The prostate gland is about the size and shape of a walnut and weighs in at around one ounce. Women seem to know more about this little gland than men do. About 11% of men don’t know that they have this gland in their body. Only 15% of men have ever heard of the term prostatitis. Of the men who do know about prostatitis (inflammation of the prostate), about 16% of them think that this condition occurs in both men and women. About 50% of men will experience prostatitis during their lifetime, and one in four men will have benign prostatic hyperplasia (BPH) by the age of 50.1

Three major problems can occur in the prostate gland. Prostatitis, BPH, or cancer. A man could experience all three conditions during his lifetime. Because so few American men know anything at all about their prostate gland, the American Urological Association Foundation has set September of 2006 as Prostate Health Month with low-cost or no-cost prostate screening available throughout the United States. This will be the eighth year that this program has been in place in the US.

This article focuses on BPH (Benign Prostatic Hyperplasia). Because the prostate gland causes more problems in men than any other tissue in the male body, we need to spend a considerable amount of time covering this tiny male gland. BPH involves enlargement of the prostate gland. This tissue expansion appears to be unique to humans.2 The prostate gland is located just below the bladder and in front of the rectum. The gland surrounds part of the urethra, which is a narrow tube that allows urine to pass from the bladder through the male penis. It’s composed of 30 to 50 branched glands that each produce fluid that will be used to transport sperm. A fibroelastic capsule surrounds the gland. This capsule and the interior stroma contain smooth muscle cells that contract to expel the prostatic fluid during ejaculation. About 30% of the prostate gland is smooth muscle tissue.

Prostate fluid contains zinc, potassium, citric acid, fructose, spermmerine, cholesterol, phospholipids, prosta-glandins, fibrinogenase, fibrinolysin, acid phosphatase, and other proteins in an alkaline fluid. This fluid is thought to help protect the sperm in the acidic vagina and also to provide the sperm with fuel. Since the vagina is colonized with bacteria, prostate fluid is also thought to help protect the male urethra from infection after intercourse.

The prostate gland consists of three different zones. The peripheral zone is the outside region of the prostate gland, and almost all prostate cancer starts in the peripheral zone. A physician, during a digital rectal examination, can feel this outer zone of the prostate; however, for cancer detection, a serum prostate specific antigen (PSA) can sometimes indicate prostate cancer before any lumps or firm areas in the prostate can be detected by a physician during the physical exam of the prostate.

PSA is a normal glycoprotein component of human male blood that is formed in the prostate gland with some escaping into the blood. PSA is actually a serine protease (an enzyme that can hydrolyze peptides or proteins). Epithelial cells in the prostate produce PSA, which will cleave insulin-like growth factor-binding protein-3 to decrease its affinity (binding) for insulin-like growth factor-I (IGF-I).2 IGF-I is a common component of the human diet, and it may play a role in prostate cancer and prostate enlargement.4 IGF-I can be found in the milk of all animal species where it appears to be used to promote animal growth, but IGF-I is also produced in the human body even if milk or dairy products are not part of a person’s diet.

A PSA level of zero (none detected) to 4 ng/ml is usually considered to be normal for most men. An increase in the size of the prostate is considered to be part of the aging process in men, and with this increase in size comes more PSA. It’s common to see a PSA level around 6.5 ng/ml in men over the age of 70. With prostate cancer, the PSA level tends to go up much higher than what you would see with prostate enlargement (BPH).

There are actually different forms of PSA. The main form that the prostate produces, and which is elevated in BPH, is used to hydrolyze the seminal fluid gel formed after ejaculation to allow the sperm to break free and swim around. Cancer cells produce another form of PSA. This form appears to allow the cancer cells to be more invasive and have a greater metastatic potential.5 The cancer-specific PSA is referred to as Pro PSA. Pro PSA can be measured,6 but it’s still too early to tell if this will result in an improvement in the early detection of prostate cancer.7

During a digital rectal examination, a physician may be able to detect that the prostate gland is larger than normal. The transition zone in the prostate gland is only five percent of the total mass of the prostate, but this is the area where BPH occurs. The transition zone is under the peripheral zone and on top of the central zone in the prostate gland. Exactly why the cells present in the transition zone start to divide around the age of 40 is not known.
BPH may occur due to subtle changes in male hormones as well as dietary factors (triggers). Even though the exact cause is not known, by age 80, about 80% of men will have BPH, according to BPH – A Patient's Guide, an informative booklet produced by the Canadian Prostate Health Council. (The booklet can be obtained by going to www.canadian-prostate.com.) The symptoms of BPH, as listed in this guide, are as follows: frequent urination, waking at night to urinate, inability to postpone urination, delay in starting to urinate, weak urinary stream—straining, intermittent stream—stopping and starting, incontinence (loss of urinary control), painful urination, and blood in urine. All these symptoms occur because the enlarged gland is squeezing the urethra.

Since cancer growth in the prostate can do the same thing, it's important to rule out cancer as a cause of the urethra compression. PSA levels can often help determine if a biopsy is necessary. This paper points out that 6.5 million American men between the ages of 50 and 79 meet the criteria for BPH treatment. Most, however, are not being treated for BPH. PSA levels can be used to help determine which of these individuals is in greatest need for immediate treatment. The Canadian guide for BPH lists all the standard tests that can be run to determine if a patient has BPH. These include abdominal ultrasound, intravenous urography, cystoscopy, urine flow study, and residual urine. A newer test involves a transrectal ultrasound to try to get a better image of the prostate and determine the degree of hyperplasia.

Traditional treatment options include removal of some of the prostate using either manual coring or laser surgery. For pharmacological treatment, two different classes of drugs are used: one class consists of alpha-blockers that relax the smooth muscle cells in the prostate gland, and the second class of drugs blocks the formation or action of the hormones that are thought to contribute to prostate enlargement.

PSA levels can be used to help determine if a biopsy is necessary. This paper points out that 6.5 million American men between the ages of 50 and 79 meet the criteria for BPH treatment. Most, however, are not being treated for BPH. PSA levels can be used to help determine which of these individuals is in greatest need for immediate treatment. The Canadian guide for BPH lists all the standard tests that can be run to determine if a patient has BPH. These include abdominal ultrasound, intravenous urography, cystoscopy, urine flow study, and residual urine. A newer test involves a transrectal ultrasound to try to get a better image of the prostate and determine the degree of hyperplasia.

Traditional treatment options include removal of some of the prostate using either manual coring or laser surgery. For pharmacological treatment, two different classes of drugs are used: one class consists of alpha-blockers that relax the smooth muscle cells in the prostate gland, and the second class of drugs blocks the formation or action of the hormones that are thought to contribute to prostate enlargement.

Males have had to deal with this problem (BPH) before modern medicine came along. Could diet changes and natural healing approaches (herbals) work for this problem? The answer is a resounding yes. Diet is thought to play a key role in causing this problem in the first place, so diet changes certainly could help to prevent the problem. Remember that not every 80-year-old male is going to have an enlarged prostate that compresses the urethra.

Oxidized cholesterol appears to be one important factor in BPH. Oxidized LDL is thought to be an important factor in plaque formation along arterial walls (heart disease). The cholesterol inside cells can also be oxidized to form epoxy-cholesterol. Prostatic fluid collected from men with BPH contains higher than normal levels of cholesterol alpha and beta-epoxides.

Antioxidants: Vitamin E, lycopene, selenium, and zinc have all been shown to play an important role in prostate gland health. A good intake of these antioxidant dietary factors appears to offer some protection from the development of prostate cancer. Their role in BPH is much less certain. A review published about seven years ago goes over all the dietary factors that are thought to offer some protection from prostate cancer. These same factors may also offer some protection from BPH. These factors are zinc, selenium, vitamin E, lycopene, phytoestrogens, and phytosterols.

Vitamin E appears to work just as it does in other tissues. Lycopene is actually concentrated in the prostate gland. Lycopene probably works as a general antioxidant, but it may also play a unique role in the prostate gland. Lycopene can specifically interfere with the mitogenic activity of insulin-like growth factor one (IGF-I). Mitogenic refers to the ability to make cells divide. Cells in the transition zone of the prostate divide more than those in the periphery. This leads to an increase in the size of the gland. Lycopene may have a role in decreasing this expansion of the prostate gland if IGF-I is involved in promoting cell division. A more recent review of the dietary factors thought to play a role in prostate cancer shows that lycopene and the phytoestrogens are still considered to be important dietary factors in the prevention of prostate cancer.

Prostate-Specific Nutrients: The fluid produced by the prostate gland is very high in zinc. The prostate gland actually contains a higher level of zinc than any other gland or tissue in the human body. This high zinc level appears to be needed to produce high levels of citric acid in human prostate fluid. This citric acid may be used as a fuel by human sperm. Since too much iodine in the thyroid gland can make that gland expand in size, it's also thought that too much zinc in the prostate gland might make this gland expand in size. Epidemiology data does suggest that, as the dietary intake of zinc increases, the risk of BPH also increases. Zinc levels in the human prostate gland have been measured in several human studies, and most of these studies show that BPH is associated with increased zinc levels in the prostate gland itself.

the prostate gland itself. The increase seen in one study (Zaichick, et al.) is similar to that seen in other similar studies that have been conducted. Normal was 1,018 micrograms per gram of dry prostate tissue versus 1,142 micrograms per gram of dry prostate tissue in patients with benign prostatic hyperplasia.

However, zinc may just be a marker for cadmium intake. (Epidemiology data showing an increase in dietary zinc may have been marking cadmium intake, rather than zinc, in relationship to prostate gland enlargement.) Cadmium levels are known to be elevated in BPH. Cadmium is now thought to be an important dietary factor in human prostate cancer risk. In castrated animals, a single low dose of cadmium (20 micrograms per kilogram body weight) increases the wet weight of the prostate gland by 1.97 to three-fold. Cadmium and zinc are very similar in terms of chemical and biologic properties. Both minerals bind to metallothionein, and both compete for absorption in the small intestine. Most of the toxic effects of cadmium appear to be due to its interference with zinc. Since cadmium has a biological half-life in humans of about 20 years, the best way to try to prevent a problem with cadmium in the first place is to have plenty of zinc present in the diet. This extensive review of what cadmium can do in humans points out that humans with the poorest zinc status display the most severe cadmium toxicity. Cadmium can also come in through the lungs from breathing in dust laden with cadmium (occupational exposure) or smoking.

Selenium is also known to be an important mineral for prostate health. Selenium has been known to prevent cadmium toxicity in the prostate for quite some time. Only recently has the mechanism for this protection been worked out. Since cadmium stays in the human body so long, it is extremely important to convert the cadmium to a non-toxic complex, and that is exactly what selenium does. To be healthy, especially when the diet or environment contains cadmium, the prostate gland must have access to good amounts of zinc and selenium.

Even though it's now apparent that cadmium is extremely damaging to human health, it's been hard to set guidelines for exposure, primarily because measuring cadmium exposure in...
Prostate Enlargement

humans is so difficult. The EPA limit of one microgram per kilogram of body weight per day for humans is hard to detect using standard methods (measuring human blood and urine levels of cadmium).

It’s tempting to say that men who make it to age 80 without prostate gland hypertrophy have not been exposed to cadmium or, if they have been exposed, they have had good intakes of selenium and zinc to protect them from that exposure. While the link seems to get stronger with each passing year, the data still is not yet there to blame this problem on cadmium exposure. Human dietary intake of cadmium is estimated to be ten to 20 micrograms per day, but some human populations are known to have much higher consumption rates due to cadmium in soil (grains from plants grown in these soils will have high levels), cadmium in sea water (bottom feeders like shellfish have the highest levels), and cadmium in drinking water (cadmium from rechargeable batteries leaching into the ground water supply).

Relief from BPH: Okay, like most men, your prostate gland is enlarged. If you don’t want to use surgical or pharmacological treatments, what are your other options? Glycine, glutamic acid, and alanine at 200 mg per day for each amino acid can provide some relief according to some alternative healers. This suggestion is based on data published a long time ago by Japanese researchers. Glutamic acid is not going to get past the human gut. Alanine and glycine are both non-essential amino acids that already exist in high levels in human blood. This early work combining glutamic acid, alanine, and glycine to provide some relief from problems encountered with benign prostatic hyperplasia might actually lead to glycine being used in irrigation fluids that are needed during prostatectomy surgery. A more recent examination of glycine’s special benefits for the prostate and urethra suggests that sterile water works just as well when transurethral surgery on an enlarged prostate gland is being performed.

There is an amino acid (actually a product of amino acid metabolism) that is useful according to the modern literature regarding inhibiting prostate tissue growth. Phenylacetate is one of the phenyl ketones that can be formed in a patient with PKU. Once the human brain fully matures at around the age of nine, phenylacetate is no longer capable of interfering with normal brain function (development). Phenylacetate has a long history of safe use in humans and is actually used to treat the hyperammonemia that occurs in patients with liver failure. More phenylacetate will be formed any time phenylalanine intake increases, even in people who do not have PKU (i.e., who lack the liver enzyme needed to convert phenylalanine to tyrosine). Another product formed from phenylalanine (phenylbutyrate) is also being looked at for its ability to prevent prostate cells from proliferating and making the gland larger.

Herbals: Saw palmetto (serenoa serrulata) berries are obtained from plants that grow from the sandy soil of South Carolina all the way around the coast of Florida to the west Texas coast. Saw palmetto is a dwarf palm tree that grows to a height of six to ten feet. Native American Indians gathered saw palmetto berries and ate them when they had urinary problems or poor urine stream flow. Many health claims have been made for these berries. In Germany, the saw palmetto berry is approved for the treatment of BPH. Eighty percent of Germans use this and other natural treatments for BPH.

A large number of human clinical trials have been conducted with standardized extracts of saw palmetto berries. The active components of the berry are in a lipid extract of the berry. This extract has been shown to inhibit dihydrotestosterone binding to androgen receptors in the prostate gland, and it also inhibits 5-alpha-reductase action on testosterone. The extract also inhibits 3-alpha-ketosteroid reductase activity on dihydrotestosterone. Testosterone is converted to dihydrotestosterone (DHT) in the prostate gland, and DHT is thought to cause a significant increase in size of the human prostate gland. Prescription drugs that inhibit the 5-alpha-reductase can reduce the size of the human prostate by 20% to 30%.

Saw palmetto does this naturally. Saw palmetto also acts on other areas that cause prostate enlargement, on which the current class of prescription drugs can’t act. Finasteride lowered DHT from an average of 4.9 ng/g to 1.0 ng/g in the prostates of 22 patients with BPH. Finasteride is a drug approved in the US for treatment of both BPH and male pattern baldness. A saw palmetto extract (320 mg/day of a standardized extract) lowered DHT from an average of 6.49 ng/g to 4.40 ng/g in the prostates of 44 patients with BPH. The saw palmetto effect was significant. The lipid extract from saw palmetto can also inhibit lipoxygenase and further help decrease the symptoms of an enlarged prostate gland — i.e., pain and inflammation.

Saw Palmetto has worked so well (and with minimal or no side effects) that it is now in the select list of herbals that equal or surpass pharmaceutical prescription medication treatments for specific human diseases. Other herbals in this select list include St. John’s Wort and ginkgo. While Australia now appears to be ready to accept saw palmetto and other herbal products as offering plant chemicals that can help with human disease, the United States is still fighting this effort to use natural remedies for BPH and other human diseases.

A paper published in the New England Journal of Medicine on February 9, 2006 states that over two million American men are now using saw palmetto for the treatment of BPH, but a double-blind, placebo-controlled clinical trial conducted in the US (NCT0037154) using 222 men and 160 mg of saw palmetto berry extract twice a day showed no benefit. An editorial in the same issue states that saw palmetto berry extract provides absolutely no benefit to men suffering from BPH and US physicians should discourage its use. This New England Journal of Medicine editorial received a large amount of media attention in the United States. The authors of the paper, describing the first clinical trial on a saw palmetto berry extract run in the US, state that their negative results could be due to not using enough of the active ingredient in saw palmetto berries or, they continue, all the previous clinical trials were flawed.

Twenty-two different preparations of saw palmetto berry extracts are currently being sold in the United States. The lipid extract used for this clinical trial was similar to 17 of these in that it had a high fatty acid and sterol content. Variability in active ingredients between different preparations of herbal extracts, as well as changes in content from one batch to another from the same source, is a significant problem. The authors of this first clinical trial of a saw palmetto berry extract to be run in the US state that they did not attempt to characterize their extract because the active ingredients and mechanism of action for saw palmetto berries is not known.

More than 30 different studies have been done in vitro to try to identify what saw palmetto berries do and how they do it. The anti-androgen action of saw palmetto berry extracts is well established; it’s the same action that the prescription medications finasteride (Proscar) and dutasteride (Avodart)
we have “some of the best data on any controlled clinical trials (none of which were done in the United States), and that large number of double-blind, placebo-controlled clinical trials (none of which were done in the United States), and that we have “some of the best data on any

Most European clinical trials of saw palmetto have used the n-hexane liposterolic extract of Serenoa repens manufactured in France called Permixon.39 The US clinical trial did not use this particular saw palmetto berry extract. Both Consumer Reports (ConsumerReports.org) and Consumer Lab (ConsumerLab.com) have analyzed the saw palmetto berry extracts available to Americans and found some that do not have any of the known in vitro actions of saw palmetto berry extracts. (Consumer Lab reports on saw palmetto berry extracts and many other herbal products are by subscription only, but many libraries will have a substantial number of issues of Consumer Reports.)

Americans are having a hard time trying to decide what to do when it comes to possible natural treatments for human disease. Prostate enlargement is not a life-threatening condition as long as cancer has been ruled out and obstruction of the urinary tract does not occur, but the condition does disrupt the lives of men who suffer from prostate enlargement. Current medical treatments for this problem have undesired side effects. Some natural remedies do produce side effects, but there are no side effects associated with saw palmetto berry ingestion or the extracts made from saw palmetto berries. Native Americans ate the berry from this dwarf palm tree. Since it grows wild along the US coast, the berries can still be harvested and eaten. However, extraction of the oil from these berries now enables individuals not living near the coast to also include this plant food in their diet.

Humans have always relied on plants to make them feel better. A recent review article in the World Journal of Urology points out that humans have always used plants to improve urine formation in men and women of all ages (diuretics) and urine flow in old men.37 This review article points out that saw palmetto berry extracts have been studied in a fairly large number of double-blind, placebo-controlled clinical trials (none of which were done in the United States), and that we have “some of the best data on any

One of the most popular combinations for BPH treatment in Germany is saw palmetto and stinging nettle.40 Stinging nettle is covered in Herbal Medicines. However, ancient natural healing only used the leaves, and the tea made from these leaves was used primarily for health problems in women. Extracting the root and using the root extract to treat men with an enlarged prostate is a new modern twist on this ancient herbal medicine plant. The carbohydrate in the root extract appears able to inhibit the replication of human prostatic epithelial and stromal cells.41 Even fewer studies have been done with stinging nettle than have been done with pygeum.

Herbal Medicines covers another ancient remedy for male prostate and urinary tract problems. This remedy involves the use of Uva ursi (commonly called bearberry). A standardized extract of the leaf of this plant is used as a urinary antiseptic. The extract is also used for the treatment of cystitis. It has been routinely used for painful urination in both men and women. Herbal Medicines reports that about 70% of patients treated with uva ursi extracts report significant relief from pain during urination. (Uva ursi was used on Goethe, who almost died from urosepsis.42 Johann Wolfgang von Goethe was perhaps Germany’s most famous poet. His masterpieces, Faust I and Faust II, were written over a period of 60 years. Had he not been saved by Uva ursi, we would never have had the pleasure of reading Faust.) Very little has been published about uva ursi use in prostate enlargement, but it does appear to have some use if urination is painful.

A recent review covered all of the alternative treatments for BPH.43 These treatments include the following: saw palmetto, African plum tree, stinging nettle, pumpkin seed, rye pollen, South African star grass, cactus flower, pine flower, and spruce. Only saw palmetto has been extensively studied. Rye pollen has been subjected to Cochrane analysis.44 A total of 444 men have been enrolled in two placebo-controlled and two comparative clinical trials. Rye pollen did not improve urinary flow rates, residual volume, or prostate size. The only effect of rye pollen was on nocturia (getting up to urinate at night), and the effect, although small compared to paraprost, was significant when compared to a placebo. Cactus flower extracts, on the other hand, look
Prostate Enlargement

promising. These extracts significantly inhibit aromatase and 5-alpha-reductase activity in the prostate.4 This is the same action that we see with saw palmetto. Combining them may give reductions in prostate size similar to what is seen for prescription medication. Angelica koreana roots also contain a 5-alpha-reductase inhibitor.46 The angelica plant species is widely used in food as a natural food flavoring agent. It may turn out that many plants produce chemicals that inhibit 5-alpha-reductase activity and are therefore good treatments for BPH, as well as for male pattern baldness.

The last component of this long list of possible herbal remedies for prostate enlargement is pumpkin seeds. Pumpkin seed oil has a very high gamma-tocopherol content.47 Pumpkin seed oil has been tested in a large number of patients with benign prostatic hyperplasia. This large multi-center clinical trial showed that one to two capsules of pumpkin seed oil each day as the only treatment did provide some benefit.47 Throughout multiple centers, 2,245 patients received pumpkin seed oil pills, and their responses were recorded. However, no placebo was used. Nonetheless, gamma-tocopherol is starting to be looked at carefully in the area of prostate health. Lycopene is already known to be important in prostate health. Now, new data is showing that gamma-tocopherol is probably just as important to the prostate gland as is lycopene.

Selenium and vitamin E (alpha-tocopherol) are already known to offer protection from the development of prostate cancer. With these new studies, the protective effect of gamma-tocopherol in the prostate may prove to be much greater than alpha-tocopherol.48 Right now, the best source of gamma-tocopherol is pumpkin seed oil. Alpha-tocopherol and selenium swept the cancer prevention field, and now it looks like gamma-tocopherol is getting ready to open some eyes in the area of prostate cancer prevention.49 Even if pumpkin seed oil has no real benefit in men with an enlarged prostate gland, the high levels of gamma-tocopherol that pumpkin seed oil provides in a small capsule should help to decrease the risk that the enlarged prostate gland will turn cancerous. Having a good intake of selenium and lycopene should also help to prevent the development of prostate cancer.

An enlarged prostate gland can be a real pain, but having cancer of the prostate gland is even worse. Knowing who all the national players are in prostate health should help you beat the odds and keep your prostate gland performing well throughout your entire life span.

Martin W. Banschbach, Ph.D., is a Professor of Biochemistry in the Department of Biochemistry and Medical Zoology at The University of Oklahoma-State University Center for Health Sciences in Tulsa, Oklahoma.

References