

# BEET the ODDS

Harness the Power of Beets to  
Radically Transform Your Health

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*Vegetables and fruits  
contain the anti-carcinogenic cocktail  
to which we are adapted.  
We abandon it at our peril.*

Epidemiologist, John Potter MD



A bundle of *Beta vulgaris* also known as beetroot

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## Introduction

How is it possible that we missed this? Our ancestors didn't miss it. How could we have ignored a food that has been faithfully passed to us through countless generations - a food whose appearance is the clue that shouts to us –this food has great potential to support our overall health and vitality with emerging research suggesting significant benefits for our own heart and circulatory system? Is it because we associated them with the terrible veggies our parents tried to make us eat, but had no clue how to make taste good? Regardless, the truth about this wonder vegetable is about to set us free.

Re-welcome, *Beta vulgaris* or beetroot (beet, table, red or garden beet), a truly remarkable food gift to the human body that is now getting the attention it deserves. After all, from leaves to root this vegetable has sustained many civilizations for thousands of years. Beet leaves are undoubtedly nutritious and tasty but it is the beet root that will be the central focus of this book. The beloved beet plant has survived through cultivation to the present because of one simple but important fact – *extreme nutritional value*.

Perhaps the most under-appreciated food in the history of eating is the beet. Historically, as a source of food, it could be easily grown most of the year, had long storability and adapted well to a wide variety of climates. From the earliest times, beets have been used to support :

- digestion
- skin health
- heart support
- circulation
- detoxification
- constipation
- alertness and energy needs
- sexual enjoyment

The beet appeared to have lost its popularity in some places, but remained a traditional mainstay in others such as in Eastern and Central Europe and India. Some speculate that beets were usurped by spinach. The good news is that the beleaguered beet is making a triumphant comeback thanks to science and a greater understanding of the power contained within it. So if someone does not become a disciple of beets through taste, at least initially, they just might come around once they discover the potential health benefits that beets can provide when added to their healthy lifestyle.

Today, the beet is still used as a “functional” food to support overall health and vitality, and beet powder is an active ingredient in multiple types of nutritional supplements. But beets and beet powders may vary significantly in their effectiveness depending on growing conditions or processing. Purity and potency is important to receiving benefits related to any functional food and beets are no exception.

Beet science is found in medical literature with published clinical studies examining important constituents in the beet which impact human physiology. The most popular studies focus on the beet's ability to help boost stamina, and support heart health. Beets contain familiar vitamins and minerals but also unique plant or "phyto" nutrients which are often referred to as phytochemicals. These powerful substances can "speak" or convey a message to the cell's genes (DNA) directing them to make other crucial compounds that support and protect the body.

Beets have become the "edge" in competitive elite sports and were recently consumed by some athletes in the 2012 Olympic Games. Preliminary research suggests that beets may be able to improve athletic performance by as much as 16%. This fact alone has piqued serious interest in beets. This book is a simple but comprehensive look at the remarkable value of beets. It moves through supporting facts to climax with the discovery of the most significant beet benefit in all of its history. Harnessing the power hidden in the hallowed beet has the potential to radically transform health and save lives.



## Chapter One:

# The Beeting Heart



## Ancient History

There has been a long and seemingly romantic relationship between humans and beets. It began with the ancestor of all cultivated beets, the wild sea beet, whose leaves have been consumed since prehistoric times. In fact, beetroot was originally grown for its leaves and stems. Beets were first cultivated by ancient Greeks, Romans and Jews who consumed the leaves, but the Romans were the first to employ the root as a medicine for fevers and other conditions. However, the beet would not become a famous “root” vegetable until the 16<sup>th</sup> century.

## Ancient Aphrodisiac

Beets are a fascinating part of Greek and Roman Mythology. It appears the goddess of beauty and love, Aphrodite (or Venus), attributed her romantic power to the beetroot. The term “aphrodisiac” persists as a tribute to this

ostensive beet-goddess. This likely explains why beetroot is portrayed in erotic paintings on brothel walls (the “Lupanar”) of ancient Pompeii. It was the aphrodisiac benefit that drove the sun god Apollo and his worshippers to fervently seek out the beetroot. The Greeks presented the beet as an offering to Apollo in the temple at Delphi - the site where Apollo was told by the Oracle that the radish is worth its weight in lead but the beet its weight in silver - second only to horseradish which was worth its weight in gold.

The heart-shape of the beetroot and leaf and the passionately red color imply a deep connection to the icon of love, the heart. The beet even “bleeds” red. And if the root is the heart then the leaves are the embodiment of its extension, pulsing red through the main “artery” and its smaller “capillaries” which are visibly traceable on a beet leaf. Although there are white beets which exude sugar juice instead of “blood”, it is the beet’s penetrating red color that creates the drama for what the ancients believed was the essence of its power.



Other historical beet links include:

- Ancient murals portray Romans drinking glasses of what appears to be red wine but some historians suggest that it is actually beetroot juice.
- In Greek history, Aristotle (384-322 BC) left descriptions about beets, as did his students, noting the depth of red color.
- Beets appear in broths and salads in a cookbook entitled *Apicius: The Roman Cookery Book* which was translated in 1958 (Flowers and Rosenbaum) from a compilation of early medicinal and culinary recipes dating back to the first century AD in Tiberius.
- Hippocrates (c460- 370 BC) the ancient Greek physician and “Father of Medicine” recommended beets for blood cleansing and digestion.
- An Assyrian text (800BC) describes beets growing in the Hanging Gardens of Babylon, one of the wonders of the ancient world.
- In beet folklore, falling in love was considered the consequence of a couple eating from the same beetroot.
- As recent as the early 20<sup>th</sup> century “taking favors in the beetroot fields” was a popular euphemism for prostitution.
- “Blood Turnip” was once a common name for the garden beet.

- Eating beetroot with garlic will nullify “garlic breath”.
- The water left behind from boiled beets was massaged into the scalp nightly as an effective cure for dandruff.
- In 1975 cosmonauts from the USSR welcomed the Apollo 18 astronauts by preparing beetroot soup (borscht) at zero gravity.
- Beetroot can be made into a wine that tastes similar to port.
- Deep red beet juice is thought to help alleviate hangovers.

### More Recent History

The ancients saw mystical qualities in the tender, sweet, earthy beet and ensured its cultivation for the benefit of posterity. From its Mediterranean origins, the beet spread across the Old World through trade routes. By the middle ages it was grown for the root and medieval herbalists were hailing its benefits. Beets could be found thriving as a winter vegetable in the monastery gardens of Italy, France and Spain. New edible beetroot varieties were being developed and introduced to northern Europe. At that time, the beet roots were a bit longer and thinner than the modern beet.

The familiar heart-shaped root emerged in the 16th century, and over a few hundred years became a mainstay in Central and Eastern European cuisine. In England, the beet was also gaining acceptance, and by the 19th century it could be found in soup, salad, pudding and desserts. European settlers brought the beet to America and colonial Americans greatly relied upon it for survival during the winter months.

Eventually, it was discovered that beets provided a concentrated source of sugar and an alternative to sugar cane. This eventually led to the emergence of distinctly sweeter varieties such as the “sugar beet” and along with it, sugar factories.

### **Beloved Beets**

Beets were used throughout history for many purposes, not just as a healthy food. Uses ranged from providing the color in dyes, food coloring, lipstick and rouge to the substrate for fermentation in food and drink that became cultural staples consumed as the “elixir of life”. To this day many people are familiar with the beloved, traditional beet-soup called borscht which remains ever-popular in Russia and Eastern Europe.

Currently, there are many varieties of cultivated *Beta vulgaris* including the leaf vegetables, chard and spinach beet, as well as the root vegetables. Beetroot varieties differ in the shape, size and color. The root color can range from yellow to red with variegated types that resemble candy-stripes. The white-rooted “sugar beet” is used for the production of table sugar (sucrose) and has been cultivated over time to contain up to 20% sugar content. Another beet called mangelwurzel is grown for fodder or animal feed and is too coarse for human consumption. The most familiar one, however, is the intensely-red beetroot – the favorite on the radar of health-conscious people these days

And for good reason.....

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## Chapter Two

# The Beetiful Color

The beetroot is a treasure trove of densely-packed priceless nutrients that the next few chapters will explore. Beets are a member of the Chenopod family and its relatives are (Swiss) chard, spinach and quinoa. These foods have related nutritional value that is not available from other food families. Chenopod phytonutrients continue to show an increasing number of unique health benefits.

Beet nutrition begins with its unrivaled antioxidant pigments found in the root and the green tops as well. The beet's root color is a complex mixture of nitrogen-containing, water-soluble pigments called **betalains** (bā'tă-lāns). The term derives from **Beta** vulgaris. Betalains are different, however, than the abundant red pigments (anthocyanins) of many fruits and vegetables such as red cabbage, grapes, cherries and plums.

It is the betalains that determine the root color of beets which can range from yellow to a deep red-violet. Collectively, the red to purple-violet betalains are called betacyanins (principally betanin), while the yellow to orange pigments are called the betaxanthins (principally vulgaxanthin and indicaxanthin). Betanin is the easiest one to remember as it is the primary pigment in red beets and the best-studied betalain to date. All beets contain the yellow pigments - they are just masked in red beets. Betalains are concentrated in the beet cell and will easily leak out or "bleed" from the beetroot when it is cut or heated.

## **Antioxidant – Promote Proper Inflammatory Response**

Beet betalains are potent antioxidants. Antioxidants are important because they snuff-out or neutralize free-radicals or oxidants which can be thought of as infinitesimally small yet highly-reactive sparks that cause damage to the body's cells and their DNA. It is thought by some that an over-abundance of these "radicals" which are "free" causes excess oxidation and inflammation (oxidative stress) and is related to premature aging. Free radicals are naturally created in the body through metabolism and are taken into the body from the environment and a poor diet. A certain amount of free radical activity is absolutely necessary but far too often the balance of oxidants versus antioxidants is weighted to the oxidant side. In defense, the body responds by making more of its own antioxidants such as glutathione, but can be complemented by antioxidants in the diet to protect against free radical damage and maintain an ideal inflammatory balance.

It has not gone unnoticed that betalains have high antioxidant activity which means they may act to reduce free radical damage thereby promoting proper inflammatory response. There are a significant number of studies to support their role as antioxidants. Betalains have demonstrated 3- to 4-times greater antioxidant activity than vitamin C and some polyphenols such as rutin and catechin. Betanin was shown to reduce free radical damage to fats (lipid peroxidation) and also inhibit COX-1 and COX-2 enzyme which is related to an increase in inflammation. Recently published results indicate that the antioxidant capacity of betanin inhibited free radical damage in neutrophils (PMNs). This is important because neutrophils are key white blood cells in the body's inflammatory response.

Antioxidants help reduce oxidative stress and inflammation. It is one mechanism by which beets may help support the circulatory system. Several other mechanisms will be discussed in the chapters to come. The beneficial effects demonstrated in pre-clinical and clinical beet studies are likely due to multiple components in beets. The antioxidants are core. The emerging research on betalains in beets suggests they may help support healthy cholesterol and triglycerides in rats fed a diet designed to cause dyslipidemia. Betalains also protect LDL cholesterol from oxidative modifications.

## **Detoxification**

Beets have historically been used for detoxification. Betalains, particularly betanin, are powerful stimulators of the body's own (phase 2) detoxification enzymes. This is crucial because there are enormous amounts of chemicals released into the environment yearly. According to a U.S. Government Funded Panel, it is estimated that globally, people commonly encounter as many as 80,000 different pollutants daily. Beets may help support the ability of cells to actively neutralize toxins.

## **Polyphenols – Cellular Rejuvenation**

Current evidence for the antioxidant effects of plant polyphenols has generated much excitement and created new expectations for supporting health and fighting free radical damage. However, emerging science suggests that the properties of polyphenols also go far beyond their widely-studied antioxidant action. Beets are a rich source of health-promoting, often colorful, polyphenols including luteolin, quercetin and carotenoids such as lutein, zeaxanthin and beta-carotene.

## Safe Colorant

It is worth mentioning that betalains are useful in the food industry as colorants. The public has shown an increasing preference for natural food colorants rather than synthetic ones in foods, cosmetics, and pharmaceuticals. Betanin, as E162, is used for flavor and color in dairy products, meats, tomato paste, sauces, desserts and breakfast cereals. Betanin appears to be a sensible food additive that not only contributes health benefits, but it has virtually no potential to provoke allergy.

## “In the Pink” - Beeturia

Sometimes colorful urine (or stool) is a noticeable side effect from eating beetroot. Producing pink-red urine is distressing because it can be mistaken for blood. It is actually excreted betalain pigments causing the red color. It has been long known, even in folklore, that some individuals excrete red urine after eating beets while others do not. Many investigations have been conducted to determine why some people experience this, but without definite conclusions. It has been suggested that beeturia may be linked to food allergies, malabsorption and gut permeability syndromes, genetic factors (polymorphisms) or iron metabolism issues. But even in repeat studies, the same individual may show variation in reproducibility of results. Furthermore, it may be that some people just excrete too little pigment to be noticed. A well-designed study supported this in which urine samples from 100 subjects who ingested 60mg of beetroot pigment all showed small amounts of pigment in the urine, however, in some participants the concentrations were just too low to appear red. To complicate the matter, the type of beetroot consumed was shown to influence the outcome. Some susceptible people who showed intense urine coloration with one beet variety gave virtually normal urine with another.

The pH of urine affects the color of the pigments. They are stable between pH 4 to 5 but lose their color in alkaline conditions and decompose in acid conditions going from red to yellow. Therefore, if pigment is present in the urine, the color intensity is dependent upon the urinary pH. The human stomach has an average acidity of about pH 2 and in these conditions the beet pigment rapidly decomposes. If this was the major determinant of beeturia, then the occurrence of beeturia would likely be more common in conditions of low stomach acid. This hypothesis was supported by a report of an elderly man who had never displayed beeturia until he began taking an acid-reducing drug for acid (esophageal) reflux. Additionally, the beetroot pigments lose their color in the presence of iron (ferric ions) from the diet. Still other studies report that vitamin C and oxalic acid found in beetroot may protect the pigments from breakdown in the stomach. Investigations into this phenomenon will likely continue but at present it appears that beeturia is dependent upon a person's physiology in regulating the pH of their system.

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## Chapter Three

# A Beet More

### **Betaine**

There are more jewels in the beet treasury that contribute to its superfood status. Another “beta” compound, distinctly different from betalains, was discovered in beet juice and was named betaine. Its role is to regulate the water content (osmosis) in the beet cell. For the science-lovers, betaine is the simple amino acid glycine with 3 attached methyl groups (tri-methyl-glycine). Donating these vital methyl groups to needy biochemistry has helped betaine earn its place as a valued nutrient.

### **Methyl is Magical**

In human health, betaine helps protect cells, proteins, and enzymes from environmental stress such as low water (dehydration), excess salt, or extreme temperature. Betaine is also used in cosmetics and beauty supplies for its water-holding (humectant) effect. As a methyl donor, betaine reduces levels of an amino acid called homocysteine. While research is still ongoing on the impact of high blood levels of homocysteine, it is thought that promoting lower levels of homocysteine is important to vascular health. . Betaine donates a methyl group to homocysteine converting it to methionine to form S-adenosyl-methionine (SAME). This step is critically important because it ensures the continuing process of methylation, which, in addition to cardiovascular health, is vital to proper prenatal development, detoxification, immune function, inflammatory balance, and the health of other organs.

In a large cross-sectional survey (ATTICA study), betaine intake led to decreases in homocysteine plus two additional markers of inflammation – C-reactive protein and tumor necrosis factor.

Research suggests that betaine may also support the liver. Multiple mechanisms contribute to betaine's beneficial liver effects: antioxidant, methyl donor, mitochondrial support (via AMPK), humectant and protection from of excess liver fat (lipotropic). Betaine stimulates the liver to keep bile flowing freely through the bile ducts. This supports liver and gallbladder health, contributing to peak digestion and the facilitation of the elimination of toxins.

### **Athletic Actions**

Yet another feature of betaine is the emerging research that indicates in trained athletes it may help increase athletic performance. Several recent studies performed at different U.S. colleges reported evidence of improved aerobic and anaerobic metabolism including gains in muscle strength plus the quantity and quality of repetitions. Researchers speculate that betaine may raise creatine levels, lower lactic acid levels and/or support growth hormone production in the body as possible mechanisms for the increased muscle strength. Although these studies were conducted with betaine as a pure supplement, here's the point: beets contain betaine which may be a contributing factor to what you are about to read in the next chapters regarding beet consumption and its potential to enhance athletic performance.

Betaine is just another instrument in the beet symphony that in concert produces a crescendo of improved function and health.

## **Folate**

### **Methyl & More**

Beets are rich in another methyl donor - folate (aka folic acid). Like betaine, folate helps support healthy levels of homocysteine and raise SAM-e levels. Beets also contain tryptophan. This is the amino acid that builds serotonin in the body. Serotonin is well known for its importance in proper mood, sleep, sexuality and appetite. Hopefully, consuming more beets rich in folate, betaine and tryptophan will help the body maintain normal function. Moreover, folate is necessary for healthy gums, blood cell formation, the prevention of birth defects and multiple functions of the gastrointestinal, immune and cardiovascular systems.

## **Boron**

Beets are a very boron-dependent crop which makes them a rich source of this trace mineral. Farmers know that a lack of boron will cause the new beet shoots to deteriorate. The importance of boron to human health was just recently uncovered in the 1980's.

You may recall in chapter one, that the aphrodisiac or sexually-invigorating property of beets was first described by the early Greeks and Romans. Evidence points to the abundance of boron as a potential key factor. In human and animal studies boron is shown to increase steroid hormones

particularly estrogen and testosterone. Additionally, boron is shown to reduce the loss of vitamin D, calcium and magnesium from the body. For these reasons combined, it is best known in healthcare for supporting bone health.

### **Nutrient Density**

Beets also contain more familiar nutrients. Besides folate, the dominant vitamins in beets appear to be vitamins A and C along with vitamin K and the B vitamins. The dominant minerals present as potassium, calcium, magnesium, manganese and phosphorus but beets also contain iron, zinc, copper, sodium and selenium. Potassium is particularly beneficial for supporting cardiovascular health. Beets contain respectable levels of insoluble and soluble fiber and contain phytosterols, both of which have been studied for their beneficial effects on metabolism and the digestive tract. Nutritionally, fresh beets and beet root juice retain their nutrient content better than canned and processed beets.

Beets contain simple carbohydrates because they have natural sweetness but they are very nutrient-dense which qualifies them as a sensible energy fuel source. This, of course, is not the case with refined and processed carbohydrates which are linked to many health problems. Beets deliver about 2 grams of protein per serving (4oz) and have a very low fat content.

It is essential to note that sources for beet nutritional facts are not consistent. It is not entirely accurate to list the weight or percentage of each nutrient due to conflicting data sources and beet conditions (i.e. cooked vs. raw, variety, stored vs. fresh, conventionally vs organically grown). The geographical

area where beets are grown can make all the difference in the nutritional profile. Key factors such as soil-richness, year-to-year changes in temperature, sunlight, rainfall and fertilizers in addition to the effects of shipping and storage - all influence the nutrient content of vegetables. Organically-grown vegetables show significant differences from conventional in nutritional data. Pesticide residue should be also taken into account as these chemicals result in detoxification burdens for the body.

## Healthy Aging

The beetroot is overflowing with antioxidant-rich betalains. It is high in betaine, boron and folate which increase its nutrient density. It has all the extra supporting nutrients and endearing history of a real superfood. The emerging research on the health benefits of beets is impressive. Add up these descriptions and the definition of the perfect anti-aging food almost surfaces, almost because.....there is one more factor in this rousing root that will forever change the human-beet relationship. With abundantly accumulating research, this next beet nutrient should put beets and beet products back on every table.

And just a note: Some people may be concerned that beets also contain oxalic acid (less than 1%) which is a universal component of plants for mineral (i.e. calcium) binding and protection from herbivores. Oxalic acid is broken down during cooking. Eating too much oxalic acid (i.e., ~16 cups of raw spinach) can be detrimental because it can bind dietary calcium and make it unavailable for absorption. But most people do not

consume enough oxalic acid in vegetables, or long enough, to negatively affect calcium absorption

The following chapters mark a new history for the bodacious beet.....

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