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Riordan Clinic is a not-for-profit 501(c)(3), nutrition-based health facility in Wichita, Kansas cofounded in 1975 by Olive W. Garvey and Hugh D. Riordan. We have integrated lifestyle and nutrition to help you find the underlying causes of your illness. Since our inception in 1975, the mission has been clear and unwavering to "...stimulate an epidemic of health."

Intravenous Vitamin C Versus Cancer and Other Killers

An Interview with
Dr. Ron Hunninghake



AUTHOR

Richard A. Passwater, Ph.D.

Recent columns have focused on new research into the many health benefits of vitamin C. We have discussed both "nutritional" requirements for people in good health and "supranutritional" requirements of others who are fighting health issues beyond scurvy. A common thread in the columns is that the amount of vitamin C in the blood is the key to vitamin C's effectiveness. Sometimes, the most convenient way to obtain adequate blood levels of vitamin C is to use intravenous vitamin C (IVC). Reports of IVC's effectiveness against some cancers are now appearing regularly in the peer-reviewed scientific literature. In July 2017, a study on IVC against prostate cancer was published that should interest additional physicians. We will discuss these findings in the next two columns. Let's start with Dr. Ron Hunninghake, M.D., medical director of the Riordan Clinic in Wichita, KS.



PASSWATER: Good to chat with you again. Long-time readers may remember the last time we discussed your research back in 2007. You have been very busy in the meantime, as your health research and clinical results are becoming of greater interest to health professionals everywhere. You continue to be the chief medical officer at the Riordan Clinic, in Wichita, KS. Please tell our readers a little about the famous Riordan Clinic.

HUNNINGHAKE: The Riordan Clinic is one of the largest non-profit, nutritional medicine centers in the United States. It was founded in 1975 by the late Hugh Riordan, M.D., a pioneer in nutritional medicine. We have a staff of about 40 people, including six full-time practitioners in addition to researchers and nurses. We have an analytical laboratory on-site for measuring vitamin and mineral levels, as well as conventional medical tests. The physical structure of the clinic is also distinctive; it consists of eight geodesic domes and a pyramid. All of this is on a 90-acre nature preserve. Readers can find out more about the clinic at www.riordanclinic.org.

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SYMPOSIUM OBJECTIVES:

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2

PASSWATER: *What natural evidence do we have to substantiate the concept that vitamin C at higher than RDA doses might help to treat serious illness?*

HUNNINGHAKE: Let me answer your question by starting with how much vitamin C animals need and make. First, let's consider the human animal — us! Humans don't make our own vitamin C, so we will use the RDA for humans (90 mg/d) and scale it to an average human's body mass which equals 1 mg/kg/d. Dogs do synthesize vitamin C, but in an amount equaling 3 mg/kg/d. That would be equivalent to about 200 mg/d for a human. Pigs also synthesize vitamin C at 8 mg/kg/d which is equivalent to about 500 mg/d for a human. Goats are amazing. Unstressed goats can make up to 190 mg/kg/d. You and I would need to take 14 one-gram vitamin C tablets to equal that. Then, unbelievably, an injured goat can synthesize a whopping 1300 mg/kg/d! That's 100,000 mg a day for a human: a whole bottle of vitamin C tablets!

PASSWATER: Other primates are especially closely related to man. Do non-human primates consume the minimum C necessary to get by?

HUNNINGHAKE: Like humans, other primates do not make vitamin C. They lack the ability to express the genome that makes a liver enzyme called GLO (L-gulonolactone oxidase). GLO converts glucose into vitamin C. So, how much do they get in their diet? Spider monkeys get about 100 mg/kg/d. That would be 7,000 mg a day for a human. Gorillas consume 30 mg/kg/d. That's about 2 grams, which is far above the measly 60 mg the RDA experts would suggest humans consume to prevent scurvy.

There's a great quotation from Dr. Levy's book that touches on this point: "This automatic ability to adequately step up vitamin C production in the face of stress explains why so many wild animals tend to live healthy for their entire life spans ... and, conversely, generally vitamin C-depleted human beings will typically spend at least half of their lifetimes coping with one or more chronic diseases."

PASSWATER: What is the optimum dose of vitamin C for humans?

HUNNINGHAKE: Dr. Linus Pauling estimated that two grams a day would go a long way towards preventing the common cold in the majority of people. But that's just a guess. Dr. James Jackson, the former head of The Bio-Center Lab at the Riordan Clinic, has developed an innovative way for each person to take into consideration all the many variables that can affect their vitamin C need for the day. It's called VitaCheck C strips. These are very similar to urinalysis test strips, with a small chemical pad at the end of a plastic strip. You wave the test pad through your urine stream and the color change corresponds to the vitamin C concentration in your urine at that moment. If it's low, you need to increase your intake. Your need can vary greatly depending on your diet, your stress load, whether you smoke, how well you slept the night before, and whether you are fighting a cold or some other oxidant-producing illness.

PASSWATER: Vitamin C doesn't seem to fit the standard definition of a vitamin does it?

HUNNINGHAKE: It depends on how you define "vitamin."

If you mean "a substance that must be provided by food or supplementation" then, yes, it definitely is a vitamin. If you take the medical definition that a vitamin is "a general term for a number of unrelated organic substances that occur in many foods in small amounts and that are necessary in trace amounts for the normal metabolic functioning of the body," then vitamin C may not be a classic vitamin, because in large amounts it helps living organisms adapt better to stress, trauma, and/or illness. I believe we should stop referring to it as vitamin C. We should start calling it "adaptogen C."

PASSWATER: Others have made strong cases for vitamin C being more than a vitamin. Even Dr. Albert Szent-Gyorgyi, who was awarded the 1937 Nobel Prize in Medicine for discovering vitamin C, saw

ascorbic acid as being more than "anti-scorbutic."

HUNNINGHAKE: Yes, Dr. Szent-Gyorgyi saw vitamin C as "The Electron Exchanger." In his words, vitamin C is, "... one of the primary substances assuring that a vigorous, continuing electron exchange takes place among the body's tissues and molecules. One definition of life, then, is that it is a state in which an optimal degree of electron interchange among cells can take place." This corresponds to what could be simply defined as three states of vitamin C intake: minimum (like the RDA); average (like the primates in the wild); and optimal (like the goats who can really go to town making huge amounts of adaptogen C when they really need it).

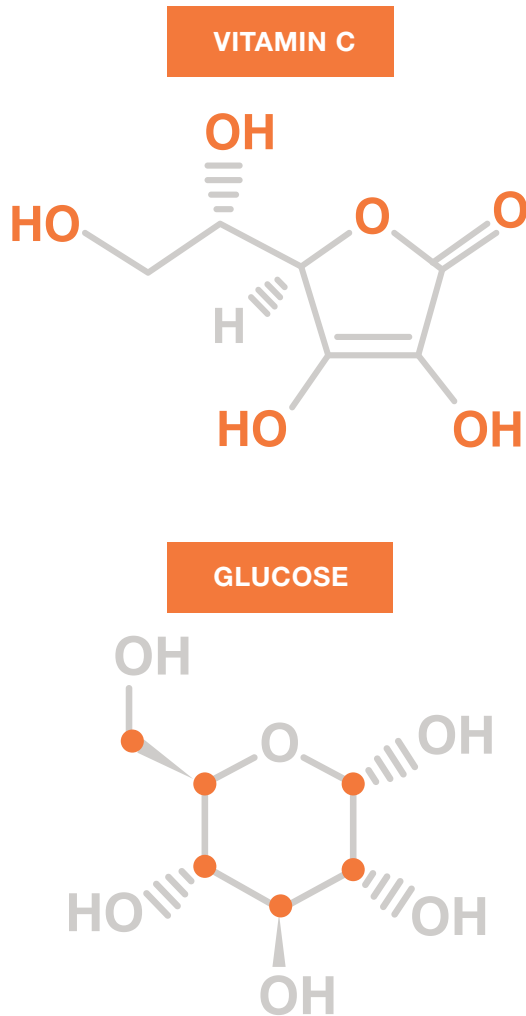
PASSWATER: The Center was founded by Dr. Hugh Riordan and you worked alongside him for a good while. What drew Dr. Riordan to IV vitamin C?

HUNNINGHAKE: Well, he was very aware of Dr. Klenner's findings.



Continued on page 4

Figure 1



Similarity between the chemical structure of glucose (blood sugar) and vitamin C (ascorbate ion) can result in cancer cells taking in vitamin C in their quest for glucose, which is vital to cancer cells.

Both molecules are small, about the same molecular weight, have an oxygen atom as part of the ring structure, have similar electronic charges around the ring (4 vs 5 hydroxyl (OH) radicals). Each molecule has six carbon atoms and six oxygen atoms. A difference is that the glucose molecule has a double bond in the ring and four more hydrogen atoms. The molecular formula for glucose is $C_6H_{12}O_6$ and the molecular formula for vitamin C is $C_6H_8O_6$. The molecular weight for glucose is 180 and for vitamin C it is 176 molar mass.

But, there was a defining experience in his life that really captured his scientific attention: In 1975 Dr. Riordan was bitten by what he believed was a Recluse spider. When he checked his plasma vitamin C level – zero! “I’ll fix that,” he thought. He got one of the Center nurses to give him 15,000 mg of ascorbic acid IV. He rechecked his C level: still zero! Only after several IVCs did he resolve his temporary state of scurvy ... some 50,000 mg of vitamin C later! A perfect illustration of the fact that the dosage of vitamin C an individual needs at any given time is totally dependent on several variables that impact their oxidative stress load ... like a Recluse spider bite.

PASSWATER: *Where did this lead him?*

HUNNINGHAKE: Real estate agents have a pet saying: location, location, location! Dr. Riordan’s was: measure, measure, measure! After the spider incident he began to routinely measure plasma vitamin C levels on all chronically ill patients coming to The Center. You can almost guess what he found: sickness and low plasma C go hand in hand. And in cancer patients he found very low vitamin C reserves! When he checked the literature, he found that a low vitamin C status was a consistent finding in cancer studies where the researchers bothered to check plasma vitamin C levels.

PASSWATER: *Why do cancer patients have such low vitamin C levels?*

HUNNINGHAKE: The membranes of cancer cells contain large numbers of glucose transporters that seek glucose. Thus, cancer cells remove vitamin C from the blood by mistake in the cancer’s efforts to take in more glucose needed for fuel for its energy.

PASSWATER: *Please explain further.*

HUNNINGHAKE: The vast majority of living creatures make the vitamin C they need from blood sugar. As chronically injured cells sustain damage to their DNA, oxidative stress builds up. This increases their tendency to divide. Over time, if the damage is progressive and irreversible, the cells will lose their control mechanisms and begin to function more like single-celled organisms rather than cells that are part of a multi-cellular organism. This is the shift towards cancer, and cancer cells are anaerobic obligates ... their metabolic pathways require glucose.

PASSWATER: *OK. So, getting nutrients into the bloodstream is only part of the story. The nutrients must also get into the cells to do their jobs. There are transporting proteins embedded in cell membranes to carry specific nutrients into the cell interiors where they can do their work. Human cells produce glucose transporters, primarily various members of a “family” called GLUTs, depending on the cell. Vitamin C can enter cells directly and passively via diffusion, but vitamin C can also be actively transported into cells via GLUT, but more so via Sodium-Ascorbate Co-Transporters (SVCTs).*

The size, structure and electronic charges on the perimeter of vitamin C molecules so closely mimic those of glucose molecules that the glucose receptors undergo conformational changes that facilitate vitamin C entry into the cells. Please see Figure 1.

Most cancer cells have large numbers of glucose transporters because glucose is critical to cancer growth. So, the glucose transporters in the membranes of cancer

cells, in their effort to bring more needed glucose into the cancer cells, mistakenly bring in vitamin C instead. Thus, vitamin C starts accumulating in cancer cells. What does this do?

HUNNINGHAKE: Recent research from the National Institutes of Health confirmed our Center's findings from the early '90s: at very high dosages, vitamin C interacts with copper and iron to form the powerful hydroxyl radical. This free radical has a strong oxidative effect on cancer cells, which lack the protective enzyme catalase. Once the threshold dose of vitamin C was attained in cell culture, all types of cancer cells were selectively killed. Healthy, non-cancerous cells were spared ... partly because of their much higher levels of catalase, and partly because they do not have near the same number of glucose (and vitamin C) transporters in their membranes as cancer cells.



PASSWATER: *So high-dose vitamin C is cytotoxic to cancer cells, but cell-protective to non-cancerous cells? Amazing! How does the vitamin C kill the cancer cells?*

HUNNINGHAKE: The same way chemotherapy and radiation do: severe oxidation. When cellular oxidative damage is severe enough, a special gene, called the p53 tumor suppressor gene, triggers apoptosis. Apoptosis is "programmed cell death." In a multicellular organism, when cells are damaged beyond repair or worn out, the p53 mechanism simply causes the cell to self-destruct, for the greater good of the whole organism. In cancer cells, the p53 DNA of a healthy cell has been damaged and the cell has mutated. Cancer cells act like "selfish" single-celled organisms whose only intent is self-replication and survival ... even if it means the death of the host organism.

PASSWATER: *In 2017, you published the exciting results of the Riordan's Clinic with IV vitamin C against prostate cancer. The published report concludes that your study "demonstrated the clinical benefit of IV vitamin C for prostate cancer patients" (1). It is a seminal study that should open a lot of eyes. All physicians and cancer patients should know about it. The results are very important and encouraging for cancer patients. Your co-researcher in the study is Dr. Nina Mikirova of the Riordan Clinic. Let's chat with Dr. Mikirova about this study next month. Dr. Hunninghake, thank you for discussing the basics of IVC against cancer with us and for your decades of research.*

REFERENCE

1. Mikirova, N. and Hunninghake, R. "Changes in the rate of PSA progression and the level of alkaline phosphatase during high dose vitamin C treatment of patients with prostate cancer." *Functional Foods in Health and Disease* 2017; 7(7) 511-528.

NOTE: The statements presented in this article should not be considered medical advice or a way to diagnose or treat any disease or illness. Dietary supplements do not treat, cure or prevent any disease. Always seek the advice of a medical professional before adding a dietary supplement to (or removing one from) your daily regimen. The opinions expressed in bylined articles are not necessarily those of the publisher.

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Please send any comments or suggestions to
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Dr. Anne Zauderer
Editor

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21-DAY DETOX PROGRAM

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Medical Weight Loss: A Co-Learner's Journey

I have struggled with my weight since high school. Then with my first pregnancy I gained a considerable amount more. I've asked so many doctors for help, joined countless programs, read numerous books, taken classes, and none provided long-term hope or change because it was all based on will power and pure grit. 'Calories in – calories out' they'd say, (as if it were that simple when my brain/thoughts tripped me up so much). In the past, doctors had suggested I use the drug phentermine to jump start my weight loss, but they didn't know how to explain it well, and I didn't feel comfortable taking something that sounded so extreme.



I met with Mike Shaw for the first time in April 2018 at the Riordan Clinic. He took the time to really listen to what I was dealing with, and explain the steps of the program. I went into the appointment with the mindset that I was going to refuse the prescription but try everything else (which hadn't worked in the past – but maybe this time??). Mike made me feel comfortable that it was a safe tool to use in addition to a lifestyle change. I have been continuing to see Mike, and follow the Lifestyle Rx+ program, for about three months, and I am very happy with the progress! I feel completely in control of each day, and am actually enjoying the journey, which I never would have thought possible.

Day-to-day I don't feel any different, other than food isn't the focus of my thoughts anymore. Because I'm not obsessing over it, I am enjoying other things and getting more done with my day. I can make better decisions more easily because food just isn't as important to me anymore. My sugar cravings have all but subsided, and I'm finding that the weeks are passing quickly as I don't mind this new lifestyle at all. I haven't felt deprived or stressed. The guilt that I had carried with me for almost two decades has lifted. When I start to feel those same thoughts of shame or embarrassment for letting my weight get so out of control, I quickly say to myself, 'I'm doing it. I'm in the process of making the changes I need. That's all I can do.' and I move on. Having hope and knowing that I am making long-term changes toward better health is priceless. I am so glad I trusted Mike and started when I did. – Erin M., Wichita, KS

Upcoming Events

For more information or to register for any of these events, please visit RiordanClinic.org/events or call 316.682.3100

Food as Medicine

Wednesday, September 12th

11:30am - 1:30pm @ Wichita Campus

Anne Zauderer, DC

Cost: FREE

This in-depth course will connect the dots and address some fundamental questions behind how our diet impacts our health and well-being and how it contributes to the progression of chronic disease. PLEASE NOTE: This course is available in-person at the Wichita campus, and online. For more information please visit: riordanclinic.org/food-as-medicine

Lunchtime Lecture: Natural Treatments for the Patient Who Has Cancer

Thursday, September 20th

Noon - 1:00pm @ Overland Park Campus

Lucas Tims, ND

Cost: FREE

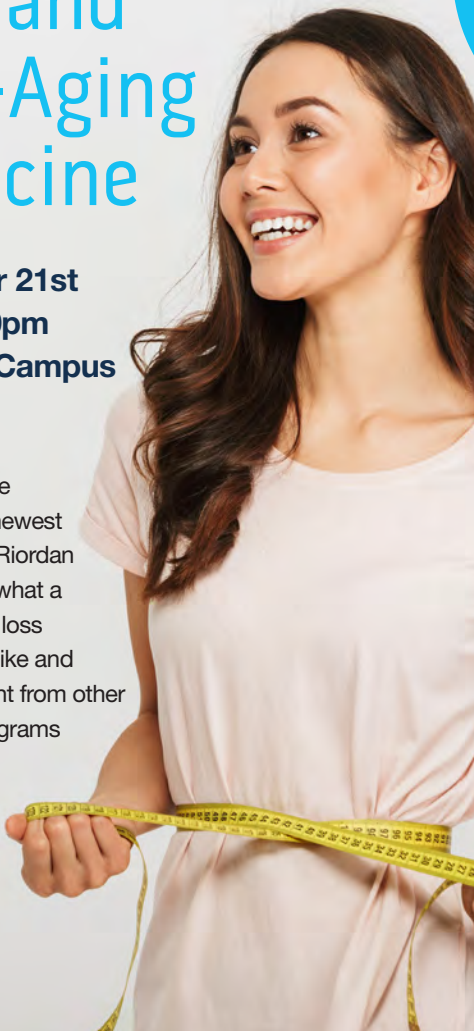
Cancer is a complex group of diseases that requires a multi-pronged approach in order to get the best results. Often times, conventional medicine is not enough to achieve long-term success. Natural medicines and integrative therapies are the missing piece of the puzzle that gives patients an edge. Join Dr. Lucas Tims for a presentation on how cancer patients can benefit from incorporating natural treatments in safe and effective ways.

FREE LUNCHTIME LECTURE

Medical Weight Loss and Anti-Aging Medicine

September 21st
Noon -1:00pm
@ Wichita Campus

Come hear Mike Shaw, PA, the newest provider at the Riordan Clinic, discuss what a medical weight loss program looks like and how it is different from other weight loss programs



Register at RiordanClinic.org/events or call 316.682.3100

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Upcoming Events

Lecture: Medical Weight Loss and Anti-Aging Medicine

Friday, September 21st

Noon -1:00pm @ Wichita Campus

Dr. Ron Hunninghake & Mike Shaw, PA

Cost: FREE

The average American will gain 1-2 pounds per year starting in early adulthood. That doesn't sound like a lot, but it can add up over 15-20 years! If your weight loss efforts have stalled, come hear Mike Shaw, PA, the newest provider at the Riordan Clinic, discuss what a medical weight loss program looks like and how it is different from other weight loss programs. In addition, he will discuss some of the advanced technology he uses to assess metabolic health and anti-aging strategies he employs.

21-Day Detox Program

Fridays October 12th, 19th, 26th, & November 2nd

Noon -1:00pm @ Wichita Campus

Dr. Anne Zauderer

Cost: \$39

Dr. Anne will lead classes in a group setting discussing how to properly do a detox program. She will walk participants through a detox program while also discussing important topics related to avoiding toxins in our environment. Class is limited to 20 participants. Class includes: weekly BIA, group class/discussion on detox, jump drive with recipes, detox booklet, and guest lecturers.



#ichooserealhealth

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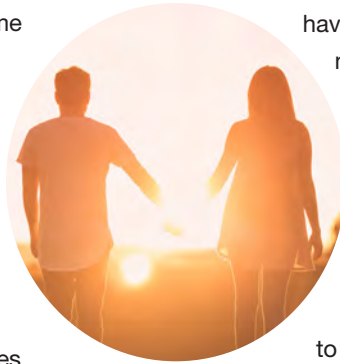
WRITTEN BY: MARY JO HUNNINGHAKE

Real health is such an interesting term for a concept that has changed so much over the years and will continue to evolve for years to come.

I have been involved in my own “Real Health” journey for over 50 years. Probably my first phase was growing up in a home where my mother was a great cook. She was a Home Economics major in college and taught foods and sewing classes at the high school level. I thought she was the best cook in the world. At that time, meals were very balanced and consisted of a protein (red meat, chicken, or fish), a carbohydrate (rice, pasta, or potatoes), and a vegetable. I made six lunches every night for my parents and siblings. I made a sandwich on white bread and put in potato chips, fruit, and cookies. Because my mom was the “expert”, I guess I would have concluded that this was “real health” with processed meats, lots of carbs, sugared cereals with cow’s milk, and lots of cookies.

During my college years and for about ten years after, I survived by eating whatever was available and whatever I could afford on a meager teacher’s salary. I didn’t give much thought to healthy eating, but tried to maintain some of the habits from my childhood. I was entering the times when low fat, low sugar, and eliminate carbs was coming across the horizon. We changed from white bread to lots of fiber, brown rice, whole wheat breads and pasta, and still lots of cow’s milk for the calcium that was supposedly great for our bones.

Probably the biggest change came when I met and fell in love with Dr. Ron. Boy, was he a different sort of guy. He was a vegetarian, ate a pretty healthy diet, meditated regularly, and almost looked too clean for me. That was truly the time when Real Health took a front seat in my life through what I would eventually learn from him and love about the good example he lived. I tried to clean up my cooking and provide healthy meals on a regular basis. As we started our family, I continued doing what I thought was right at the time. We did have some chips and cookies in the pantry, but not as much as most. (When my kids spent the night at a friend’s house, they made me very aware about how stocked their friends’ pantries were!) We weren’t perfect but we were still learning.



As Ron continued helping me with my health, I learned an interesting concept from him about how Real Health can be very deceiving. I might look healthy and feel relatively healthy, but have an underlying root cause for why I might be tired or not feeling as good as I could. This was when I started to delve deeper into where I really thought I might be and what I was willing to do to be healthier. Real Health was now a priority.

I would like to share some elements of wellness that are very important for me and that I have learned in my Real Health journey. Am I doing all of these steps to my satisfaction? Probably not. But, it doesn’t make them any less important as I continue to strive for better health for the remaining years of my life.

1. **SELF-RESPONSIBILITY** – No one can “make” you do anything. You have to choose it and take personal responsibility for your choices.
2. **FOOD CHOICES** – If we tried to follow every plan on the market these days (grass-fed, organic, lectin free, gluten free, lactose free, low or no carbs...etc), we would have little left to eat. Make good choices based upon what you think your body needs and what you think is best for you.
3. **EXERCISE** – Keep moving with some form of enjoyable exercise.
4. **STRESS MANAGEMENT** – This is a big one for me as I continue to shape the minds and hearts of 2nd graders.
5. **ENVIRONMENTAL SENSITIVITY** – I work on this constantly as each day I work in an old building. I have a special fan going constantly to pull dust out of the air. I have a salt lamp and a diffuser going daily to try and lessen the unclean air in my room.

If you ask me in 10 years what Real Health means to me, I would probably have a different answer. Be open to letting Real Health be the best it can be in your life and enjoy the journey and path toward feeling better and appreciating the highest quality of life possible.

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