fruit, nuts and seeds. Deep-sea fish three times a week plus flaxseeds will boost omega 3 intake, plus small amounts of very lean meat (young and preferably “game”) can enhance iron intake. At least **70% of our diet must come from vegetables** – more if we can manage ². Vegetables are the most “natural” complex foods available to us today.

Dairy products may be replaced with Soy, Rice or Oat milk (in moderate quantities) if you need “milk” (milk is **not** a natural food for humans). While cows milk contains a lot of calcium, it is very difficult for humans to absorb, because of a very large molecule size, and may inhibit calcium absorption from other foods ². Those societies consuming the highest rate of dairy products also show the highest rate of osteoporosis. Calcium is more readily available from green vegetables (especially broccoli stalks), sardines, tuna, sesame seeds and a variety of other foods ².

Eggs provide excellent protein and can be safely eaten several times each week. They are often maligned by people scared of cholesterol. However, we manufacture about 80% - 100% of our cholesterol in our body and this is utilized for a large number of important functions. The cholesterol in fresh, free-

range eggs is well utilized by most people. Eggs, as part of a sensible low-fat, high natural fibre diet are good food.

Sugar needs to be limited to very small amounts, while refined carbohydrates, food colouring and flavouring, and processed foods should be eliminated.

Diet drinks are particularly toxic as the aspartame sweetener is up to five times more active when combined with other drink ingredients. Aspartame, and the newer version known as Neotane, is one of the most neurotoxic chemicals known! Never consume it or any other artificial sweetener in either food or drink.

Drink 1 to 2 litres (5 to 8 glasses) of clean, pure water daily (without fluoride or chloride if possible), plus dilute fruit juices, herbal teas and/or coffee substitutes. **Fresh vegetable juices** are an excellent way to improve enzyme activity and boost energy.

We need to continue to move our body to the extent of our ability, then stretch ourselves to exceed our expectations. Exercise is very important because, if we sit and feel we “can’t” do what we want, we will never be able to do them. If we try, and keep on trying, there’s a really good chance we’ll succeed ².

When I was displaying gross signs of Parkinson's disease, I could not walk unassisted more than 5 metres before falling. So I learnt to walk again by falling over as often as possible each day. I would stagger as far as I could until I fell, then get up and start again. Within four weeks, I could walk 50 to 100 metres at a time, and continued to improve; because I tried. I learnt to speak coherently the same way; trying and failing many times until I could speak well again. It took longer than learning to walk, but I did it.

Eliminate “can't” from your vocabulary and continue to move, stretch, exercise, walk, swim, jump and laugh. Seek help from empathic Pilates or Yoga teachers who can help you develop muscle strength and flexibility. I have seen “miracles” happen when combining all the strategies and therapies noted above with Pilates and Yoga.

A wonderful, gentle, Australian-developed bodywork called Bowen Therapy ^{20,21,22} can also assist progress by hydrating fascia (enhancing the work of the Aqua Hydration Formulas), improving flexibility and reducing pain. There are a number of fine Bowen training schools around the world, and many experienced therapists to choose from. You may even find a specially trained

therapist near you ⁴. Having Bowen Therapy each fortnight can certainly make your reversal of symptoms much more effective.

There are many therapies in Western and Complementary Medicine that may help us. We can choose, and need to be alert for those therapists who brush us off, refuse to answer questions, or try to dictate to us.

If we truly love ourselves, laugh a lot, meditate every day, eat the best food available and use proven remedies wisely, we can improve our health and face the real prospect of recovery.

This is our body, our journey and our responsibility.

We can improve our health. There may not be a **cure**, but I, for one, much prefer to **recover** my treasure.

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JOHN COLEMAN ND, MANPA, MBTAV

PO Box 2051, Templestowe Heights, Victoria 3107, Australia

10 Amberley Court, Bulleen, Victoria 3105, Australia

Telephone 03 9850 9048

Fax 03 9850 9076

By August 1995, John Coleman had lost his power of speech and was wondering how he could go on living. Suffering symptoms of stage IV Parkinson's disease, diagnosed by six medical and complementary practitioners, he was unable to walk more than 5 metres without assistance and took up to an hour and a half to dress himself. Severely dissatisfied with the treatment and prognosis he received from western medical practitioners, John decided to pursue other pathways to health. With the aid of Homeopathy, Aqua Hydration Formulas, Bowen Therapy, Craniosacral Therapy, Flower Essences, Counselling, Meditation and Spiritual Development, John was completely symptom-free by April 1998.

John, Naturopath and Bowen Therapist, was co-founder of Very Special Kids in 1984 and founder of the neuro recovery foundation in 2001. He lives in Melbourne, Australia, with his partner Nichol, among peace-giving trees and shrubs, conducts Neuro Recovery Pathways programmes at his beautiful premises, and lectures around Australia to practitioners and members of the public. During 2006/7, he also visited Europe, UK, USA and Canada. His first book, "Stop Parkin' and Start Livin'", was released by Michelle Anderson Publishing in 2005.

John was a finalist for the **Pride of Australia Medal for Courage** in October 2007.

Chapter 2: Dehydration

By Robert Rodgers, Ph.D. and Deborah Russell, M.S.

Our bodies are three-quarters water. Dehydration means your body does not have enough water in it to keep it working optimally. You lose water when you sweat, breathe, urinate, defecate, blow your nose, have diarrhea, or vomit. . To make up for the water you lose, you hydrate your body by eating and drinking.

Who gets dehydrated?

Chances are you are dehydrated right now and you don't even know it!! Everyone gets dehydrated, even babies and teenagers. Babies get dehydrated in part because their thirst mechanism is not fully developed and the mothers are not properly hydrated. Even in the teen years, symptoms of inadequate hydration may already be present and proper hydration may be a problem.

Athletes and anyone engaging in a regular exercise routine are also prone to

compromised hydration.

What are the symptoms of compromised hydration?

Signs of dehydration are many. Energy loss is usually the first sign of dehydration because the cells of the body lose water first. Water is a primary driving force of energy production inside the cells, so even a little water loss causes a big drop in energy. Some say that for every one percent drop of water inside your cells that energy production is cut by 10%.

Other symptoms include;

- fatigue,
- moodiness,
- feeling drained,
- noticeable thirst, headaches,
- unquenchable thirst,
- feeling lightheaded or dizzy,
- rapid heartbeat, dry lips and mouth,
- wrinkles and sagging skin,
- infrequent urination,
- a dark colored or strong smelling urine,

- digestive problems,
- constipation,
- Allergies.

Researchers who study hydration suggest that compromised hydration is at the core of serious health problems. Some suggest that good hydration can aid in the cure of arthritis, back pain, angina, migraines, colitis, asthma, high blood pressure, adult-onset diabetes, high cholesterol, metabolism problems, weight loss, kidneys, joint problems, lower back problems, morning sickness, heartburn, arthritis, depression, chronic fatigue syndrome, lupus, multiple sclerosis, muscular dystrophy, loss of libido and other chronic and degenerative diseases. Some health care researchers suggest that chronic conditions are caused by compromised hydration.

How do our drinking habits affect dehydration?

The typical response to the brain's signal to drink is often the opposite of what our bodies truly need. We drink because of habit, ritual or taste, not because we are thirsty. The signal for thirst becomes grossly distorted. We wind up drinking even more drinks that dehydrate our bodies when, in reality, our bodies are thirsty for life enhancing water. When we drink soft drinks or alcoholic beverages, we become thirstier and wind up drinking even more soft drinks or more alcohol. Sound familiar?

What habits contribute to compromised hydration?

We drink soft drinks, sport drinks, energy drinks, vitamin waters, juice, milk, tea, coffee, and alcoholic beverages. These popular drinks may be enjoyable but are they providing the adequate body hydration that is the foundation of health and vitality? The answer is no.

Soft drinks, both colas and uncolas, have no real nutritional value. Acids are used to carbonate soft drinks and chemicals are often used to flavor these beverages. Damage to your teeth and weakening bones may result with extensive use. The carbohydrates in soft drinks have the effect of slowing down the absorption of water in the body. Soft drinks promote weight gain. The diet soft drinks contain unhealthy sweeteners and additives.

Coffee and tea, both diuretics, tend to promote water loss. A diuretic is any substance that tends to increase the flow of urine, which causes the body to get rid of excess water. The term diuretic suggests that the kidneys are required to take more water out of your bloodstream even as you are taking water into your digestive system by drinking. If you add milk, sugar, or chocolate to your coffee or tea, the rate of water absorption is even further reduced.

Alcohol consumption dehydrates your body. Alcohol promotes water loss by depressing production of the antidiuretic hormone called vasopressin, which acts on the kidneys, concentrating the urine by promoting the reabsorption of water and salt in the body. Vasopressin helps to regulate the concentration of fluids in the body and interference with its action leads to an increased loss of body fluid from urination, which can lead to dehydration. Alcohol-induced water loss can also lead to the loss of minerals such as magnesium, potassium, calcium, and zinc which are involved in maintaining fluid balance in the body, as well as nerve and muscle action.

Sports drinks do not generally hydrate better than water. They also do not necessarily quench thirst. What do they do? They give you some flavor, a boost of carbohydrates, contain sugar and provide electrolytes that are lost with perspiration. Just like soft drinks, the carbohydrates slow down the absorption of water in the body. They may also contain chemicals that your body doesn't need.

Juices, which could be categorized as food, have carbohydrates, vitamins, minerals, and electrolytes but are not the best thirst quencher. Undiluted juice also has fructose, a form of sugar, which reduces the rate that the cells can absorb water even further. The result is that cells aren't hydrated very quickly.

Milk may provide some hydration, although the sugars in milk slow down the hydration process. In addition, many people are lactose intolerant. Lactose is the primary sugar found in milk and foods with milk. Intolerance means you cannot digest foods with lactose in them. Many people have digestive and gastric disturbances from milk, resulting in dehydration.

Vitamin waters contain vitamins, minerals and herbs that are advertised to do something extra for you. Usually, they are loaded with sugar for flavoring, contain chemicals, have electrolytes and are packed with over 100 calories per bottle. You are better off drinking pure water and taking a multiple vitamin supplement that you and your health care provider have determined is right for you. Vitamin drinks are not the best choice to hydrate your body.

Energy drinks or power drinks tend to have high doses of sugar and caffeine as well as many chemicals and additives that can dehydrate your body. We have already discussed how these inhibit hydration in the body.

[A Revolutionary Answer to Dehydration is Finally Here.](#)

AQUAS are a unique form of energy medicine that work by treating the individual, not by altering the water itself.

Using a unique combination of 16 natural ingredients, **AQUAS** were formulated to reprogram the thirst mechanism in the brain, the natural mechanism in the body that tells us to drink when we are thirsty. A dormant thirst reflex is brought back to

life. **AQUAS** were designed so that we drink water when the body needs water. And, just as importantly, the water we drink is readily transferred to and absorbed by all tissues and cells in our bodies.

AQUAS were formulated to make possible

- a optimal balance of fluids in the body.
- an efficient transfer of water to cells and tissues.
- a reduction of toxic substances in the tissues and cells.

What Are AQUAS?

AQUAS combine herbal extracts, Bach Flower Essences and other homeopathic remedies. The ingredients were formulated to help the brain remember how to signal thirst and distribute water where it is needed in the body **as well as assist the optimal uptake of water right down to the cellular level.**

How Do AQUAS Function?

AQUAS function in a way that is markedly different when compared to other hydration products. They work vibrationally to support the body's return to balance and full functionality. **AQUAS** were formulated to help the body control the balance of water so that every cell can receive the nourishment it needs to function at its optimal level.

AQUAS are homeopathic energy medicine in the sense that only a few drops produce powerful results. Taking more drops does not produce better results.

AQUAS were designed to:

- work on the physical, mental and emotional aspects of each individual,
- support the body's natural self healing abilities,
- enhance positive mental states and
- encourage emotional balance.

A wide variety of emotional conditions may lead to compromised dehydration. These include depression, anxiety, insomnia and stress. **AQUAS** contain Bach Flower Essences that are derived from nontoxic substances. Dr. Bach explains that his flower essences enhance the emotional state of the individual by transforming negative emotions into positive ones.

At Zero Point Healers, our personal experience with **AQUAS** is that they address emotional issues that can block a person from realizing their full potential in life. Good hydration creates the conditions for emotional, physical and mental balance in the body, resulting in improved cellular uptake and transfer of nutrients through all the membranes and tissues of the body.

There is an age old saying: "If this product is that great, it must not be true." There are exceptions to every rule. This is one of them.

How Were AQUAS Developed?

AQUAS were developed using a synergistic process using the tried and true traditions of intuition and biofeedback studies. They have been continuously evaluated for quality and effectiveness over a 10 year period using traditional trial and error chemistry protocols. Biofeedback studies were used to

monitor hydration before and after using the **AQUAS** over a time frame. This made it possible to tell how they worked most effectively.

The end result is the product release of **AQUAS** for men and for women.

Why are AQUAS Patented?

The core components of the Aqua Hydration Formulas are patented because of the synergy that is created from combining the core ingredients. The combined effect conveys a subtle but powerful signal to the body. No single ingredient works independently. Rather, it is the unique combination, or synergy, of all the core **AQUA** ingredients makes it a unique formula.

Biofeedback studies show that this synergy makes it possible for the body to maintain an optimum balance of water throughout all membranes, tissues and organs. These studies show that the combined effect of all ingredients helps to maintain mental, physical and emotional homeostasis in the body.

What will happen to me when I begin taking the AQUAS?

People react differently depending on their personal health history. Our experience at Zero Point Healers is that some clients feel the positive effects of the **AQUAS** immediately. Others initially experience the effects of releasing toxins from their bodies. These people may experience one or more symptoms such as headaches, nausea and fatigue. Emotions that have not been experienced for a long may be felt as our bodies wake up and begin to function at their peak potential.

These re-balancing effects are perfectly natural and temporary - the

expected response to any detoxification process. With a well hydrated body there is finally sufficient water to remove the toxins that are lodged in the tissues. The incredible positive effects of the **AQUAS** follow and continue as a result of a regular routine of using them.

Detoxification symptoms are more common in people who are unwell. It generally takes a few days for these detoxification effects to subside or for heightened emotions to lose their intensity. These physical and emotional effects can feel unfamiliar in the beginning. As the fluids in the body strive for balance, these detoxification effects disappear.

John Coleman, a naturopathic doctor in Melbourne, Australia, recommends that anyone diagnosed with Parkinsons or any critical disease for that matter should start with a baseline of one drop per day in the morning and evening. If side effect symptoms are too overpowering, a further dilution may be needed. Extensive information about diluting **AQUAS** can be found in John Coleman's book, Stop Parkin' and Start Livin': Reversing the Symptoms of Parkinson's Disease.

John Coleman, ND, has worked with many, many clients with health problems. If you are currently ill, he suggests that you experiment to discover the quantity of drops per day that is right for your body. John explains that you will know when you have found the dose that is perfect for you when you experience little or no side effects whatsoever.

What research exists that shows the **AQUAS are effective?**

Although biofeedback studies of **AQUAS** show they are effective, no controlled clinical trials have evaluated its effectiveness. One difficulty with clinical studies is

that current evaluation tools are not an effective match to evaluate the effects of energy medicine. A clinical study of the core components is in the planning stages.

Disclaimer: The Food and Drug Administration in the United States has not evaluated the statements contained herein. This product is not intended to diagnose, treat, cure or prevent any disease. Consult with your health care provider before including the [AQUAS in your health regime](#).

How Does the AQUA Technology Compare to Other Hydration Products?

Structured Water

[AQUAS](#) provide a markedly different approach to hydrating the body when compared with "structured" water products such as Penta Water. "Structured" water products reduce the size of the water molecules so that the water enters the cells more readily. There are three problems with this approach.

- First, you may become dependent on drinking "structured" water products every day to be hydrated. This is inconvenient and can wind up costing a fortune.

[The AQUA Solution](#): The body already has a natural, internal mechanism to restructure water utilization. The [AQUAS](#) were designed to promote optimal body hydration which encourages this natural mechanism to function as intended.

- Second, to hydrate using "structured" water products you become dependent on one water source by drinking them every day.

[The AQUA Solution](#): [AQUAS](#) do not make you dependent on any one water

source. You can add the drops to any water source you choose. Of course everyone benefits from drinking pure water from safe and nontoxic sources.

- Third, "structured" water products are sold in plastic bottles that may contain toxic substances which clutter and pollute the environment and you may ingest uncertain amounts of toxins into your body.

The AQUA Solution: In stark contrast, **AQUAS** are distributed in recyclable, nontoxic glass bottles with pure ingredients.

AQUAS were formulated to restore the function of the thirst reflex which, when working, tells us when we need water. **AQUAS** were designed to assist water uptake. That is to say, they were designed to help the body hydrate itself.

Cost Comparison

When compared to the structured water products, the good news is that there is a significantly lower cost to using the **AQUAS**. Consider a very conservative cost comparison:

Two bottles of Penta water per day = \$6.00

VERSUS

Ten drops (2 x 5) from the **AQUAS** per day including shipping

(2 months) = \$1.12

Six drops (2 x 3) from the **AQUAS** per day including shipping

(4 months) = 56 cents

Four drops (2 x 2) from the **AQUAS** per day including shipping

(6 months) = 37 cents

Sports Drinks

Sports drinks are recommended to replenish electrolytes, sugar and other nutrients when you exercise strenuously for a minimum of 60 minutes. Without doing the exercise they may be toxic to the body as they contain sodium and carbohydrates and other unhealthy ingredients. Without exercising you may become bloated and even gain weight.

The Aqua Solution

In stark contrast with sports drinks, **AQUAS** are a natural and healthy energy medicine. As a homeopathic remedy, only a few drops in fresh, filtered water produce the optimal hydration result. The good news is that the cost is considerably less than drinking sports drinks. You are not motivated to want more. Better yet, you do not become bloated or gain weight.

One 20 ounce bottle of Gatorade per day = \$2.00

One 20 ounce bottle of Powerade per day = \$2.00

VERSUS

Ten drops (2 x 5) from the **AQUAS** per day including shipping

(2 months) = \$1.12

Six drops (2 x 3) from the **AQUAS** per day including shipping

(4 months) = 56 cents

Four drops (2 x 2) from the **AQUAS** per day including shipping

(6 months) = 37 cents

Consult with our Health Care Professional Before Taking the **AQUAS**

The US FDA has not evaluated the statements contained herein. **AQUAS** are not intended to diagnose, treat, cure or prevent any disease.

Why were the **AQUAS** Created?

Most people believe that drinking more water will insure that they do not become dehydrated. Life would be simple if this were true. Unfortunately, this is a myth.

Scientists have known for years that drinking more water does not necessarily ensure that cells in the body have enough fluids to function and thrive. It is not only how much water you drink but how well you absorb and metabolize water that counts. As people age the problem of dehydration becomes worse. The consequences are disease and illness, wrinkles, bagging skin and more.

AQUAS were originally developed to help the performance of athletes. As you may recall, Dr. Boublik was able to run the marathon in his own record time because of the amazing benefits of what is now known as the **AQUAS**. This is why Dr. Jaroslav Boublik, a Ph.D. medical researcher, collaborated with Leonie Hibbert, a natural health therapist to refine and manufacture a product they now call the **AQUAS** - a perfect name for a perfect solution.

AQUAS were designed to help to re-set the master control system in the body to

regulate the amount of water that is in the cells. This formula was created to invigorate the body's natural thirst reflex. **AQUAS** make optimal hydration possible for persons of all ages whether they are well or not..

- **good hydration boosts energy -**

Good hydration improves the uptake of water throughout the body by making the conditions ripe for long path hydration. People who are dehydrated are victims of short path hydration. The sad news is that many people who are dehydrated do not even know it.

Short path hydration means that fluids follow a path from the mouth to the stomach to the small intestines into the circulation, then the kidneys, the bladder and out of the body. With short path hydration, virtually all of the organs in the body are bypassed. It is little wonder that compromised hydration is the number one trigger of daytime fatigue.

AQUAS are designed to help convert the delicate process of hydrating the body from short path hydration to long path hydration. With long path hydration water flows into the organs, tissues and cells of the body. Water is distributed where it is needed before being sent to the kidneys. Stress on the kidneys is relieved, leaving critical organs in the body to do their work without stress or aggravation. The result can be a burst of new energy and stamina.

- **Good hydration optimizes the uptake of nutrients -**

Good hydration enhances the ability of the body to absorb water. The twin benefits of total penetration are to supply needed nutrients and to flush the harmful toxins from cells. If cells do not have sufficient fluid, toxins become glued to the cell walls and cannot be excreted. When the toxic buildup reaches a critical mass, the cell dies.

The AQUA patented core technology combines herbal extracts, homoeopathic remedies and Bach Flower Essences into a special synergistic formula concentrate.

Why bother to make sure your body is hydrated every day of the week? Without adequate hydration metabolism in the body is slowed by 3% or more. Toxins build up in the body. You gain weight.

- **Good hydration releases toxins from the body -**

According to a recent four year scientific study by the Natural Resources Defense Council bottled water is not always filtered and safer than tap water. Both bottled water and tap water may contain contaminants that are toxic to the body.

The AQUAS were created to nourish the thirst reflex so that it functions properly. Bioabsorption is enhanced. With improved hydration in the body, there is an efficient transport mechanism for the transfer of nutrients to the cells and the removal of waste and toxins from the cells. Detoxification takes place gently, with less stress on the delicate systems of the body.

Studies have shown that exercise, use of drugs or medications (including

caffeine), and exposure to environmental toxins significantly increase the kidney's requirement for water. The thirst reflex in many people is seriously compromised, so there is no motivation to drink water when your body needs it. This is one reason cells become overloaded with toxins.

- **Good hydration decreases the risk of disease -**

Water provides the medium for movement of heat from the core of the body to the surface. Water is the fundamental matrix for all biochemical reactions that together make up cellular metabolism.

AQUAS were designed to help the thirst reflex in the brain to remember how to control the delicate balance of water that needs to be maintained in the body. The brain's central control center can be reprogrammed.

The good news is that better hydration cuts the risk of many diseases. Adequate hydration cuts the risk of breast cancer by 79%, reduces the risk of colon cancer by 45% and slashes the risk of bladder cancer by 50%.

- **Good hydration enhances mental clarity -**

Good hydration helps you become mentally alert throughout the day. A drop of just 2% in body water causes short term memory problems and difficulty with concentration.

AQUAS were specifically formulated so that (1) thirst for a person who seldom experiences thirst is activated and (2) unsatiated thirst for a person who never feels like they get enough to drink is re-activated.

- **Good hydration improves digestion -**

Good hydration insures that sufficient fluid is present in the digestive track to distribute nutrients to the body.

A digestive system without sufficient fluid is constipated and inefficient. Even when good food is ingested, fluid is essential for the nutrients to pass through the delicate membrane barriers of the intestines so that nutrients can be transported to the vital organs throughout the body.

- **Good hydration softens skin texture -**

Good hydration makes it possible for water to move through all the membranes of the body so that the largest organ in the body, the skin, is hydrated.

How do you know if your body is dehydrated? Hydration can be tested by pinching the skin on the back of your hand. If it springs back to its original shape, chances are good that hydration is satisfactory. If, on the other hand, a small ridge appears for a few seconds, you lack sufficient fluid in your body. When the skin is dehydrated wrinkles multiply, skin becomes scaly and muscles are flabby.

- **Good hydration slows the aging process -**

Good hydration lowers the surface tension of the water that is ingested and reduces the cluster size of its molecules. "Wetting" capacity is increased,

making water more readily available for transport throughout each and every cell of the body.

AQUAS were formulated to reset the water balance mechanism and thus improve the bioavailability of water at the cellular level.

A little known fact is that adequate hydration relieves back and joint pain for 80% of sufferers

A key reason for poor hydration as we age is the gradual decline of the thirst mechanism in the brain. When we are young and get thirsty there is no stopping us when we want a drink.

A different story emerges as we age. The thirst signal becomes distorted because we ignore it and because we drink dehydrating drinks such as coffee or alcohol. For most people, the thirst mechanism in the brain becomes compromised as early as the teenage years.

- **Good hydration helps control body weight -**

Good hydration resets the thirst mechanism in the brain so that hunger is not confused with thirst. The obvious benefit is a subsequent loss of excess weight due to eating too much food.

When the thirst reflex is not functioning many people confuse the thirst message sent by the brain with the hunger message. The thirst mechanism in the body is so weak that it is mistaken for hunger in one third of Americans. Instead of drinking water we eat too much. Weight gain and obesity is a major health threat in the USA and a growing concern around

the globe.

To Summarize ...

Good hydration is critical to good health. It creates reserves of energy throughout the day. Vitality may be restored, encouraging us to feel much younger. Mental clarity may be enhanced. The digestive system prepares the nutrients for transport to each and every cell. Skin texture softens. Aging can be slowed. Wrinkles may vanish. Bagging skin can firm.

Good hydration promotes overall health and well being. It is the perfect solution for athletes who want to enhance their lifestyle and for people with health challenges. Better digestion is facilitated. Harmful toxins are removed. Weight control may be restored. Ability to handle stress can be enhanced. The natural aging process may be slowed. Pain from aching joints may be reduced. Overall flexibility in the body can be restored.

In other words with good hydration all systems in the body begin to function at their peak potential. Sound too good to be true? It's not. As simple minded as it may sound, water and optimal hydration is the secret to good health.

AQUAS were formulated to restore energy and vitality because all systems in the body function at their peak capacity. In Australia, Aquas are popular with athletes who are intent on demanding the best from their bodies.

According to John Coleman ND, use of the **AQUAS** can help to reverse the disease process. He explains that regular use of Aquas has been critical to his own recovery from Parkinsons. As a naturopath, John has subsequently helped

dozens of other persons see relief from the symptoms of Parkinsons or, in some cases, fully recover.

What you will receive

AQUAS acknowledge the differences between male and female metabolism, so a unique product set exists depending on your gender. Ingredients of the **AQUAS** correlate with well known differences in the ability of men and women to metabolize water.

Separate formulas have been developed to address the waking and sleeping cycles of metabolism. A separate formula concentrate exists for morning (AM) and evening (PM) for men and women.

Men

Men order and receive a set of two glass bottles of **AQUA** therapeutic drops, one AM bottle and one PM bottle. It is recommended you place 3-5 drops from the AM concentrate bottle in a glass of water and drink it in the morning with apple or pear juice. A good ratio is 70% water and 30% apple juice. The apple juice helps the body process the energy medicine, but the drops can be taken with water without juice if preferred. The AM bottle contains a unique combination of eight herbal extracts, homeopathies and Bach Flower essences.

Men follow the same procedure in the evening by placing 3-5 drops of the **PM AQUA** bottle in a glass of water and apple juice. A good ratio is 70% water to

30% juice. The **PM AQUA** bottle contains a unique combination of eight herbal extracts, homeopathics and Bach Flower Essences.

It is best to take the AM and PM drops for five days in a row, followed by a break for two days. The reason for the break is to insure that the body does not become immunized from the use of the **AQUAS** day in and day out.

For men who are highly sensitive or who have health problems, John Coleman ND., recommends that you begin taking 1 drop a day from the AM bottle and one drop from the PM bottle. Even a dose of one drop may need to be diluted. John Coleman recommends ways to dilute the AQUAS in his **book**.

You can adjust the number of drops you take as you learn more about your own body's response to the homeopathic energy medicine. Consult with your health care practitioner to discover the best therapeutic dosage. Under no condition is it necessary to take more than 5 drops.

An additional dose of the **PM AQUAS** can also be taken after exercise and before/during flying to assist jet lag.

Each bottle contains 20 milliliters. Depending on the number of drops that are taken daily, each bottle lasts from 2 months to 6 months. **AQUAS** are a powerful and effective treatment. Taking more than 5 drops does not produce "better" results.

Women

Women order and receive a set of two separate glass bottles of

AQUA therapeutic drops, one AM bottle and one PM bottle. It is recommended you place 3-5 drops from the AM concentrate bottle in a glass of water and apple or pear juice and drink it on rising, in the morning. A good ratio is 70% water and 30% juice. The apple juice helps the body process the energy medicine, but the drops can be taken with water without juice if preferred. The **AM AQUA** bottle contains a unique combination of nine different herbal extracts, homeopathies and Bach Flower essences.

Women follow the same procedure in the evening by adding 3-5 drops from the **PM AQUA** bottle to a glass of water and apple juice. The **PM AQUA** bottle contains a unique combination of eight different herbal extracts, homeopathics and Bach Flower Essences.

It is best to take the drops five days in a row, followed by a break for two days. The reason for the break is to insure that the body does not become immunized from the use of the **AQUAS** day in and day out.

For women who are highly sensitive or who have health problems, John Coleman ND, recommends that you begin by taking only one drop a day from each Aqua bottle. You can then adjust the number of drops you need to take as you learn more about your own body's response to the energy medicine. Some people are very sensitive to homeopathic medicine. Consult with your health care practitioner to discover the therapeutic dosage that is best for you. Under no condition is it necessary to take more than 5 drops.

An additional dose of the **PM AQUAS** can also be taken after exercise and

before flying to assist with the symptoms of jet lag.

Each bottle contains 20 milliliters. Depending on the number of drops that are taken daily, each bottle lasts from two to six months. Aquas are a powerful and effective treatment, so taking more drops does not produce "better" results.

Production of [AQUAS](#) follows a rigorous protocol that satisfies the government of Australia's highest standards of production quality. [AQUAS](#) carry the Therapeutic Goods Administration (TGA) approval in Australia. The TGA is Australia's equivalent to the USA's Federal Drug Administration.

Following strict TGA procedures, all steps of the production process are meticulously monitored before the product is ready for shipment. [AQUAS](#) are shipped directly from Australia and thus take approximately 10-14 days to be received after the order is received.

Chapter 3: Hydration

By Jaroslav Boublik

What is Hydration?

Hydration is a term used to describe your body's ability to manage water. In our working definition we consider this to be water management at every level down to the individual cells. Correct hydration is dependent on cellular uptake of water, not simply whole body intake of water but just drinking water is not sufficient to ensure optimal hydration.

If you are well hydrated your body will take the water you drink (and eat as a part of your food) and distribute it correctly to all the cells in your body that need it, taking with the water all the essential nutrients for those cells. The well hydrated body is also able to use this cellular water to wash out waste products and toxins from cells and deliver them to the organs of excretion. In a poorly hydrated body these processes will be sluggish or absent and so nutrients will not be available to the cells and waste products will build up to toxic levels. Hydration is one of the most fundamental processes in a healthy body and yet it has received very little attention by the biomedical research community and by the population at large.

In this chapter we will tell you about the dynamics of the hydration process, look at it's implications in health and disease and show you how to improve your hydration state.

How important is water?

Water has several roles in the human body. It gives structure and form to cells and tissues. It provides the medium for movement of heat from the core of the body to the surface. It is the matrix within which occurs all of the biochemical reactions that together make up cellular metabolism. Last, it is the transport mechanism for all internal movements of all nutrients and biomolecules, exchange of nutrients between the environment and cells and clearance of waste products.

Water is the most important nutrient that the body uses. It is correctly thought of as a nutrient as it is a limiting factor in many, if not all, biochemical processes. The correct metabolism of all other nutrients depends on the availability of sufficient water for correct biochemistry to occur. The macronutrients (nutrients required in relatively large amounts on a daily basis) protein, carbohydrate and fat all require water for their correct assimilation and utilization. All micronutrients (nutrients required in smaller amounts or less frequently) including vitamins and minerals require water for correct uptake and distribution. These macro

and micronutrients all follow a common pathway to get from our food to the cells where they are used and the vehicle that they use to go down that path is water.

The water pathway

It may be useful for us to have a look at what happens to water, and other nutrients, as they enter the body. The first process is digestion. The digestive process is not required for plain water but every other food or drink that is ingested starts the digestive process. This process depends on the secretion of gastric juices in the stomach and other digestive juices in the small intestine. These juices are largely composed of water and so this initial step of digestion actually requires the body to secrete a considerable quantity of water. In a poorly hydrated individual this may compromise an already stressed system. This is especially important in athletes where this temporary loss of circulating water can be critical. Many individuals who experience digestive difficulties may see rapid improvements following some attention to improved hydration. If sufficient water is available the digestive process continues until the fully digested food finds its way into the part of the small intestine where uptake of nutrients occurs. Here water again plays its part as all nutrients are wrapped in a cocoon of water so that they can be transported out of the gastrointestinal tract and into the circulation. In some cases

this occurs via diffusion – the dissolved nutrient simply moves through the cells of the gut and into the surrounding small blood vessels. In other cases there are specific pumps that select a particular nutrient and actively moves it to the circulation where it is picked up by transport mechanisms so that it finds it's correct destination. These processes all depend on the correct amounts of water being available at all times and will quickly falter in a dehydrated individual.

The second process is distribution via the circulation. At this point the water from the gut, laden with nutrients, becomes circulating water, now a component of the blood's plasma. This circulating water will take the dissolved nutrients and the specific transporters to the right cell for the nutrients to be used to build new cells, repair damaged cells, nourish existing cells and to create energy and cell products like hormones, electrical activity or immune components. The water, having entered the specific cell to carry its cargo then leaves the cells, this time carrying a load of waste products or toxins. This is the third and last part of the process – excretion. This cargo of waste product is transported to the organs of excretion (kidneys, gut, skin and lungs) where the waste products are packaged and delivered back to the outside world.

In someone whose hydration is compromised these transport processes are limited and the whole system becomes

compromised. There are many reasons this transport cascade fails but the most common reason is that the transport medium – water – is not present in sufficient amount. This is the metabolic state usually known as dehydration. In a dehydrated individual any available water follows a much shorter path and does not facilitate the transport of nutrients or clearance of waste products. Long term or chronic dehydration, even to only a small extent, steadily downgrades the nutrient transport system and progressively degrades the body.

Hydration and thirst

Dehydration also downgrades another system – the thirst reflex. Paradoxically long-term dehydration has the effect of decreasing our sensitivity to the very system that should notify us that all is not right. The reason is that the thirst reflex is a complex behavioral circuit and is actively filtered by our higher brain functions. To understand this consider the situation where you are at a cocktail party. You are standing speaking to someone and you are able to concentrate on what they are saying without any difficulty because you are able to filter out all of the background noise. Now a few meters away someone says your name and even though you have no idea what else they are saying you hear your name loud and clear above the noise. This is the filter at work. Normally the background noise is filtered out,

but when it contains an important piece of information, in this example your name, the filter lets that information through.

It turns out that the thirst reflex is also filtered. When all is well, like when we are young and well hydrated, the message gets through the filter every time because the filter knows the message to drink is an important one. As we grow older (and these days this can begin at a young age) we start to respond to the message to drink with actions that don't actually do much to hydrate the system. Often we drink soft drinks or milk. Later in life it's caffeinated soft drinks, tea, coffee, and alcoholic beverages. These drinks don't do much for our immediate hydration state because, unlike water, they need to be digested or they act as diuretics and actually dehydrate us. The consequence of this is that the message to drink begins to be filtered because, like the boy who cried wolf, our thirst reflex is not being heard. Ultimately the message can be lost altogether and often the most profoundly dehydrated individuals will report that they are never thirsty. (This isn't always the case as some dehydrated people speak of the unquenchable thirst – the flip side of the same coin). One added consequence of the lost thirst reflex is that many people begin to confuse the thirst message with the hunger message. What is really a message to drink finds an answer in eating food. We conjecture that at least with some people their tendency to overeat is a consequence of a damaged thirst reflex.

Resetting the reflex is not an easy process and requires attention to drinking water whenever the vaguest thirst is perceived as this will serve to strengthen the reflex. There are specific remedies designed to reset the reflex that can help with this also.

What should I drink and how much?

As you can see from what we have discussed about hydration, water has a special place in the list of what we should drink. Because it needs no processing to be taken up water is unique and in most cases results in the most rapid improvements in hydration. There are however many other beverages to choose from and all have their place.

The choice of what kind of water to drink is quite large. There is good scientific evidence to support the choice of the purest water that is available. This may be bottled, filtered from a pristine local source or even, depending on where you live, out of the tap. The danger represented by the many potential contaminants of water will not be reviewed in detail here but we do know that many of the common contaminants in tap waters and water from unprotected sources pose health risks and have a direct effect on the hydration process. Another factor, though not so well defined in strict scientific terms, is that of “life-force”. The volume of

research into this factor is significant and the general finding is that water that exhibits good “life-force” is more bioavailable and supports the various steps of the hydration cascade better. This kind of water, which finds its origins in naturally occurring water in mountain streams or from underground sources, has recently been mimicked by various techniques and is now available commercially in bottled form and via filter units that can be installed next to your kitchen tap. The evidence that these waters have more to offer than conventional purified water is compelling and well worth investigation.

The range of other drinks that one can choose from is vast and we don't plan to review them all in detail here. The ability of a given drink to improve hydration is dependent very much on the hydration state of the individual concerned. For example the appropriate use of a sports drink by a well hydrated sportsperson during training or competition will give a very much different result to the use of the same drink by a dehydrated competitor. As another example the use of a caffeinated beverage (coffee or soft drink) by a dehydrated individual as a 3 o'clock in the afternoon pick-me-up will often result in a greater degree of dehydration (with the attendant tiredness) than if that drink was had with a glass or two of water on a regular basis.

The real problem with selecting what to drink, apart from water, is that it is a chicken-and-the-egg problem with many drinks

acting to perpetuate the current dehydrated state of the individual. How then does one break the dehydration cycle? There are two approaches. The first is to use the water co-transporter fructose, with abundant water to reactivate the hydration mechanism. Fortunately fructose is available in abundance in apple and pear juices and when these juices (preferably in organic unfiltered from) are diluted 1:2 or 1:3 with purified water and sipped throughout the day they will switch hydration mechanisms back on to a significant extent. Sucrose also works (as it is broken down to fructose and glucose in the gut) and so a very diluted soft drink can be used if apple or pear juices are not available.

The second approach is to use herbal and homoeopathic remedies to reactivate the hydration mechanisms in a more long-term way. These remedies can be simple herbs which have a known hydrating effect or a specialized combination of remedies that have been assembled for this exact purpose. Called the “Aqua Hydration Formulas” these have been developed here in Australia. They are taken morning and night in the apple-juice/water mixture and there are even different formulas for women and men because their hydration mechanisms are subtly different.

As to the question of how much to drink there has been much said about the need to drink X glasses (250 ml) of water a day.

We have seen articles where that X is 12 and a recent article by a medical professional from the United States who said X is zero as we get all the water we need from the food we eat! The standard is 8 but where this came from is anyone's guess. The facts are that the average (adult but not elderly) 55 kg female is composed of about 32 kg of water. A component of that water is exchanged each day and if that woman is well but sedentary that component is about 2-2.5 liters. That means this amount of water is excreted each day; 60% in urine, 5% in faeces, 5% in basal sweating and 30% in exhaled air. That water must be replaced and that will come as follows: 10% from the burning of carbohydrate fuel, 30% from ingested food and 60% from ingested fluids. So you can see that the baseline requirement is more like 5 glasses but this is baseline only. These figures will all vary according to factors including the amount of exercise (exercise increases respiration, metabolism and sweating), the ambient temperature (the hotter it gets the more you sweat), humidity (the more humid it is the less water you expire) and so on. In addition it has been shown in several studies that many factors quickly increase the kidney's requirement for water to facilitate clearance of waste products including use of prescription and recreational drugs (including caffeine), exercise and exposure to environmental toxins. So we quickly get back to the 8 glasses a day as a good rule of thumb. What is even better, however, is to let the body itself set the

correct intake on a moment to moment basis by maintaining an accurate and effective thirst reflex.

What will happen when I become well hydrated?

The well hydrated individual will not become a super-hero overnight but improvements in digestion, energy levels, sleeping patterns, skin quality, recovery from illness and physical exertion and clarity of thought are often reported. Menstrual and menopausal symptoms often reduce and allergies and sensitivities become less troublesome. Athletic performance is critically dependent on hydration not just because of it's role in metabolism but because water is the basis of our temperature control mechanisms.

Because hydration is such a requisite component of cellular metabolism any improvement in someone who is compromised will result in a sequence of changes that will result overall in an improvement in wellness.

A final word

Hydration is *the* most important, yet most commonly overlooked, component of a holistic approach to wellness. Water is at the very basis of the functioning of our cells and our cells

make up our tissues and organs. Keeping well hydrated means making sure that water is available in abundance, moving where it needs to move and sustaining the river of life.

Chapter 4: Hydration changed my life!

By Jaroslav Boublik

For over 10 years I lived my life in the regimented world of modern scientific research. I travelled widely, specialized in neuroendocrinology - the study of the central nervous system hormones and their receptors - achieving various honors in my profession including a Fulbright Fellowship and a postdoctoral fellowship at the Salk Institute in San Diego. This was my life and there was never a moment that I doubted my passion or belief in science and what it could enable us to do.

Although I had no idea at the time that my life was to be turned upside down, this all started to change in late 1992.

It began during my preparation for the Melbourne Marathon which was to be run in June 1993, as I was experiencing real difficulty in my training. During training runs I was struggling at about 20km's and then despite drinking along the way and attempting to preload with water and sports drinks prior to the

runs, I would suffer profound dehydration. The common term is to 'hit the wall' and hit it I did!

No matter what I did I wasn't able to keep sufficient fluids in my body and would lose all energy having to stop the runs. To say this experience was frustrating is an understatement because I began to doubt my ability to achieve this goal I had set myself. My wife was seeing a Natural Health Therapist, Leonie Hibbert, and suggested that I see Leonie because she had some interesting formulas which were a combination of herbs, and other things I didn't understand, that might be able to help me with my training and the difficulties I was experiencing.

Skeptical as I was I went to see Leonie and the 1 hour session ended up being at least 2 hours of intense discussion. From that point on I started using the *Aqua Formulas*, or at least the original versions of the Formulas and my life started to change.

My training improved dramatically and I went into the marathon well prepared with a 44km run under my belt. Most of the long distance runs in the lead up to the marathon were done throughout the latter part of summer and leading up to June, so during the hottest part of summer I was completing 30km runs. I can remember a number of them where, even though the runs were done in the early part of the day, the temperature was

getting up to 35°C near the end of the run and at no time did I have problems with dehydration. After my previous experiences during my training runs, I can only attribute this remarkable improvement to the *Aqua Formulas*. I had not changed anything else in my diet, training or rest patterns.

I completed the marathon in a reasonable time of 4hrs 20 minutes and I was using the *Aqua Formulas* during the marathon every half-hour or so. The only problems I had during the run was due to the rain and wind in the 3rd quarter at which point my pace slowed appreciably. At no time was there any difficulty of temperature control or maintaining energy levels and at the 3/4 mark I was able to pick up my pace considerably, running the final kilometer of the marathon in my quickest time for any kilometer of the race.

I believe the *Aqua Formulas* were the main reason I was able to finish the run with such high energy levels and can only attribute this to them very effectively keeping my hydration levels high throughout the duration of the marathon. I had also weighed myself before and after the marathon to find that I had only lost 600 grams of body weight which is remarkable as a typical marathon runner may lose up to five kilos – most of it body water (ref 1).

To further convince me of the effectiveness of the *Aqua Formulas* the day after the marathon I flew to a conference in Las

Vegas which meant a flight of 20 hours duration broken only by brief stops in Auckland and LA. No matter how well I pulled up after the marathon, my concern here was in relation to the potential for lactic acid build up and very painful stiffening of my muscles. I had noticed all through the training that I hadn't really had trouble with this, even on the days following my long distance runs which had meant 4-5 hours of constant exertion, but I fully expected to be in agonizing pain with the stiffness and deep soreness one feels after intense exercise such as the marathon. To my great surprise and pleasure, I got off the plane in Las Vegas after the 20 hours and went for a run the following day, just to turn my legs over, to find that I had **no pain at all**.

From my scientific background I found all these combined outcomes fascinating. My ability to overcome 'hitting the wall', my increased time for the last kilometer of the race, my unbelievable recovery from the marathon itself and then no pain after 20 hours of flight when even the most rested person can feel stiff and sore after such a trip.

My only logical conclusion is that this was an extraordinary example of how well the *Aqua Formulas* contribute to and maintain a high level of hydration and how effectively they stimulate the clearance of metabolic waste products. Under normal circumstances a lengthy period of inactivity following something like a marathon would result in significant muscle

soreness due to the accumulation of lactic acid, but I experienced none of that.

Having been so thoroughly impressed with the impact that the *Aqua Formulas* had had on my sense of wellness, my performance and my recovery after the marathon, I was keen to see them being made more available, and from discussions with Leonie, *AquaConneXions* (now Wild Medicine) was born. I often feel like the Shaver man who ‘liked the product so much he bought the company’ except in this case there was no company until we created it. But I believed, without necessarily being able to scientifically “pigeonhole” them that the *Aqua Formulas* have a very important role to play in our health, both individually and on a global scale. Hydration is **vital** for every biochemical process in the body from brain function to skin condition to digestion and elimination.

It became important to Leonie and myself to understand how and why they work and then to set about not only making them available to others, but also to educate others about the importance of hydration. We wanted to shout to the world that **simply drinking water is not enough!** Proper hydration, on a cellular level, is imperative to our whole health & wellbeing.

Some six months after *Wild Medicine* was formed I left my position as a laboratory head at the Baker Medical Institute of Research ending my 10 year career in conventional science to

pursue the issue of Hydration via research, product development and the ongoing task of getting the message to the world. The journey since then has been endlessly fascinating, very challenging and periodically frustrating but we are committed and with commitment comes satisfaction.

The science of hydration is in its infancy, as a search of the scientific literature will show. There are only very few biochemists that have specifically asked questions about cellular hydration and this is despite the fact that water is the single most important nutrient for cells and biological systems in general. Perhaps it is this very ubiquity that leads to the issue of cellular water being overlooked so comprehensively. Of course what is important about cellular water is not its mere presence or absence but the rates at which it moves within the system. For instance water influx rates are the limiting variable in the uptake of nutrients into all cells (ref 2.). These nutrients include oxygen and glucose – the essentials for cellular respiration. They also include virtually every other water-soluble nutrient and, because they travel in tandem with lipid, most lipid soluble nutrients also. Clearance rates of metabolic waste products are dependent on the rate of water efflux and so any improvement in the rate of water efflux will result in an improvement in the speed and extent to which metabolic wastes are cleared. The analogy of the movement of tides is an apt one. The tide of cellular water carries in nutrients and fuels and the ebbing tide washes out the waste products. Of course in

the cell these two processes are occurring simultaneously and are mediated by a variety of mechanisms. One of our research projects is to determine which of these processes The Aqua Formulas affect. The water transport processes are both active(ref 3.) and passive(ref 4.) There are specific water channel molecules that act like pores in cell membranes. Some of these are simply able to be opened and closed and allow water to move passively down osmotic gradients. Others are driven by molecular pumps and are used to move water and dissolved species such as electrolytes and other small molecular weight entities against osmotic gradients. Still others are water specific and simply pump water into cells and out of cells to satisfy many, as yet unknown, requirements. It is via these pumps that water exhibits a set of characteristics that are more akin to a hormone than a simple molecule.

In one of the only reviews in the scientific literature of the effects of cellular hydration on cell function, Dieter Haussinger of the Heinrich Heine University in Dusseldorf has stated, “Most importantly, small fluctuations of cell hydration, i.e. of cell volume, act as a separate and potent signal for cellular metabolism and gene expression.(ref 5.)” In the studies of Haussinger’s group, in which cultured rat liver cells (hepatocytes) are used as the experimental model system, they have shown that under the influence of a range of factors, including peptide hormones, simple molecules and ATP the cultured hepatocytes lose water

and move into a catabolic state. When the same cells are exposed to amino acids, insulin and a range of drugs they gain water and move to an anabolic state. It was previously thought that these various factors caused the catabolic or anabolic states directly but Haussinger's group. have shown that it is the change in hydration state, not the direct effect of the various factors, that controls the anabolic/catabolic switch (ref 6.). This has important implications for our understanding of hydration state as it would appear that it is the hydration state, which may also be influenced by a wide variety of other factors, including environmental, emotional, and nutritional states, that is critical.

In this context, the Aqua Formulas, by acting directly to raise the hydration state of the cell can quickly switch catabolic metabolism to anabolic and thus reverse cell degradative processes. When coupled with the direct effects of increasing uptake of nutrients and assisting with clearance of toxins there is significant potential for positive effects on cells and therefore tissues in both normal and pathological states.

In a holistic view of the body there is another component to the control of hydration state and that is the thirst reflex. This has been well studied and much is known about the neuroendocrinology and neuroanatomy of the reflex arc (ref 7.). We know that drinking occurs when a decreased water fraction in the cerebrospinal fluid is sensed by one of the peri-ventricular

organs – the organum vasculosum of the lateral terminalis or OVLT for short. The OVLT sends messages to behavioral centers to stimulate the individual (or animal) to seek water and drink. This assumes that there is access to water. Unfortunately in our modern world we so often respond to this reflex activation inappropriately and consume either fluids other than water, many of which (such as those that contain caffeine, alcohol or excess sugar) are actually dehydrating, or we eat food. The consumption of food or inappropriate fluids in response to this reflex activation leads to several problems. First, consumed food must be digested and this requires the secretion of gastric and other digestive fluids. These digestive fluids contain a large fraction of water, which is temporarily unavailable to the rest of the body, and thus this secretion serves to further dehydrate the organism. Second, the repetitive use of an inappropriate response (either food or fluids other than water) serves to downgrade the reflex. We have a powerful ability to suppress “noise” in any response system and it only requires a few instances of inappropriate response for a reflex to be treated as “noise” and effectively ignored. This results in the common state where a dehydrated individual reports that they are never thirsty. Less commonly the ignored reflex arc will open without feedback inhibition. When this occurs we have the situation where the individual reports having an insatiable thirst, and is always drinking. All too often, however, the fluids consumed are those that exacerbate the problem.

To address the issue of resetting the thirst reflex the Aqua Formulas contain components including Bach Flower Essences and homoeopathics including those of the core technology, which appear to reset the thirst reflex. Thus an often reported consequence of the use of the Formulas is the activation of thirst in an individual who has not experienced thirst, often for years, or the control of unsatisfied thirst.

The long term biological effects of less than optimal hydration are only starting to be investigated. There are scant publications on this topic but one paper, published in 1981, suggests that in the last decades of life losses in body water (up to 5 litres over 10 years in men of 80 years of age) showed the best correlation with decreased function and increased morbidity (ref 8.). This issue alone deserves research attention.

In the 5 years that the Aqua Formulas have been available we have had many individuals and practitioners who have made use of the formulas with success. One of those, John Coleman, was the subject of a recent article in Diversity regarding his studies on Parkinson's Disease (ref 9.). John's protocol has used the Aqua Formulas, together with Bowen Therapy to effect healing in Parkinson's sufferers, including himself. We have worked closely with John in the refinement of the use of the formulas in his protocol and would be happy to do likewise with other practitioners with specific research interests. We are also

planning a series of research studies aimed at further elucidating the mechanism of action of the formulas in part to validate their use but more importantly to use them as a tool to improve our understanding of this little studied area of biology – cellular hydration.

The task we have set ourselves is enormous and has only just begun but I feel passionate about how important hydration is. I'm excited about what this technology has the potential to do in any situation where hydration is compromised. Most, if not all people that read this are suffering some degree of dehydration and their health is being affected. Virtually every athlete we have spoken to and tested exhibit signs of dehydration and the improvements in performance and recovery following even short periods on the formulas are often surprisingly large. The Aqua Hydration Technology can help solve these problems and I'm proud to be part of the solution. (No pun intended)

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Chapter 5: Body Water

A significant fraction of the human body is water. This body water is distributed in different compartments in the body. Lean muscle tissue contains about 75% water. Blood contains 83% water, body fat contains 25% water and bone has 22% water.

In diseased states where body water is affected, the compartment or compartments that have changed can give clues to the nature of the problem.

Body water is regulated by hormones, including anti-diuretic hormone (ADH), aldosterone and atrial natriuretic peptide.

There are many methods that can be used to determine body water. One way to get a simple estimate is by calculation.

Calculation of body water

In individuals of normal weight, water is abundant in most parts of the body, except in adipose tissue (fat). These calculations are for adults of average build, and are inappropriate for obese or overly muscular people. These proportions are very simplified and use round numbers for quick calculation.

In men about 55% of the body mass is water. This value is about 51% in women due to a higher proportion of body fat. This is the *total body water*.

Body water is broken down into the following compartments.^[1]

Intracellular fluid (2/3 of Body Water)

Extracellular fluid (1/3 of Body Water)

Plasma (1/4 of Extracellular fluid)

Interstitial fluid (3/4 of Extracellular fluid)

Transcellular fluid (normally ignored in calculations)

- Contained inside organs, such as the gastrointestinal, cerebrospinal, and ocular fluids.

Measurement of body water

Dilution and equilibration

Total body water can be determined using Flowing afterglow mass spectrometry FA-MS measurement of deuterium abundance in breath samples from individuals. A known dose of deuterated water (Heavy water, D₂O) is ingested and allowed to equilibrate within the body water. The FA-MS instrument then measures the deuterium-to-hydrogen (D:H) ratio in the exhaled breath water vapour. The total body water is then accurately measured from the increase in breath deuterium content in relation to the volume of D₂O ingested.

Different substances can be used to measure different fluid compartments.^[2]

total body water: tritiated water or deuterium

extracellular fluid: inulin

blood plasma: Evans blue

Bioelectrical impedance analysis

Another method of determining total body water percentage (TBW%) is via Bioelectrical Impedance Analysis (BIA). In the traditional BIA method, a person lies on a cot and spot electrodes are placed on the hands and bare feet. Electrolyte gel is applied first, and then a current of 50 kHz is introduced. BIA has emerged as a promising technique because of its simplicity, low cost, high reproducibility and noninvasiveness. BIA prediction equations can be either generalized or population-specific, allowing this method to be potentially very accurate. Selecting the appropriate equation is important to determining the quality of the results.

For clinical purposes, scientists are developing a multi-frequency BIA method that may further improve the method's ability to predict a person's hydration level. New segmental BIA equipment that uses more electrodes may lead to more precise measurements of specific parts of the body.

Conditions associated with abnormal body water

- Renal failure
- Obesity
- Third Spacing

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Chapter 6: Medical Issues with Dehydration

Dehydration (hypohydration) is the removal of water (*hydro* in ancient Greek) from an object. Medically, it is a condition in which the body contains an insufficient volume of water for normal functioning.

Medical causes of dehydration in humans

In humans, dehydration can be caused by a wide range of diseases and states that impair water homeostasis in the body. These include:

External or stress-related causes

- Prolonged physical activity without consuming adequate water, especially in a hot and/or humid environment
- Prolonged exposure to dry air, e.g., in high-flying airplanes (5-15% r.h.)
- Survival situations, especially desert survival conditions
- Blood loss or hypotension due to physical trauma
- Diarrhoea
- Hyperthermia
- Shock (hypovolemic)
- Vomiting
- Burns

- Lacrimation
- Infectious diseases
 - Cholera
 - Gastroenteritis
 - Shigellosis
 - Yellow fever
- Malnutrition
 - Electrolyte disturbance
 - Hypernatremia (also caused by dehydration)
 - Hyponatremia, especially from restricted salt diets
 - Consumption of alcohol, caffeine or other diuretic substances.
 - Fasting
 - Recent rapid weight loss may reflect progressive depletion of fluid volume. (The loss of 1 L of fluid results in a weight loss of 1 kg, or 2.2 lb.)^[1]
 - Patient refusal of nutrition and hydration
- Other causes of obligate water loss
 - Severe hyperglycemia, especially in Diabetes mellitus
 - Glycosuria

Symptoms and prognosis

Symptoms may include headaches similar to what is experienced during a hangover, a sudden episode of visual

snow, decreased blood pressure (hypotension), and dizziness or fainting when standing up due to orthostatic hypotension. Untreated dehydration generally results in delirium, unconsciousness, and in extreme cases death.

Dehydration symptoms generally become noticeable after 2% of one's normal water volume has been lost. Initially, one experiences thirst and discomfort, possibly along with loss of appetite and dry skin. This can be followed by constipation. Athletes may suffer a loss of performance of up to 30%^[2], and experience flushing, low endurance, rapid heart rates, elevated body temperatures, and rapid onset of fatigue.

Symptoms of mild dehydration include thirst, decreased urine volume, abnormally dark urine, unexplained tiredness, lack of tears when crying, headache, dry mouth, and dizziness when standing due to orthostatic hypotension.

In moderate to severe dehydration, there may be no urine output at all. Other symptoms in these states include lethargy or extreme sleepiness, seizures, sunken fontanel (soft spot) in infants, fainting, and sunken eyes.

The symptoms become increasingly severe with greater water loss. One's heart and respiration rates begin to increase to compensate for decreased plasma volume and blood pressure, while body temperature may rise because of decreased sweating. Around 5% to 6% water loss, one may become groggy or sleepy, experience headaches or nausea, and may feel tingling in one's limbs (paresthesia). With 10% to 15% fluid loss, muscles may become spastic, skin may shrivel

and wrinkle, vision may dim, urination will be greatly reduced and may become painful, and delirium may begin. Losses greater than 15% are usually fatal. ^[3]

Treatment



Nurses encouraging this patient to drink an Oral Rehydration Solution to improve dehydration he acquired from cholera.

Courtesy:Centers for Disease Control and Prevention

The best treatment for minor dehydration is drinking water and stopping fluid loss. Water is preferable to sport drinks and other commercially-sold rehydration fluids, as the balance of electrolytes they provide may not match the replacement requirements of the individual. To stop fluid loss from vomiting and diarrhea, avoid solid foods and drink only clear liquids. ^[4]

In more severe cases, correction of a dehydrated state is accomplished by the replenishment of necessary water and electrolytes (rehydration, through oral rehydration therapy or intravenous therapy). Even in the case of serious lack of fresh water (e.g., at sea or in a desert), drinking seawater or urine does not help, nor does the consumption of alcohol. It is often thought that the sudden influx of salt into the body from

seawater will cause the cells to dehydrate and the kidneys to overload and shut down but it has been calculated that an average adult can drink up to 0.2 liters of seawater per day before the kidneys start to fail. ^[citation needed]

When dehydrated, unnecessary sweating should be avoided, as it wastes water. If there is only dry food, it is better not to eat, as water is necessary for digestion. For severe cases of dehydration where fainting, unconsciousness, or other severely inhibiting symptom is present (the patient is incapable of standing or thinking clearly), emergency attention is required. Fluids containing a proper balance of replacement electrolytes are given orally or intravenously with continuing assessment of electrolyte status; complete resolution is the norm in all but the most extreme cases.

Avoiding dehydration

Dehydration is best avoided by drinking plenty of water. The greater the amount of water lost through perspiration, the more water must be consumed to replace it and avoid dehydration. Since the body cannot tolerate large deficits or excesses in total body water, consumption of water must be roughly concurrent with the loss (in other words, if one is perspiring, one should also be drinking water frequently). Drinking water slightly beyond the needs of the body entails no risk, since the kidneys will efficiently remove any excess water through the urine with a large margin of safety.

A person's body, during an average day in a temperate climate such as the United Kingdom, loses approximately 2.5

litres of water. This can be through the lungs as water vapor, through the skin as sweat, or through the kidneys as urine. Some water (a less significant amount, in the absence of diarrhea) is also lost through the bowels. In warm or humid weather or during heavy exertion, however, the water loss can increase by an order of magnitude or more through perspiration; all of which must be promptly replaced. In extreme cases, the losses may be great enough to exceed the body's ability to absorb water from the gastrointestinal tract; in these cases, it is not possible to drink enough water to stay hydrated, and the only way to avoid dehydration is to reduce perspiration (through rest, a move to a cooler environment, etc.).

A useful rule of thumb for avoiding dehydration in hot or humid environments or during strenuous activity involves monitoring the frequency and character of urination. If one develops a full bladder at least every 3-5 hours and the urine is only lightly colored or colorless, chances are that dehydration is not occurring; if urine is deeply colored, or urination occurs only after many hours or not at all, water intake may not be adequate to maintain proper hydration.

When large amounts of water are being lost through perspiration and concurrently replaced by drinking, maintaining proper electrolyte balance becomes an issue. Drinking fluids that are hypertonic or hypotonic with respect to perspiration may have grave consequences (hyponatremia or hypernatremia, principally) as the total volume of water turnover increases.

If water is being lost through abnormal mechanisms such as vomiting or diarrhea, an imbalance can develop very quickly into a medical emergency. In fact, the main mechanisms through which diseases such as infantile diarrhea and cholera kill their victims are dehydration and loss of electrolytes.

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Chapter 7: Electrolyte disturbance

Electrolytes play a vital role in maintaining homeostasis within the body. They help to regulate myocardial and neurological function, fluid balance, oxygen delivery, acid-base balance and much more. Electrolyte imbalances can develop by the following mechanisms: excessive ingestion or diminished elimination of an electrolyte or diminished ingestion or excessive elimination of an electrolyte. The most common cause of electrolyte disturbances is renal failure.

The most serious electrolyte disturbances involve abnormalities in the levels of sodium, potassium, and/or calcium. Other electrolyte imbalances are less common, and often occur in conjunction with major electrolyte changes. Chronic laxative abuse or severe diarrhea or vomiting can lead

to electrolyte disturbances along with dehydration. People suffering from bulimia or anorexia are at especially high risk for an electrolyte imbalance.

Nomenclature

There is a standard nomenclature for electrolyte disorders:

1. The name starts with a prefix denoting whether the electrolyte is abnormally elevated ("hyper-") or depleted ("hypo-").
2. The word stem then gives the name of the electrolyte in Latin. If no Latin equivalent exists, then the corresponding term in English is used.
3. The name ends with the suffix "-emia," meaning "in the blood." (Note, this doesn't mean that the disturbance is *only* in the blood; usually, electrolyte disturbance is systemic. However, since the disturbance is usually detected from blood testing, the convention has developed.)

For instance, elevated potassium in the blood is called "hyperkalemia" from the Latin term for potassium, "kalium".

Table of common electrolyte disturbances

Electrolyte	Ionic formula	Elevation disorder	Depletion disorder
Sodium	Na^+	hyponatremia	hypernatremia
Potassium	K^+	hypokalemia	hyperkalemia

Calcium	Ca^{2+}	hypercalcemia	hypocalcemia
Magnesium	Mg^{2+}	hypermagnesemia	hypomagnesemia
Chloride	Cl^-	hyperchloremia	hypochloremia
Phosphate	PO_4^{3-}	hyperphosphatemia	hypophosphatemia
Bicarbonate	HCO_3^-	hyperbicarbonatemia	hypobicarbonatemia

Electrolyte Abnormalities and ECG Changes

The most notable feature of hyperkalemia is the "tent shaped" or "peaked" T wave. Delayed ventricular depolarization leads to a widened QRS complex and the P wave becomes wider and flatter. When hyperkalemia becomes severe, the ECG resembles a sine wave as the P wave disappears from view. In contrast, hypokalemia is associated with flattening of the T wave and the appearance of a U wave. When untreated, hypokalemia may lead severe arrhythmias.

The fast ventricular depolarization and repolarization associated with hypercalcemia lead to a characteristic shortening of the QT interval. Hypocalcemia has the opposite effect, lengthening the QT interval.

Chapter 8: Tears

The tear system. A) Tear gland / Lacrimal gland B) Superior lacrimal punctum C) Superior lacrimal canal D) Tear sac / Lacrimal sac E) Inferior lacrimal punctum F) Inferior lacrimal canal G) Nasolacrimal canal

Tears are a liquid produced by the body's process of lacrimation to clean and lubricate the eyes. The word *lacrimation* may also be used in a medical or literary sense to refer to crying.

Physiology

In humans, the tear film coating the eye has three distinct layers, from the most outer surface:

1. The **lipid layer** contains oils secreted by the meibomian glands. The outer-most layer of the tear film coats the aqueous layer to provide a hydrophobic barrier that retards evaporation and prevents tears spilling onto the cheek.
2. The **aqueous layer** contains water and other substances such as proteins (e.g. tear lipocalin, lactoferrin, lysozyme^[1] and lacritin) secreted by the glands and the lacrimal gland. The aqueous layer serves to promote spreading of the tear film, control of infectious agents and osmotic regulation.
3. The **mucous layer** contains mucin secreted by the conjunctival goblet cells. The inner-most layer of the tear film, it coats the cornea to provide a hydrophilic layer

that allows for even distribution of the tear film, as well as mucus covering of the cornea.

Having a **thin** tear film may prevent you from wearing contact lenses as the amount of oxygen need is higher than normal and contact lenses stop oxygen entering your eye. You will find that your eyes will dry out while wearing contact lenses whilst having a thin tear film. Special eye drops are available for contact lens wearers, also certain types of contact lenses are designed to let more oxygen through.

Drainage of tear film

One lacrimal gland is located superiortemporally to each eye, behind the upper eyelid. The lacrimal glands secrete lacrimal fluid which flows through the main excretory ducts into the space between the eyeball and lids. When the eyes blink the lacrimal fluid is spread across the surface of the eye. Lacrimal fluid gathers in the lacrimal lake, and is drawn into the puncta by capillary action, then flows through the lacrimal canaliculi at the inner corner of the eyelids through the nasolacrimal duct, and finally into the nasal cavity. An excess of tears, as with strong emotion, can thus cause the nose to run.

Types of tears

There are three very basic types of tears:

1. **Basal tears:** In healthy mammalian eyes, the cornea is continually kept wet and nourished by *basal tears*. They lubricate the eye and help to keep it clear of dust. Tear

fluid contains water, mucin, lipids, lysozyme, lactoferrin, lipocalin, lacritin, immunoglobulins, glucose, urea, sodium, and potassium. Some of the substances in lacrimal fluid fight against bacterial infection as a part of the immune system.

2. **Reflex tears:** The second type of tears results from irritation of the eye by foreign particles, or from the presence of irritant substances such as onion vapors, tear gas or pepper spray in the eye's environment. These *reflex tears* attempt to wash out irritants that may have come into contact with the eye.
3. **Crying or weeping (psychic tears):** The third category, generally referred to as *crying* or *weeping*, is increased lacrimation due to strong emotional stress, depression or physical pain. This practice is not restricted to negative emotions; many people have been known to cry when extremely happy or when they are laughing. In humans, *emotional tears* can be accompanied by reddening of the face and sobbing — cough-like, convulsive breathing, sometimes involving spasms of the whole upper body. Tears brought about by emotions have a different chemical make up than those for lubrication. The limbic system is involved in production of basic emotional drives, such as anger, fear, etc. The limbic system, specifically the hypothalamus, also has a degree of control over the autonomic system. The parasympathetic branch of the autonomic system controls the lacrimal glands via the neurotransmitter acetylcholine through both the nicotinic

and muscarinic receptors. When these receptors are activated that the lacrimal gland is stimulated to produce tears.^[2]

Diseases and disorders

Quality of vision is affected by the stability of the tear film.^[3]

"Crocodile tears syndrome" is an uncommon consequence of recovery from Bell's palsy where faulty regeneration of the facial nerve causes sufferers to shed tears while eating.^[4]

Keratoconjunctivitis sicca, more commonly known as dry eye, is a very common disorder of the tear film. Paradoxically, sufferers can experience watering of the eyes which is

"Leamy Eye" is a condition whereby there is excessive watering of one eye in response to environmental stimuli.

Societal aspects



A Frenchman weeps as German soldiers march into the French capital, Paris, on June 14, 1940.

Most mammals will produce tears in response to extreme pain or other stimuli, but crying as an emotional reaction is considered by many to be a uniquely human phenomenon, possibly due to humans' advanced self-awareness. Some studies suggest that elephants and gorillas may cry as well.^[5]

In nearly all cultures, crying is seen as a specific act associated with tears trickling down the cheeks and accompanied by characteristic sobbing sounds. Emotional triggers are most often anger and grief, but crying can also be triggered by sadness, joy, fear, laughter or humor, frustration, or other strongly-experienced emotions.

In many cultures, crying is associated with babies and children. Some cultures consider crying to be undignified and infantile, casting aspersions on those who cry publicly, except if it is due to the death of a close friend or relative. In most cultures, it is more socially acceptable for women to cry than men.

Some modern therapy movements such as Re-evaluation Counseling believe that crying is beneficial to health and mental wellbeing, and positively encourage it.^[6]

An insincere display of grief or dishonest remorse is called crocodile tears, from the ancient anecdote that crocodiles would *pretend* to weep while luring or devouring their prey.^[7]

Spiritual aspects

Many religions describe gods or prophets as crying:

According to a hadith, the prophet Muhammad proclaimed: *"This (tears) is an expression of the tenderness and compassion, which the Lord hath put into the hearts of His servants. The Lord doth not have compassion on and commiserate with His servants, except such as are tender and full of feeling."*

The shortest verse in English translated Bibles is found in the Gospel of John 11:35, *"Jesus wept."*

Jade is sometimes known as "tears of the Buddha".

The *Gift of Tears* in Shin Buddhism: Tears of joy and grief cleanse our souls. Christians as well may perceive tears as a spiritual gift when they refer to Gospel of Jesus Christ: "Blessed are you that weep now, for you shall laugh" (Luke 6.21), while Weeping Icons are a common feature of the Eastern Christian Traditions.

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Chapter 9: Hypovolemia

In physiology and medicine, **hypovolemia** (also hypovolaemia) is a state of decreased blood volume; more specifically, decrease in volume of blood plasma.

Causes

Common causes of hypovolemia can be dehydration, bleeding, severe burns and drugs such as diuretics or vasodilators typically used to treat hypertensive individuals. Rarely, it may occur as a result of a blood donation.^[1]

Effects

Severe hypovolemia leads to *hypovolemic shock*.

A low blood volume can result in multiple organ failure, erectile dysfunction, kidney damage and failure, brain damage, coma and death (desanguination).

Diagnosis

Clinical symptoms may not present until 10-20% of total whole-blood volume is lost.

Hypovolemia can be recognized by elevated pulse, diminished blood pressure, and the absence of perfusion as assessed by skin signs (skin turning pale) and/or capillary refill on forehead, lips and nail beds. The patient may feel dizzy, faint, nauseated, or very thirsty. These signs are also characteristic of most types of shock.

Note that in children, compensation can result in an artificially high blood pressure despite hypovolemia. This is another reason (aside from initial lower blood volume) that even the possibility of internal bleeding in children should always be treated aggressively.

Also look for obvious signs of external bleeding while remembering that people can bleed to death internally without any external blood loss.

Also consider possible mechanisms of injury (especially the steering wheel and/or use/non-use of seat belt in motor vehicle accidents) that may have caused internal bleeding such as ruptured or bruised internal organs. If trained to do so and the situation permits, conduct a secondary survey and check the chest and abdominal cavities for pain, deformity, guarding or swelling. (Injuries to the pelvis and bleeding into the thigh from the femoral artery can also be life-threatening.)

Treatment

Minor hypovolemia from a known cause that has been completely controlled (such as a blood transfusion from a healthy patient who is not anemic) may be countered with initial rest for up to half an hour, oral fluids including moderate sugars (apple juice is good) and the advice to the donor to eat good solid meals with proteins for the next few days. Typically, this would involve a fluid volume of less than one liter (1000 ml), although this is highly dependent on body weight. Larger people can tolerate slightly more blood loss than smaller people.

More serious hypovolemia should be assessed by a nurse or doctor. When in doubt, treat hypovolemia aggressively.

First Aid

External bleeding should be controlled by direct pressure. If direct pressure fails, other techniques such as elevation and pressure points should be considered. The tourniquet should be used in the case of massive hemorrhage i.e. arterial bleeds, such as the femoral artery. If a first-aider recognizes internal bleeding, the life-saving measure to take is to immediately call for emergency assistance.

Field Care

Emergency oxygen should be immediately employed to increase the efficiency of the patient's remaining blood supply. This intervention can be life-saving.

The use of intravenous fluids (IVs) may help compensate for lost fluid volume, but IV fluids cannot carry oxygen in the way that blood can. See also emergency medical services for a discussion of techniques used in IV fluid management of hypovolemia.

Hospital Treatment

If the hypovolemia was caused by medication, the administration of antidotes may be appropriate but should be carefully monitored to avoid shock or the emergence of other pre-existing conditions.

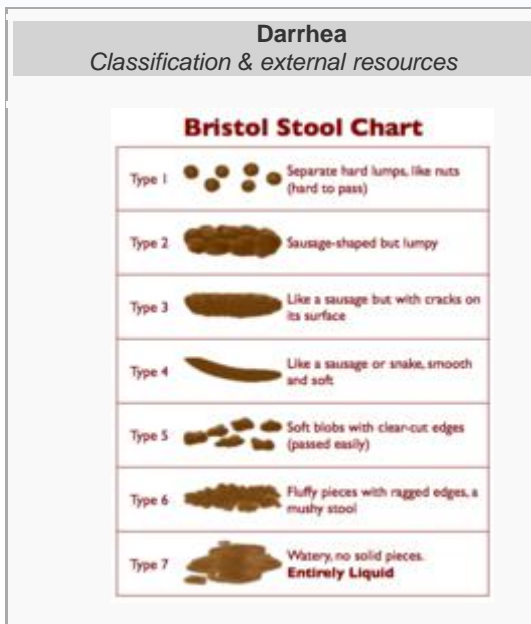
Blood transfusions coupled with surgical repair are the definitive treatment for hypovolemia caused by trauma. See also the discussion of shock and the importance of treating reversible shock while it can still be countered.

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Chapter 10: Diarrhea

From Wikipedia, the free encyclopedia



Types 4-7 on the Bristol Stool Chart are often associated with diarrhea

ICD-10 A09., K59.1

ICD-9 787.91

DiseasesDB 3742

eMedicine ped/583

MeSH D003967

Diarrhea (in American English) or **diarrhoea** (in British English) is a condition in which the sufferer has frequent watery, loose bowel movements (from the Greek word διάρροια; literally meaning "through-flowing"). Acute infectious diarrhea is a common cause of death in developing countries (particularly among infants), accounting for 5 to 8 million deaths annually^[1]. Much of the incidence of these deaths is due to the lack of adequate safe water and lack of sewage treatment capacity; the separation of drinking water from contaminated sewage is also a major issue.

Causes

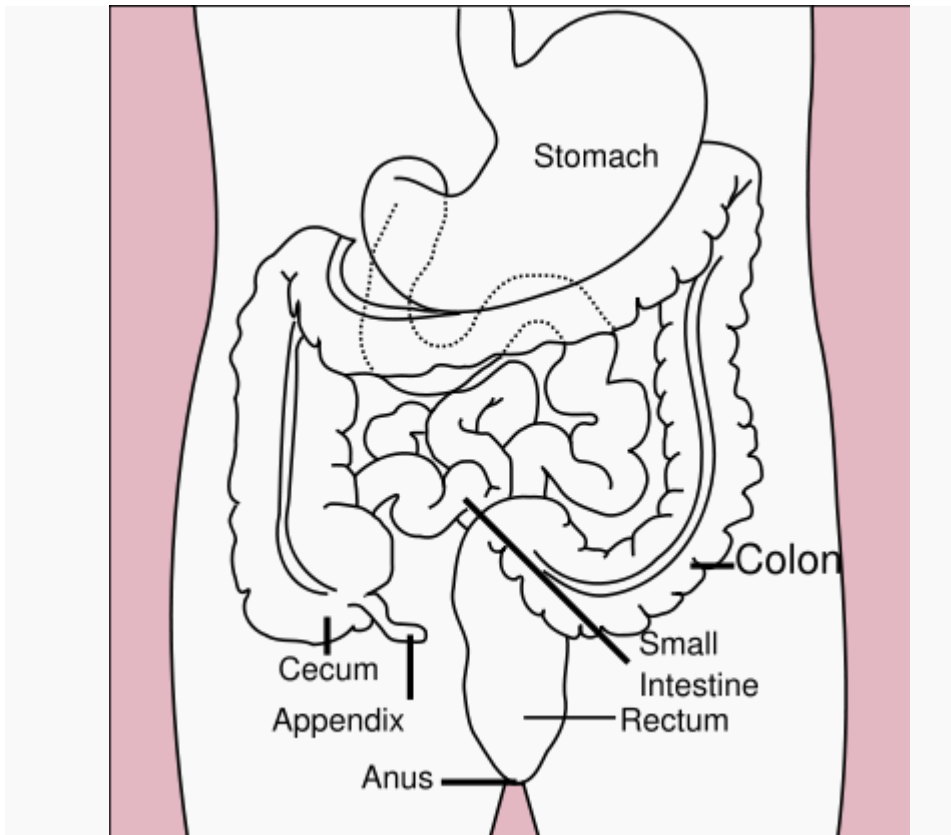


Diagram of the human gastrointestinal tract.

This condition can occur as a symptom of infection, allergy, food intolerance, foodborne illness and/or extreme excesses of Vitamin C and/or magnesium and may be accompanied by abdominal pain, nausea and vomiting. Temporary diarrhea can also result from the ingestion of laxative medications or large quantities of certain foods like prunes with laxative properties. There are other conditions which involve some but not all of the symptoms of diarrhea, and so the formal medical definition of

diarrhea involves defecation of more than 200 grams per day (though formal weighing of stools to determine a diagnosis is rarely actually carried out).

Diarrhea occurs when insufficient fluid is absorbed by the colon. As part of the digestion process, or due to fluid intake, food is mixed with large amounts of water. Thus, digested food is essentially liquid prior to reaching the colon. The colon absorbs water, leaving the remaining material as a semisolid stool. If the colon is damaged or inflamed, however, absorption is inhibited, and watery stools result.

Diarrhea is most commonly caused by viral infections or bacterial toxins. In sanitary living conditions and with ample food and water available, an otherwise healthy patient typically recovers from the common viral infections in a few days and at most a week. However, for ill or malnourished individuals diarrhea can lead to severe dehydration and can become life-threatening without treatment.

Diarrhea can also be a symptom of more serious diseases, such as dysentery, cholera, or botulism, and can also be indicative of a chronic syndrome such as Crohn's disease. Though appendicitis patients do not generally have diarrhea, it is a common symptom of a ruptured appendix. It is also an effect of severe radiation sickness.

Diarrhea can also be caused by dairy intake in those who are lactose intolerant.

Symptomatic treatment for diarrhea involves the patient consuming adequate amounts of water to replace that loss,

preferably mixed with electrolytes to provide essential salts and some amount of nutrients. For many people, further treatment is unnecessary. The following types of diarrhea generally indicate medical supervision is desirable:

Diarrhea in infants;

Moderate or severe diarrhea in young children;

Diarrhea associated with blood;

Diarrhea that continues for more than 2 weeks;

Diarrhea that is associated with more general illness such as non-cramping abdominal pain, fever, weight loss, etc;

Diarrhea in travelers, since they are more likely to have exotic infections such as parasites;

Diarrhea in food handlers, because of the potential to infect others;

Diarrhea in institutions such as hospitals, child care centers, or geriatric and convalescent homes.

Mechanism

To expel the contents of the lower digestive tract, the fluidity of the contents of the small and large intestines is increased. Active transport of Na^+ back into the gut initiates a reverse sodium transport. This causes both Cl^- and HCO_3^- to follow passively, as well as water. Now in the intestines, the water dilutes toxins as well as triggering contractions of the intestine due to increase in intestinal distension. These contractions push the contents of the lower GI tract towards and out of the anal canal.

Types of diarrhea

There are at least four types of diarrhea: secretory diarrhea, osmotic diarrhea, motility-related diarrhea, and inflammatory diarrhea.

Secretory diarrhea

Secretory diarrhea means that there is an increase in the active secretion, or there is an inhibition of absorption. There is little to no structural damage. The most common cause of this form of this type of diarrhea is a cholera toxin that stimulates the secretion of anions, especially chloride ions. Therefore, to maintain a charge balance in the lumen, sodium is carried with it, along with water.

Osmotic diarrhea

Osmotic diarrhea occurs when there is a loss of water due to a heavy osmotic load. This can occur when there is maldigestion (e.g., pancreatic disease or Coeliac disease), where the nutrients are left in the lumen, which pulls water into the lumen.

Motility-related diarrhea

Motility-related diarrhea occurs when the motility of the gastrointestinal tract is abnormal. If the food moves too quickly, there is not enough contact time between the food and the membrane, meaning that there is not enough time for the nutrients and water to be absorbed. This can follow a vagotomy or diabetic neuropathy.

Inflammatory diarrhea

Inflammatory diarrhea occurs when there is damage to the mucosal lining or brush border, which leads to a passive loss of protein-rich fluids, and a decreased ability to absorb these lost fluids. Features of all three of the other types of diarrhea can be found in this type of diarrhea. It can be caused by bacterial infections, viral infections, parasitic infections, or autoimmune problems such as inflammatory bowel disease.

Infectious diarrhea

Infectious diarrhea is diarrhea caused by a microbe such as a bacterium, parasite, or virus.

Malabsorption

These tend to be more severe medical illnesses. Malabsorption is the inability to absorb food, mostly in the small bowel but also due to the pancreas.

Causes include celiac disease (intolerance to gluten, a wheat product), lactose intolerance (Intolerance to milk sugar, common in non-Europeans), fructose malabsorption, pernicious anemia (impaired bowel function due to the inability to absorb vitamin B12), loss of pancreatic secretions (may be due to cystic fibrosis or pancreatitis), short bowel syndrome (surgically removed bowel), radiation fibrosis (usually following cancer treatment), and other drugs such as chemotherapy.

Inflammatory bowel disease

The two overlapping types here are of unknown origin:

Ulcerative colitis

Ulcerative colitis is marked by chronic bloody diarrhea and inflammation mostly affects the distal colon near the rectum.

Crohn's disease

Crohn's disease typically affects fairly well demarcated segments of bowel in the colon and often affects the end of the small bowel.

Irritable Bowel Syndrome

Main article: Irritable Bowel Syndrome

Another possible cause of diarrhea is Irritable Bowel Syndrome (IBS). Symptoms defining IBS: abdominal discomfort or pain relieved by defecation and unusual stool (diarrhea or constipation or both) or stool frequency, for at least 3 days a week over the previous 3 months.^[2] IBS symptoms can be present in patients with a variety of conditions including food allergies, infective diarrhea, celiac, and inflammatory bowel diseases. Treating the underlying condition (celiac disease, food allergy, bacterial dysbiosis, etc.) usually resolves the diarrhea.^[3] IBS can cause visceral

hypersensitivity. While there is no direct treatment for undifferentiated IBS, symptoms, including diarrhea, can sometimes be managed through a combination of dietary changes, soluble fiber supplements, and/or medications.

Alcohol

Chronic diarrhea can be caused by chronic ethanol ingestion ^[1]. Consumption of alcohol affects the body's capability to absorb water - this is often a symptom that accompanies a hangover after a heavy drinking session. The alcohol itself is absorbed in the intestines and as the intestinal cells absorb it, the toxicity causes these cells to lose their ability to absorb water. This leads to an outpouring of fluid from the intestinal lining, which is in turn poorly absorbed. The diarrhea usually lasts for several hours until the alcohol is detoxified and removed from the digestive system. Symptoms range from person to person and are influenced by both the amount consumed as well as physiological differences. Alcohol-induced diarrhea is often accompanied by "the follow through" where a feeling that the patient is going to break wind (flatulence) instead becomes an uncontrolled episode of diarrhea.

Other important causes

Ischemic bowel disease. This usually affects older people and can be due to blocked arteries.

Bowel cancer: Some (but not all) bowel cancers may have associated diarrhea. Cancer of the large intestine is most common.

Hormone-secreting tumors: some hormones (e.g. serotonin) can cause diarrhea if excreted in excess (usually from a tumor).

Bile salt diarrhea: excess bile salt entering the colon rather than being absorbed at the end of the small intestine can cause diarrhea, typically shortly after eating. Bile salt diarrhea is a possible side-effect of gallbladder removal. It is usually treated with cholestyramine, a bile acid sequestrant.

Footnotes

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Chapter 11: Hyperthermia

Hyperthermia in its advanced state referred to as **heat stroke** or **sunstroke**, is an acute condition which occurs when the body produces or absorbs more heat than it can dissipate. It is usually due to excessive exposure to heat. The heat-regulating mechanisms of the body eventually become overwhelmed and unable to effectively deal with the heat, and body temperature climbs uncontrollably. This is a medical emergency that requires immediate medical attention.

Hyperthermia can be created artificially by drugs or medical devices. In these instances it may be used to treat cancer and other conditions. Malignant hyperthermia is a rare complication of some types of general anesthesia.

Hyperthermia is the opposite of hypothermia.

Progression

Body temperatures above 40°C (104 °F) are life-threatening. This compares to normal body temperature of 36-37°C (97-98°F). At 41°C (106 °F), brain death begins, and at 45°C (113°F) death is nearly certain. Internal temperatures

above 50°C (122°F) will cause rigidity in the muscles and certain, immediate death.

Heat stroke may come on suddenly, but usually follows a less-threatening condition commonly referred to as *heat exhaustion* or *heat prostration*.

Signs and symptoms

Heat prostration, or *heat exhaustion*, is characterized by mental confusion, muscle cramps, and often nausea or vomiting. At this stage the victim will likely be sweating profusely. With continued exposure to ambient heat, which sometimes is facilitated by the mental confusion, temperature may rise into the 39 to 40 °C range (103 to 104 °F), and lead to full-blown *heat stroke*.

One of the body's most important methods of temperature regulation is perspiration. This process draws heat from inside, allowing it to be carried off by radiation or convection. Evaporation of the sweat furthers cooling, since this endothermic process draws yet more heat from the body. When the body becomes sufficiently dehydrated to prevent the production of sweat this avenue of heat reduction is closed. When the body is no longer capable of sweating core temperature begins to rise swiftly.

Victims may become confused, may become hostile, often experience headache, and may seem intoxicated. Blood pressure may drop significantly from dehydration, leading to possible fainting or dizziness, especially if the victim stands

suddenly. Heart rate and respiration rate will increase (tachycardia and tachypnea) as blood pressure drops and the heart attempts to supply enough oxygen to the body. The skin will become red as blood vessels dilate in an attempt to increase heat dissipation. The decrease in blood pressure will cause blood vessels to contract as heat stroke progresses, resulting in a pale or bluish skin colour. Complaints of feeling hot may be followed by chills and trembling, as is the case in fever. Some victims, especially young children, may suffer convulsions. Acute dehydration such as that accompanying heat stroke can produce nausea and vomiting; temporary blindness may also be observed. Eventually, as body organs begin to fail, unconsciousness and coma will result.

Under very rare circumstances a person may exhibit symptoms similar to heat stroke without suffering a heat stroke.

First aid

Heat stroke is a medical emergency requiring hospitalisation, and the local emergency services should be notified as soon as possible.

The body temperature must be lowered immediately. The victim should be moved to a cool area (indoors, or at least in the shade) and clothing removed to promote heat loss (passive cooling). Active cooling methods may be used: The person is bathed in cool water, a hyperthermia vest can be applied, or the person may be wrapped in a cool wet towel. Cold compresses to the torso, head, neck, and groin will help cool the victim. A fan may be used to aid in evaporation of the water (evaporative

method). Ice and very cold water can produce hypothermia; they should be used only when there are means to monitor the victim's temperature continuously.

Immersing a victim into a bathtub of cold water (immersion method) is a recognized method of cooling. This method requires the effort of 4-5 persons and the victim should be monitored carefully during the treatment process. This should be avoided for an unconscious victim; if there is no alternative, the victim's head must be held above water.

Hydration is of paramount importance in cooling the victim. This is achieved by drinking water (Oral rehydration). Commercial isotonic drinks may be used as a substitute. Alcohol and caffeine should be avoided due to their diuretic properties. Some authorities are opposed to giving any fluids, except by emergency personnel. Intravenous hydration (via a drip) is necessary if the victim is confused, unconscious, or unable to tolerate oral fluids.

Alcohol rubs will cause further dehydration and impairment of consciousness and should be avoided. The victim's condition should be reassessed and stabilized by trained medical personnel. The victim's heart rate and breathing should be monitored, and CPR may be necessary if the victim goes into cardiac arrest.

The victim should be placed into the recovery position to ensure that their airway remains open.

Prevention

The risk of heatstroke can be reduced by observing precautions to avoid overheating and dehydration. Light, loose-fitting clothing will allow perspiration to evaporate. Wide-brimmed hats in bright colour keep the sun from warming the head and neck; vents on a hat will allow perspiration to cool the head. Strenuous exercise should be avoided during daylight hours in hot weather; so should remaining in enclosed spaces (such as automobiles). People who must be outside should be aware that humidity and the presence of direct sunlight may cause the heat index to be 10 °C (18 °F) hotter than the temperature indicated by a thermometer.

In hot weather people need to drink plenty of liquids to replace fluids lost from sweating. Thirst is not a reliable sign that a person needs fluids. A better indicator is the color of urine. A dark yellow color indicates dehydration. While alcoholic beverages, tea, and coffee may help somewhat in restoring lost fluids, their diuretic effect in these situations is counterproductive. Water or sports drinks are more effective.

Especially susceptible populations

While anyone can be affected by hyperthermia, some populations are especially susceptible to heat illness and injury. As noted by Joseph Rampulla in the *The Health Care of Homeless Persons* ^[1] :

Heat illness most seriously affects the poor, urban-dwellers, young children, those with chronic physical and mental illnesses,

substance abusers, the elderly, and people who engage in excessive physical activity under harsh conditions.

Clinical applications

Hyperthermia can be intentionally produced for medical purposes. Thermotherapy, or therapy by induced hyperthermia, may be used as a cancer treatment to kill or weaken tumor cells, with negligible effects on healthy cells.

External links

International Red Cross Information on Heat Stroke
Hiking and Camping Note Book Heat Stroke Advice
BBC Heat Illness News and Information
Environment Canada's Heat Index (humidex) Chart
Working in Hot Environments, from the United States'
National Institute for Occupational Safety and Health
(NIOSH)
Excessive Heat Events Guidebook, from the United States'
Environmental Protection Agency (EPA)

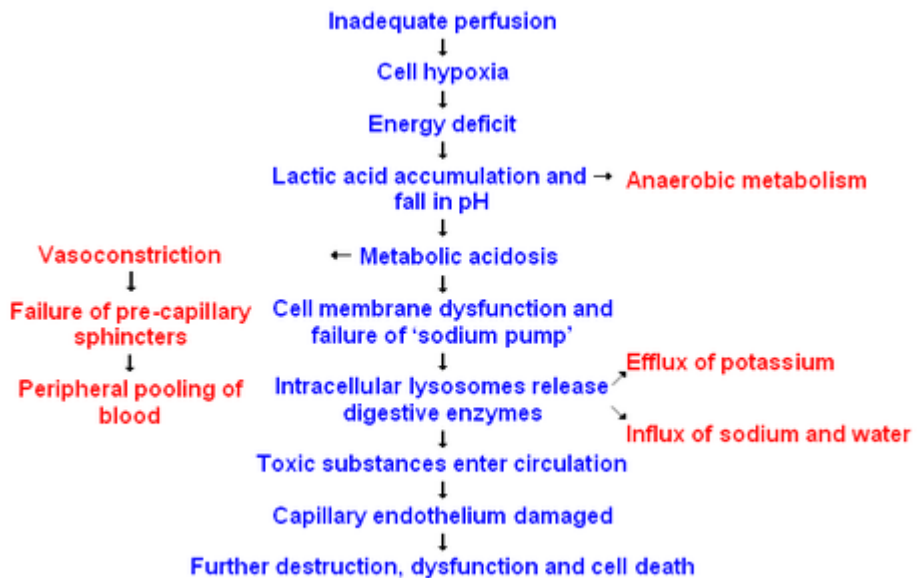
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Chapter 12: Shock

Shock is a serious medical condition where the tissue perfusion is insufficient to meet demand for oxygen and nutrients. This **hypoperfusal** state is a life-threatening medical emergency and one of the leading causes of death for critically ill people. This primary cause may lead to many other medical emergencies, such as hypoxia or cardiac arrest.^{[1] [2] [3] [4] [5]}

Stages of shock



There are four stages of shock.^[6]

Initial

During this stage, the hypoperfusional state causes hypoxia, leading to the mitochondria being unable to produce adenosine triphosphate. Due to this lack of oxygen, the cell membranes become damaged and the cells perform anaerobic respiration. This causes a build-up of lactic and pyruvic acid which results in systemic metabolic acidosis. The process of removing these compounds from the cells by the liver requires oxygen, which is absent.

Compensatory

This stage is characterised by the body employing physiological mechanisms, including neural, hormonal and bio-chemical mechanisms in an attempt to reverse the condition. As a result of the acidosis, the person will begin to hyperventilate in order to rid the body of carbon dioxide (CO₂). CO₂ indirectly acts to acidify the blood and by removing it the body is attempting to raise the pH of the blood. The baroreceptors in the arteries detect the resulting hypotension, and cause the release of adrenaline and noradrenaline. Noradrenaline causes predominately vasoconstriction with a mild increase in heart rate, whereas adrenaline predominately causes an increase in heart rate with a small effect on the vascular tone; the combined effect results in an increase in blood pressure. Renin-angiotensin axis is activated and

arginine vasopressin is released to conserve fluid via the kidneys. Also, these hormones cause the vasoconstriction of the kidneys, gastrointestinal tract, and other organs to divert blood to the heart, lungs and brain. The lack of blood to the renal system causes the characteristic low urine production. However the effects of the Renin-angiotensin axis take time and are of little importance to the immediate homeostatic mediation of shock.

Progressive

Should the cause of the crisis not be successfully treated, the shock will proceed to the progressive stage and the compensatory mechanisms begin to fail. Due to the decreased perfusion of the cells, sodium ions build up within while potassium ions leak out. As anaerobic metabolism continues, increasing the body's metabolic acidosis, the arteriolar and precapillary sphincters constrict such that blood remains in the capillaries. Due to this, the hydrostatic pressure will increase and, combined with histamine release, this will lead to leakage of fluid and protein into the surrounding tissues. As this fluid is lost, the blood concentration and viscosity increase, causing sludging of the micro-circulation. The prolonged vasoconstriction will also cause the vital organs to be compromised due to reduced perfusion.

Refractory

At this stage, the vital organs have failed and the shock can no longer be reversed. Brain damage and cell death have occurred. Death will occur imminently.

Shock is a complex and continuous condition and there is no sudden transition from one stage to the next.

Types of shock

In 1972 Hinshaw and Cox suggested the following classification which is still used today.^[1] It uses four types of shock: hypovolaemic, cardiogenic, distributive and obstructive shock.^{[2][3][4][5][7]}

Hypovolaemic shock - This is the most common type of shock and based on insufficient circulating volume. Its primary cause is loss of fluid from the circulation from either an internal or external source. An internal source may be haemorrhage. External causes may include extensive bleeding, high output fistulae or severe burns.

Cardiogenic shock - This type of shock is caused by the failure of the heart to pump effectively. This can be due to damage to the heart muscle, most often from a large myocardial infarction. Other causes of cardiogenic shock include arrhythmias, cardiomyopathy, congestive heart failure (CHF), contusio cordis or cardiac valve problems.

Distributive shock - As in hypovolaemic shock there is an insufficient intravascular volume of blood. This form of "relative" hypovolaemia is the result of dilation of blood vessels which diminishes systemic vascular resistance. Examples of this form of shock are:

Septic shock - This is caused by an overwhelming infection leading to vasodilation, such as by Gram negative bacteria i.e. *Escherichia coli*, *Proteus* species, *Klebsiella pneumoniae* which release an endotoxin which produces adverse biochemical, immunological and occasionally neurological effects which are harmful to the body. Gram-positive cocci, such as pneumococci and streptococci, and certain fungi as well as Gram-positive bacterial toxins produce a similar syndrome.

Anaphylactic shock - Caused by a severe anaphylactic reaction to an allergen, antigen, drug or foreign protein causing the release of histamine which causes widespread vasodilation, leading to hypotension and increased capillary permeability.

Neurogenic shock - Neurogenic shock is the rarest form of shock. It is caused by trauma to the spinal cord resulting in the sudden loss of autonomic and motor reflexes below the injury level. Without stimulation by sympathetic nervous system the vessel walls relax uncontrolled, resulting in a sudden decrease in peripheral vascular resistance, leading to vasodilation and hypotension.

Obstructive shock - In this situation the flow of blood is obstructed which impedes circulation and can result in

circulatory arrest. Recently a fifth form of shock has been introduced:^[1]

Endocrine shock based on endocrine disturbances.

Hypothyroidism, in critically ill patients, reduces cardiac output and can lead to hypotension and respiratory insufficiency. Thyrotoxicosis may induce a reversible cardiomyopathy.

Acute adrenal insufficiency is frequently the result of discontinuing corticosteroid treatment without tapering the dosage. However, surgery and intercurrent disease in patients on corticosteroid therapy without adjusting the dosage to accommodate for increased requirements may also result in this condition.

Relative adrenal insufficiency in critically ill patients where present hormone levels are insufficient to meet the higher demands

Signs and symptoms

Hypovolaemic shock

Anxiety, restlessness, altered mental state due to decreased cerebral perfusion and subsequent hypoxia.

Hypotension due to decrease in circulatory volume.

A rapid, weak, thready pulse due to decreased blood flow combined with tachycardia.

Cool, clammy skin due to vasoconstriction and stimulation of vasoconstriction.

Rapid and deep respirations due to sympathetic nervous system stimulation and acidosis.

Hypothermia due to decreased perfusion and evaporation of sweat.

Thirst and dry mouth, due to fluid depletion.

Fatigue due to inadequate oxygenation.

Cold and mottled skin (cutis marmorata), especially extremities, due to insufficient perfusion of the skin.

Cardiogenic shock, similar to hypovolaemic shock but in addition:

Distended jugular veins due to increased jugular venous pressure.

Absent pulse due to tachyarrhythmia.

Obstructive shock, similar to hypovolaemic shock but in addition:

Distended jugular veins due to increased jugular venous pressure.

Pulsus paradoxus in case of tamponade

Septic shock, similar to hypovolaemic shock except in the first stages:

Pyrexia and fever, or hyperthermia, due to overwhelming bacterial infection.

Vasodilation and increased cardiac output due to sepsis.

Neurogenic shock, similar to hypovolaemic shock except in the skin's characteristics. In neurogenic shock, the skin is warm and dry.

Anaphylactic shock

Skin eruptions and large welts.

Localised edema, especially around the face.

Weak and rapid pulse.

Breathlessness and cough due to narrowing of airways and swelling of the throat.

Treatment

Definitive therapy

Hypovolaemic shock

- Maintain or increase intravascular volume.
- Decrease any future fluid loss via i.v. fluid regimen.
- Give supplementary O₂ therapy.

Cardiogenic shock

- O₂ therapy.
- Administration of cardiac drugs.
- Increase heart's pumping action through medication.

Septic shock

- Restore intravascular volume via i.v. fluids.
- Give supplemental oxygen therapy.
- Identify and control source of infection.
- Administer antibiotics.
- Remove risk factors for infection.

Anaphylactic shock

- Identify and remove causative antigen.
- Administer counter-mediators such as anti-histamine.
- O₂ therapy and i.v. fluid replacement.

Supportive therapy

- Maintain airway and respiratory effort.
- Maintain the cardiac pump.
- Restore metabolic equilibrium.
- Reverse metabolic acidosis.



Modified and adapted from Alexander M.F., Fawcett J.N. and Runciman, P.N. (2004) Nursing Practice. The Hospital and Home. The Adult. (2nd edition) Edinburgh: Churchill Livingstone

In the early stages, shock requires immediate intervention to preserve life. Therefore, the early recognition and treatment depends on the transfer to a hospital.

The management of shock requires immediate intervention, even before a diagnosis is made. Re-establishing perfusion to the organs is the primary goal through restoring and maintaining the blood circulating volume ensuring oxygenation and blood pressure are adequate, achieving and maintaining effective cardiac function, and preventing complications. Patients attending with the symptoms of shock will have, regardless of the type of shock, their airway managed and oxygen therapy initiated. In case of respiratory insufficiency (i.e. diminished levels of consciousness, hyperventilation due to acid-base disturbances or pneumonia) intubation and mechanical ventilation may be necessary. A paramedic may intubate in emergencies outside the hospital, whereas a patient with respiratory insufficiency in-hospital will be intubated usually by a physician.

The aim of these acts is to ensure survival during the transportation to the hospital; they do not cure the cause of the shock. Specific treatment depends on the cause.

A compromise must be found between:

raising the blood pressure to be able to transport "safely" (when the blood pressure is too low, any motion can lower the heart and brain perfusion, and thus cause death);

respecting the golden hour. If surgery is required, it should be performed within the first hour to maximise the patient's chance of survival.

Notes

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Chapter 13: Vomiting

Vomiting (also **throwing up** or **emesis**) is the forceful expulsion of the contents of one's stomach through the mouth and sometimes the nose. **Vomiting** may result from many causes, ranging from gastritis or poisoning to brain tumors, or elevated intracranial pressure (ICP). The feeling that one is about to vomit is called nausea. It usually precedes, but does not always lead to vomiting. Antiemetics are sometimes necessary to suppress nausea and vomiting, and in severe cases where dehydration develops, intravenous fluid may need to be administered to replace fluid volume.



14th century illustration of vomiting from the Casanatense Tacuinum Sanitatis

The medical branch investigating vomiting, emetics and antiemetics is called **emetology**.

Mechanism

Vomiting center

Vomiting is coordinated in the vomiting center in the lateral medullary reticular formation in the pons. Receptors on the floor of the fourth ventricle of the brain represent a chemoreceptor trigger zone, stimulation of which can lead to vomiting. The chemoreceptor zone lies outside the

blood-brain barrier, and can therefore be stimulated by blood-borne drugs that can stimulate vomiting, or inhibit it.

There are various sources of input to the vomiting center:

The chemoreceptor trigger zone at the base of the fourth ventricle has numerous dopamine D₂ receptors, serotonin 5-HT₃ receptors, opioid receptors, Acetylcholine receptors, and receptors for substance P. Stimulation of different receptors are involved in different pathways leading to emesis, in the final common pathway substance P appears to be involved.^[1]

The vestibular system which sends information to the brain via cranial nerve VIII (vestibulocochlear nerve). It plays a major role in motion sickness and is rich in muscarinic receptors and histamine H₁ receptors.

Cranial nerve X (vagus nerve), which is activated when the pharynx is irritated, leading to a gag reflex.

Vagal and enteric nervous system inputs that transmit information regarding the state of the gastrointestinal system. Irritation of the GI mucosa by chemotherapy, radiation, distention or acute infectious gastroenteritis activates the 5-HT₃ receptors of these inputs.

The CNS mediates vomiting arising from psychiatric disorders and stress.

Vomiting act

The vomiting act encompasses three types of outputs initiated by the medulla: Motor, parasympathetic nervous system (PNS) and sympathetic nervous system (SNS). Collectively, they are as follows:

Increased salivation to protect the enamel of teeth from stomach acids (excessive vomiting leads to caries).

This is part of the PNS output.

Retroperistalsis, starting from the middle of the small intestine, sweeping up the contents of the digestive tract into the stomach, through the relaxed pyloric sphincter.

A lowering of intrathoracic pressure (by inspiration against a closed glottis), coupled with an increase in abdominal pressure as the abdominal muscles contract, propels stomach contents into the esophagus without involvement of retroperistalsis. The lower esophageal sphincter relaxes. This is part of the motor output, and it is also important to note that the stomach itself does not contract in the process of vomiting.

Vomiting is ordinarily preceded by retching.

Vomiting also initiates a SNS response causing both sweating and increased heart rate.

The neurotransmitters that regulate vomiting are poorly understood, but inhibitors of dopamine, histamine and serotonin are all used to suppress vomiting, suggesting that these play a role in the initiation or maintenance of a

vomiting cycle. Vasopressin and neurokinin may also participate.

Content

Since the stomach secretes acid, vomit contains a high concentration of hydronium ions and is thus strongly acidic. Recent food intake will be reflected in the gastric vomit.

The content of the **vomit** (vomit) may be of medical interest. Fresh blood in the vomit is termed hematemesis ("blood vomiting"). Old blood bears resemblance to coffee grounds (as the iron in the blood is oxidized), and when this matter is identified the term "coffee ground vomiting" is used. Bile can enter the vomit during subsequent heaves due to duodenal contraction if the vomiting is severe. Fecal vomiting is often a consequence of intestinal obstruction, and is treated as a warning sign of this potentially serious problem ("signum mali ominis"); such vomiting is sometimes called "miserere". If food has recently been consumed, then partly digested food may show up in the vomit.

If the vomiting reflex continues for an extended period of time with no appreciable vomitus, the condition is known as **non-productive emesis** or **dry heaves**, which can become both extremely painful and debilitating.

Complications of vomiting

Aspiration of vomit

Vomiting can be very dangerous if the gastric content gets into the respiratory tract. Under normal circumstances the gag reflex and coughing will prevent this from occurring, however these protective reflexes are compromised in persons under narcotic influences such as alcohol or anesthesia. The individual may choke and asphyxiate or suffer an aspiration pneumonia.

Dehydration and electrolyte imbalance

Prolonged and excessive vomiting will deplete the body of water (dehydration) and may alter the electrolyte status. The loss of acids leads to metabolic alkalosis (increased blood pH), and the electrolyte imbalance shows hypokalemia (potassium depletion) and hypochloremia (chlorine depletion). The hypokalemia is an indirect result of the kidney compensating for the loss of acid. With the loss of intake of food the individual will become cachectic.

Causes

Vomiting may be due to a large number of causes, and protracted vomiting has a long differential diagnosis.

Digestive tract

Causes in the digestive tract:

Gastritis (inflammation of the gastric wall, usually by viruses)

Pyloric stenosis (in babies - this typically causes a very forceful "projectile vomiting" and is an indication for urgent surgery)

Bowel obstruction

Acute abdomen and/or peritonitis

Ileus

Cholecystitis, pancreatitis, appendicitis, hepatitis

In children, it can be caused by an allergic reaction to cow's milk proteins (milk allergy)

Sensory system and brain

Causes in the sensory system:

Movement: motion sickness (which is caused by overstimulation of the labyrinthine canals of the ear)

Ménière's disease

Causes in the brain:

Concussion

Cerebral hemorrhage

Migraine

Brain tumors, which can cause the chemoreceptors to malfunction

Benign intracranial hypertension and hydrocephalus

Metabolic disturbances (these may irritate both the stomach and the parts of the brain that coordinate vomiting):

Hypercalcemia (high calcium levels)

Uremia (urea accumulation, usually due to renal failure)

Adrenal insufficiency

Hypoglycemia

Pregnancy:

Hyperemesis, Morning sickness

Drug reaction (vomiting may occur as an acute somatic response to):

alcohol (being sick whilst being drunk or being sick the next morning suffering from the after-effects, i.e. the hangover).

opioids

selective serotonin reuptake inhibitors

many chemotherapy drugs

some entheogens (such as peyote or ayahuasca)

Other

Self-induced

Eating disorders (anorexia nervosa or bulimia nervosa)

Sexual fetish (emetophilia)

To remove a poison in case such has been ingested (some poisons should not be vomited as they may be more toxic when inhaled or aspirated; it is generally considered better to ask for help before inducing vomiting)

Some people who are engaged in binge drinking will induce vomiting in order to make room in their stomachs for further alcohol consumption. In the United Kingdom, this practice is known as *tactical chundering*, and as *boot and rally* or *pulling the trigger* in the United States.

After surgery (postoperative nausea and vomiting)
Disagreeable sights, smells or thoughts (such as decayed matter, others' vomit, thinking of vomiting), etc.
Extreme pain, such as intense headache or myocardial infarction (heart attack)
Violent emotions (including laughing)
Cyclic vomiting syndrome (a poorly understood condition with attacks of vomiting)
High doses of ionizing radiation will sometimes trigger a vomit reflex in the victim.
Violent fits of coughing or hiccups
Nervousness

Related medication

Emetics

An *emetic*, such as Syrup of Ipecac, is a substance that induces vomiting when administered orally or by injection. An emetic is used medically where a substance has been ingested and must be expelled from the body immediately. Inducing vomiting can remove the substance before it is absorbed into the body. Ipecac abuse can lead to detrimental health effects.

Antiemetics

An antiemetic is a drug that is effective against vomiting and nausea. Antiemetics are typically used to treat motion sickness and the side effects of some opioid analgesics and chemotherapy directed against cancer.

Antiemetics act by inhibiting the receptor sites associated with emesis. Hence, anticholinergics, antihistamines, dopamine antagonists, serotonin antagonists and cannabinoids are used as anti-emetics.

Social implications

Nausea inducement in groups

It is quite common that when one person vomits, others nearby will become nauseated, particularly when smelling the vomit of others, often to the point of vomiting themselves. It is believed that this is an evolved trait among primates. Many primates in the wild will tend to browse for food in small groups. Should one member of the party react adversely to some ingested food it may be advantageous (in a survival sense) for other members of the party also to vomit. This tendency in human populations has been observed at drinking parties, where excessive consumption of alcoholic beverages may result in a number of party members vomiting nearly simultaneously, this being triggered by the initial vomiting of a single member of the party. This phenomenon has been touched on in popular culture: notorious instances

appear in the films *Monty Python's The Meaning of Life* (1983), *Saving Private Ryan* (1998), and *Stand By Me* (1986), while in the computer game *Theme Hospital*, it is referred to as a 'vomit wave' and can spread through the hospital quickly.

Intense vomiting in ayahuasca ceremonies is a common phenomenon. However, people who experience "la purga" after drinking ayahuasca generally regard it as both a physical and spiritual cleanse and often come to welcome it. ^[2] It has been suggested that the consistent emetic effects of ayahuasca — in addition to its many other therapeutic properties — was of medicinal benefit to indigenous peoples of the Amazon, in helping to clear parasites from the gastrointestinal system. ^[3]

There have also been documented cases of a single ill and vomiting individual inadvertently causing others to do so, when they are especially fearful of also becoming ill, through a form of mass hysteria.

Context

Most people try to contain their vomit by vomiting into a sink, toilet, or trash can, as both the act and the vomit itself are widely considered embarrassing; vomit is also difficult to clean. On airplanes and boats, special bags are supplied for sick passengers to vomit into. Alternatively, a special disposable bag is available containing absorbent material that solidifies the vomit quickly, making it convenient and

safe to keep (leakproof, puncture resistant, odorless) until there is an opportunity to dispose of it conveniently.

People who vomit chronically (e.g. as part of an eating disorder such as bulimia nervosa) may devise various ways to hide this disorder.

Sound

According to an online study of 30 traditionally bad sounds, the sound of vomiting is the worst sound in the world[1]. Professor Cox of the University of Salford's Acoustic Research Centre said that "We are pre-programmed to be repulsed by horrible things such as vomiting, as it is fundamental to staying alive to avoid nasty stuff". It is thought that the thought of disgust is triggered by the sound of vomiting to protect food from those possibly diseased nearby^[4].

In language

As with other physiological processes involving body wastes, vomiting has taboo aspects. This is shown by the large number of colourful euphemisms and dysphemisms for vomiting. (see: toilet humour). Reference to vomiting is often made in speech (e.g. "it makes me sick", "I need a bucket") or by gesturing to signify being disgusted by someone or something.

Slang terms for the act of vomiting include: "hurling", "throwing up", "upchucking", "booting", "puking", "ralphing", "barfing", "keeling", "chucking up", "sicking up", "spewing",

"spewing chunks", "chundering", "tossing cookies", "a technicolor yawn", "making street pizza", "shouting groceries", and "boking".

"Wallace and Gromit" has recently become Cockney rhyming slang for vomit.[2]

"Puke" and "puking" date from at least the 16th century.^[5] In *As You Like It*, Shakespeare talks of the infant 'Mewling and puking in the nurse's arms'.

Vomit Phobia

Vomit phobia, or emetophobia, as it is also known, is the sixth most common phobia in the world, according to the International Emetophobia Society. In addition to the actual phobia, there are many other disorders and phobias that sufferers may suffer from, such as IBS and agoraphobia. People with emetophobia tend to avoid eating in public, socialising and going to parties. They may hardly eat at all, and for this reason may be diagnosed as anorexic. Emetophobes will go to extraordinary lengths to avoid vomiting or seeing someone vomit. Some emetophobics have the distinct ability to actually prevent themselves from vomiting, called "vomit continence". They are able to fight the feeling of nausea before the feeling eventually subsides.

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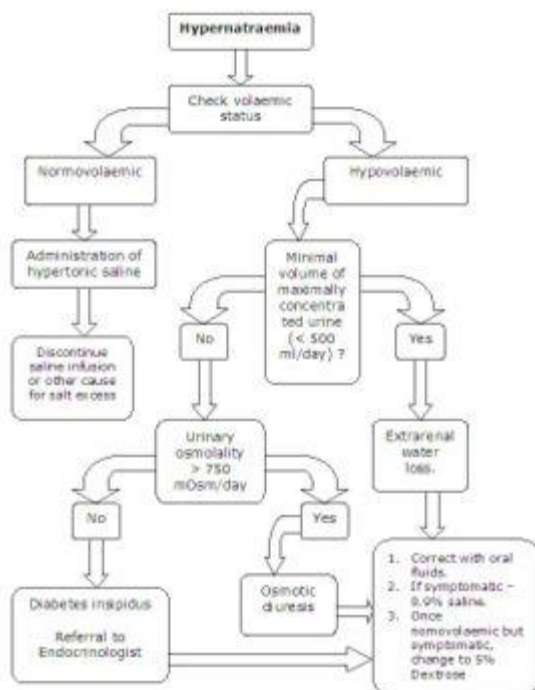
Chapter 14: Hypernatremia

Hypernatremia is an electrolyte disturbance consisting of an elevated sodium level in the blood (compare to hyponatremia, meaning a low sodium level). The most common cause of hypernatremia is not an excess of sodium, but a relative deficit of free water in the body. For this reason, hypernatremia is often synonymous with the less precise term dehydration.

Water is lost from the body in a variety of ways, including perspiration, insensible losses from breathing, and in the feces and urine. If the amount of water ingested consistently falls

below the amount of water lost, the serum sodium level will begin to rise, leading to hypernatremia. Rarely, hypernatremia can result from massive salt ingestion, such as may occur from drinking seawater.

Ordinarily, even a small rise in the serum sodium concentration above the normal range results in a strong sensation of thirst, an increase in free water intake, and correction of the abnormality. Therefore, hypernatremia most often occurs in people such as infants, those with impaired mental status, or the elderly, who may have an intact thirst mechanism but are unable to ask for or obtain water. Etiology



Common causes of hypernatremia include:

Inadequate intake of water, typically in elderly or otherwise disabled patients who are unable to take in water as their thirst dictates. This is the most common cause of hypernatremia.

Inappropriate excretion of water, often in the urine, which can be due to medications like diuretics or lithium or can be due to a medical condition called diabetes insipidus

Intake of a hypertonic fluid (a fluid with a higher concentration of solutes than the remainder of the body).

This is relatively uncommon, though it can occur after a vigorous resuscitation where a patient receives a large volume of a concentrated sodium bicarbonate solution.

Ingesting seawater also causes hypernatremia because seawater is hypertonic.

Mineralcorticoid excess due to a disease state such as Conn's syndrome or Cushing's Syndrome

Symptoms

Clinical manifestations of hypernatremia can be subtle, consisting of lethargy, weakness, irritability, and edema. With more severe elevations of the sodium level, seizures and coma may occur.

Severe symptoms are usually due to acute elevation of the plasma sodium concentration to above 158 mEq/L (normal is typically about 135-145 mEq/L). Values above 180 mEq/L are associated with a high mortality rate, particularly in adults.

However such high levels of sodium rarely occur without severe coexisting medical conditions.

Treatment

The cornerstone of treatment is administration of free water to correct the relative water deficit. Water can be replaced orally or intravenously. However, overly rapid correction of hypernatremia is potentially very dangerous. The body (in particular the brain) adapts to the higher sodium concentration. Rapidly lowering the sodium concentration with free water, once this adaptation has occurred, causes water to flow into brain cells and causes them to swell. This can lead to cerebral edema, potentially resulting in seizures, permanent brain damage, or death. Therefore, significant hypernatremia should be treated carefully by a physician or other medical professional with experience in treatment of electrolyte imbalances.

Chapter 15: Hyperglycemia

Hyperglycemia, hyperglycaemia, or high blood sugar is a condition in which an excessive amount of glucose circulates in the blood plasma.

The origin of the term is Greek: *hyper-*, meaning excessive; *-glyc-*, meaning sweet; and *-emia*, meaning "of the blood".

Causes

Diabetic hyperglycemia

Chronic hyperglycemia that persists even in fasting states is most commonly caused by diabetes mellitus, and in fact chronic hyperglycemia is the defining characteristic of the disease. Acute episodes of hyperglycemia without an obvious cause may indicate developing diabetes or a predisposition to the disorder.

Non-diabetic hyperglycemia

Certain eating disorders can produce acute non-diabetic hyperglycemia, as in the binge phase of bulimia nervosa, when the subject consumes a large amount of calories at once, frequently from foods that are high in simple and complex carbohydrates. Certain medications increase the risk of hyperglycemia, including beta blockers, thiazide diuretics, corticosteroids, niacin, pentamidine, protease inhibitors, L-asparaginase,^[1] and some antipsychotic agents.^[2]

A high proportion of patients suffering an acute stress such as stroke or myocardial infarction may develop hyperglycemia, even in the absence of a diagnosis of diabetes. Human and animal studies suggest that this is not benign, and that stress-induced hyperglycemia is associated with a high risk of mortality after both stroke and myocardial infarction.^[3]

Measurement and definition

Glucose levels are measured in either:

You poop a lot.

1. Milligrams per deciliter (mg/dL), in the United States and other countries (e.g., Japan, France, Egypt, Columbia); or

2. Millimoles per liter (mmol/L).

Scientific journals are moving towards using mmol/L; some journals now use mmol/L as the primary unit but quote mg/dl in parentheses.^[4]

Comparatively:^[5]

72 mg/dL = 4 mmol/L

90 mg/dL = 5 mmol/L

108 mg/dL = 6 mmol/L

126 mg/dL = 7 mmol/L

150 mg/dL = 8 mmol/L

180 mg/dL = 10 mmol/L

270 mg/dL = 15 mmol/L

300 mg/dL = 16 mmol/L

360 mg/dL = 20 mmol/L

400 mg/dL = 22 mmol/L

600 mg/dL = 33 mmol/L

Glucose levels vary before and after meals, and at various times of day; the definition of "normal" varies among medical professionals. In general, the normal range for most people (fasting adults) is about 80 to 120 mg/dL or 4 to 7 mmol/L. A subject with a consistent range above 126 mg/dL or 7 mmol/L is generally held to have hyperglycemia, whereas a consistent range below 70 mg/dL or 4 mmol/L is considered hypoglycemic. In fasting adults, blood plasma glucose should

not exceed 126 mg/dL or 7 mmol/L. Sustained higher levels of blood sugar cause damage to the blood vessels and to the organs they supply, leading to the complications of diabetes.

Chronic hyperglycemia can be measured via the HbA1c test. The definition of acute hyperglycemia varies by study, with mmol/L levels from 8 to 15.^{[6][7]}

Symptoms of hyperglycemia

The following symptoms may be associated with acute or chronic hyperglycemia:

Polyphagia - frequent hunger, especially pronounced hunger

Polydipsia - frequent thirst, especially excessive thirst

Polyuria - frequent urination, especially excessive urination

Blurred vision

Fatigue

Weight loss

Poor wound healing (cuts, scrapes, etc.)

Dry mouth

Dry or itchy skin

Impotence (male)

Recurrent infections such as vaginal yeast infections, groin rash, or external ear infections (swimmer's ear)

Frequent hunger without other symptoms can also indicate that blood sugar levels are too low. This may occur when people who have diabetes take too much oral hypoglycemic

medication or insulin for the amount of food they eat. The resulting drop in blood sugar level to below the normal range prompts a hunger response. This hunger is not usually as pronounced as in Type I diabetes, especially the juvenile onset form, but it makes the prescription of oral hypoglycemic medication difficult to manage.

Polydipsia and polyuria occur when blood glucose levels rise high enough to result in excretion of excess glucose via the kidneys (glycosuria), producing osmotic diuresis.

Symptoms of acute hyperglycemia may include:

Ketoacidosis

A decreased level of consciousness or confusion

Dehydration due to glycosuria and osmotic diuresis

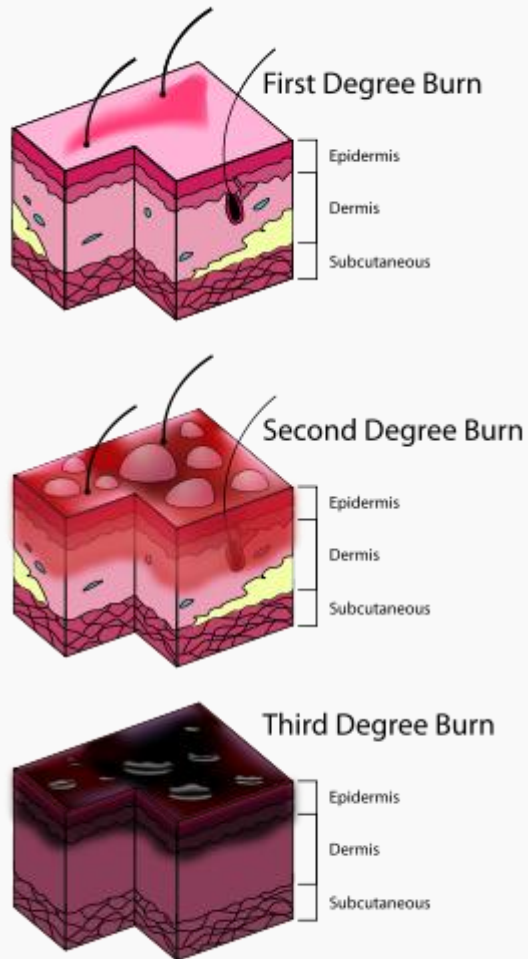
Acute hunger and/or thirst

Impairment of cognitive function, along with increased sadness and anxiety^{[8][9]}

Chapter 16. Burns

In medicine, a **burn** is any extremity experienced by the skin caused by heat, cold, electricity, chemicals, friction or radiation (e.g. a *sunburn*).

Classification



First, Second, and Third Degree Burns.

First-degree burns are usually limited to redness (erythema), a white plaque and minor pain at the site of injury. These burns usually extend only into the epidermis.

Second-degree burns additionally fill with clear fluid, have superficial blistering of the skin, and can involve more or less pain depending on the level of nerve involvement. Second-degree burns involve the superficial (papillary) dermis and may also involve the deep (reticular) dermis layer.



Evolution of a 2nd
degree burn — One hour



Evolution of a 2nd
degree burn — One day



Evolution of a 2nd
degree burn — two days,
the blister is appearing

Third-degree burns additionally have charring of the skin, and produce hard, leather-like eschars. An eschar is a scab that has separated from the unaffected part of the body. Frequently, there is also purple fluid. These types of burns are often painless because nerve endings have been destroyed in the involved areas.

Burns that injure the tissues underlying the skin, such as the muscles or bones, are sometimes categorized as **fourth-degree burns**. These burns are broken down into three additional degrees: fourth-degree burns result in the skin being irretrievably lost, fifth-degree burns result in muscle being

irretrievably lost, and sixth-degree burns result in bone being charred.

A newer classification of "Superficial Thickness", "Partial Thickness" (which is divided into superficial and deep categories) and "Full Thickness" relates more precisely to the epidermis, dermis and subcutaneous layers of skin and is used to guide treatment and predict outcome.

Table 1. A description of the traditional and current classifications of burns.

Nomenclature	Traditional nomenclature	Depth	Clinical findings
Superficial thickness	First-degree	Epidermis involvement	Erythema, minor pain, lack of blisters
Partial thickness — superficial	Second-degree	Superficial (papillary) dermis	Blisters, clear fluid, and pain
Partial thickness — deep	Second-degree	Deep (reticular) dermis	Whiter appearance, with decreased pain. Difficult to distinguish from full thickness
Full thickness	Third- or fourth-degree	Dermis and underlying tissue and possibly fascia, bone, or muscle	Hard, leather-like eschar, purple fluid, no sensation (insensate)

Serious burns, especially if they cover large areas of the body, can cause death; any hint of burn injury to the lungs (e.g. through smoke inhalation) is a medical emergency.

Chemical burns are usually caused by chemical compounds, such as sodium hydroxide (lye), silver nitrate, and more serious compounds (such as sulfuric acid). Most chemicals (but not all) that can cause moderate to severe chemical burns are strong acids or bases. Nitric acid, as an oxidizer, is possibly one of the worst burn-causing chemicals. Hydrofluoric acid can eat down to the bone and its burns are often not immediately evident. Most chemicals that can cause moderate to severe chemical burns are called caustic.

Electrical burns are generally symptoms of electric shock, being struck by lightning, being defibrillated or cardioverted without conductive gel, etc. The internal injuries sustained may be disproportionate to the size of the "burns" seen - as these are only the entry and exit wounds of the electrical current.

Survival and outcome (scars, contractures, complications) of severe burn injuries is remarkably improved if the patient is treated in a specialized burn center/unit rather than a hospital.

Scald



Two day-old scald caused by boiling radiator fluid.



Two day-old scald from taking a frying pan from an oven.

Scalding is a specific type of burning that is caused by hot fluids or gasses. Examples of common liquids that cause scalds are water and cooking oil. Steam is a common gas that causes scalds. The injury is usually regional and usually does not cause death. More damage can be caused if hot liquids enter an orifice. However, deaths have occurred in more unusual circumstances, such as when people have accidentally broken a steam pipe. Young children, with their delicate skin, can suffer a serious burn in a much shorter time of exposure than the average adult. Also, their small body surface area means even a small amount of hot/burning liquid can cause severe burns over a large area of the body.

Table 2. Scald Time (Hot Water)

Temper ature	Max duration until injury
155F (68.3C)	1 second

145F (62.9C)	3 seconds
135F (57.2C)	10 seconds
130F (54.4C)	30 seconds
125F (51.6C)	2 minutes
120F (48.8C)	5 minutes

Cold burn

A **cold burn** (see frostbite) is a kind of burn which arises when the skin is in contact with a low-temperature body. They can be caused by prolonged contact with moderately cold bodies (snow for instance) or brief contact with very cold bodies such as dry ice, liquid helium, liquid nitrogen, or canned air, all of which can be used in the process of wart removal. In such a case, the heat transfers from the skin and organs to the external cold body (as opposed to most other situations where the body causing the burn is hotter, and transfers the heat into the skin and organs). The effects are very similar to a "regular" burn. The remedy is also the same as for any burn: for a small wound keep the injured organ under a flow of comfortably

temperated water; the heat will then transfer slowly from the water to the organs and help the wound. Further treatment or treatments of a more extended wound also are usual.

Assessing burns

Burns are assessed in terms of total body surface area (TBSA), which is the percentage affected by partial thickness or full thickness burns (superficial thickness burns are not counted). The rule of nines is used as a quick and useful way to estimate the affected TBSA.

Table 3. Rule of nines for assessment of total body surface area affected by a burn - Adult

Anatomic structure	Surface area
Head	9%
Anterior Torso	18%
Posterior Torso	18%
Each Leg	18%
Each Arm	9%

Perineum	1%
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Table 4. Rule of nines for assessment of total body surface area affected by a burn - Infant

Anatomic structure	Surface area
Head	18%
Anterior Torso	18%
Posterior Torso	18%
Each Leg	14%
Each Arm	9%
Perineum	1%

Management

The first step in managing a person with a burn is to stop the burning process. With dry powder burns, the powder should be brushed off first. With other burns, the affected area should be rinsed with a large amount of clean water to remove foreign bodies and help stop the burning

process. Cold water should never be applied to any person with extensive burns, as it may severely compromise the burn victim's temperature status.

At this stage of management, it is also critical to assess airway status. If the patient was involved in a fire, then it must be assumed that he or she has sustained inhalation injury until proven otherwise, and treatment should be managed accordingly.

Once the burning process has been stopped, and airway status is ensured, the patient should be volume resuscitated according to the Parkland formula. This formula dictates that the amount of Lactated Ringer's solution to deliver in the first twenty four hours after time of injury is:

$$\text{Fluid} = 4\text{cc} \times \% \text{TBSA} \times \text{weight in kg}$$

%TBSA excludes any first degree burn

Half of this fluid should be given in the first eight hours post injury and the rest in the subsequent sixteen hours. The formula is a guide only and infusions must be tailored to urine output and central venous pressure. Inadequate fluid resuscitation causes renal failure and death.

Severe edema in full thickness burns may be treated by escharotomy.



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