

Walking in Sunshine

***LifeStyle Changes to Make
for a Bright Healthy Future***

Kathleen E Fuller, PhD

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Introduction

Around ten years ago, while working on an article, I realized that I was not walking the talk. Because of my degrees in paleoanthropology and biological anthropology, I knew all about human origins and adaptations. I knew what was necessary in order to have a healthy, successful life, but I was not fully implementing what I knew. I decided that day to begin making the necessary changes that would bring my lifestyle into better accord with that of our foraging ancestors. Our ancestors lived this lifestyle for at least two million years. This is the lifestyle to which our bodies are adapted. The chapter “The Sun...Exposed!” will explain our adaptations and our place in nature.

Once having made my fateful decision to walk the talk, the first thing I did was pour the rest of my gallon of milk down the drain. As you will discover in the chapters “The Staff of Life?” and “Premier Nutrition”, milk does not do a body good. Agriculture is a very recent innovation in the history of human existence which means that our bodies are not adapted to the type of lifestyle that has resulted from this major alteration to the environment and to social organization. I gave away my boxes of cereal, loaves of bread, and packages of cheese. My goal was to

eliminate all dairy and grain-based products from my diet. I now had gaping holes in my diet that needed to be filled.

What did our foraging ancestors eat? Well, that was pretty simple: lots of fruits, tree nuts, eggs, fish, shellfish, some meat, and some vegetables. Instead of eating grain-based snacks, I ate almonds and cashews. Instead of cereal for breakfast, I had a salsa omelet. Instead of candy, I ate fruit. Two benefits from making these changes were that I began losing some of the extra weight that had crept up onto my body over the years, and I discovered that fruits and vegetables actually tasted better to me. The taste of dairy products is not a good complement to the taste of fruit. Eliminating grains and dairy from my diet made it easy to get 8 – 10 servings of fruits and vegetables per day. So, while losing weight, I also improved my health through the addition of abundant phytonutrients and antioxidants. “Premier Nutrition” will help you make these positive changes to your diet and your health.

Having successfully made dietary changes, I decided it was time to get active. I find it incredibly easy to sit for hours at a time reading, writing, and thinking. Our ancestors probably spent a lot of time thinking, too, but they had to be pretty active or they would have starved. In the chapter “Walk, Don’t Run” you will learn why walking is the best exercise for humans. Taking my own advice, I literally began walking the talk for

about two miles per day. What with the dietary changes and walking every day, within weeks I was back to my optimal weight. Flexibility was also important to our ancestors as they needed to reach, climb, bend, and stretch with ease. A program of daily flexibilities is included in the Appendix. I have been doing these flexibilities for over two decades with great success.

An added benefit of walking in sunshine is that exposing unprotected skin to sunlight activates the production of vitamin D. I first began researching the effects of inadequate levels of vitamin D in 1992. For years, I felt like a lone voice in the wilderness. Oh, there were a few of us writing and talking about the effects of vitamin D deprivation, but it seemed that few people wanted to listen. Fortunately, that has all changed in the last year or so. The chapters “Vitamin D is the Key” and “Your Skin Color and Your Health” focus on the topic of how our bodies are adapted to vitamin D and the consequences of vitamin D deprivation.

Electricity has allowed us to lead 24/7 lives. But we are not adapted for such a lifestyle. We are adapted to be active when the sun rises and to go to sleep when the sun sets. In the chapter “To Sleep...” you will discover why sleep is so important and the problems that can happen when we fail to get enough shut-eye.

Our ancient ancestors can also provide us with helpful parenting tips. After all, if they were not successful parents, none of us would be here. Successful parenting seems to be a scarce resource in our modern lives, so the chapter “Natural Parenting” explains the changes parents can make that will lead to happier, healthier outcomes for their children.

As a biological anthropologist, I could not end my book without discussing the issue of diversity. Some people appear to fear diversity while others seek to exploit it. Both attitudes lead to divisiveness. In the chapter “Diversity, Not Divisiveness” I explain how focusing on what we hold in common is the way out of conflict to conciliation. After all, despite our differences, we all have a common origin.

Finally, in the After Word, I give a prescription for success. Am I able to follow all my prescriptions for a bright, healthy life successfully at all times? Of course not. But when I fall off the path, I rest and think for a bit about how much healthier I am when I follow the path. Then I get up and continue on to bright, healthy future.

The Sun...Exposed!

Guess what! The dermatologists are wrong when they say there is no safe exposure to the sun. In fact, if you follow their advice and avoid all unprotected exposure to the sun you will seriously harm your health. Avoiding sunlight significantly increases your odds of developing a variety of health problems including prostate, breast, and colon cancers, and these odds are far higher than the odds that you may develop the most deadly form of skin cancer, melanoma. In fact, if you are a dark-skinned male your odds of developing melanoma are vanishingly small compared to your odds of developing prostate cancer. Why is that? Why are the dermatologists wrong? Well, that is what this chapter is all about. Stay tuned.

It is not easy for life to get a toehold, and once it does, it is difficult to maintain. We look around us and see a planet brimming, overflowing with life and forget that this is the exception, not the rule. Out of eight planets (sorry, Pluto) in our solar system, ours is the only one with life. Just like Goldilocks' porridge, we aren't too hot or too cold, we are just right: just right for plants to directly use the sun's energy to provide us with food and oxygen. Without sunlight, life is impossible. But humans don't

just need the sun for heat, and oxygen and energy via plant photosynthesis. Humans, as is true of all other animals, also require direct exposure to sunlight to maintain optimal health.

Science fiction writers who have humans living underground or on planets without sunlight do not have much familiarity with biology, the study of life, or they would know that they have created nonviable conditions. The inhabitants might not die immediately, but without sunlight, death is inevitable.

The largest organ in the human body is the skin. This is also true of other animals. Now, the skin does more than just hold all our other organs inside. It is a protective interface between our body and the environment. And one of its most important “responsibilities” is as the interface between our body and sunlight. Although we live on a “just right” planet, the amount sun exposure we receive is not always just right for our individual conditions. To understand why, we need to go back in time and look at human evolution.

What it means to be a Primate

As I’ve said before, and will probably say again, humans are animals. Specifically, we are primates and, precisely, we are in the same family as the great apes: orangutans, gorillas, and chimpanzees/bonobos.

Primates are a tropically-adapted group. In the wild, none of the great ape species are found outside the tropics. Only a very few monkey species are subtropical. From this, it can be concluded that humans were originally a tropically-adapted species.

Now, there may be some readers who question my statement that humans fall in the same family with great apes, let alone that we are primates, so it is important to review the evidence here. There are several characteristics that define a primate. One is that vision is more important to primates than the sense of smell. This is obvious if you look at the face of a monkey or ape or human. The eyes are relatively large, close together, and vertically positioned on the face. This allows the individual to have over-lapping fields of vision and provides depth perception, a necessary trait for climbing trees and leaping from limb to limb. However, our improved visual acuity means that the ability to have a heightened sense of smell is severely diminished. The olfactory lobe, the portion of the brain used to process scents, sits right between the eyes. Large, closely-spaced eyes mean that there is little room for the olfactory lobe. Fortunately, scents are not particularly important high in the tree canopy, so the loss of that ability is more-than-compensated for by the increased visual acuity.

Primates have retained a generalized limb structure from the earliest mammalian ancestor. Instead of the specialized hooves of horses, for instance, we have the more ancient form of five digits on our hands and feet. This allows primates to more readily manipulate their environment than is possible among more specialized species. Another aid to manipulation is that instead of having digits that end in pointed claws, primates have flattened digits with nails. The generalized structure also allows the upper and lower limbs to have a much wider range of movement than is possible in other species. When at rest (not sleeping), primates tend to sit upright. Again, this allows them to more readily manipulate their environment with their generalized hands and arms.

Another ancient retention of primates is their generalized dentition. Primates have four different types of teeth (incisors, canines, premolars, molars) while more specialized animals may have only two types. Having different types of teeth allows primates to eat a varied diet. While some primates do specialize in a particular type of food such as fruits or leaves, they are able to eat a more varied diet and most do so. Those with the most varied diet, eating leaves, fruit, nuts, small animals, eggs, etc., are called omnivores, a group that includes baboons, chimpanzees, and humans.

When matched to a non-primate animal of similar body size, primates have a larger brain-to-body ratio. While there is not a direct correlation of brain size to intelligence within a species, there is such a correlation across species. For instance, baboons and chimpanzees are smarter than non-primates of a similar body size. One of the reasons for this increased intelligence is that primates must learn everything they need to know in order to survive in their environment. Since this learning period requires a large investment of time and energy on the part of the mother, primates tend to have only one offspring at a time. This is especially the case for the larger monkeys and the apes. When twins are born, generally one or both will die during infancy because the mother's resources are over-taxed. Apes (chimpanzees, gorillas, and orangutans) have a particularly long developmental period, comparable to that of humans, and are, with the exception of humans, the smartest of the primates.

If you want to know how to differentiate a monkey from an ape, the best thing to do is to look at yourself. Most of the traits that differentiate you from a monkey also differentiate an ape from one. For instance, apes and humans are much larger than monkeys. Apes and humans don't have a tail, but most monkeys do have one. Apes and humans have a much larger brain-to-body ratio than is true of monkeys. Apes and

humans have a much longer lifespan. The average lifespan of an ape is 45 – 50 years. That of a human forager is also about 45 – 50 years, while that of a baboon, the largest monkey, is 25 – 30 years. Apes, particularly chimpanzees, actively teach their young how to do certain activities such as crack hard nuts using a hammerstone and anvil, or fish for termites using a specially-prepared wand. Humans also actively teach their young how to do various tasks. Monkeys do not do so. Next time you are at the zoo, spend an hour carefully watching the behavior of monkeys and another hour watching the behavior of chimpanzees. It should be an insightful experience.

Humans at the Equator

I mention chimpanzees frequently because they are our nearest relative. We are not descended from chimpanzees any more than you are descended from your first cousin. But we do share a common, many greats-grandmother. Around six million years ago, the ancestors of humans and chimpanzees were one big family. Something happened to isolate a small portion of the population from the rest of group. This founder group did not encounter members of the original group for tens of thousands of years. Over that period of time, the two groups gradually

became so distinct that they could no longer mate. The original population became the chimpanzees and the smaller founder group became us.

Our earliest ancestors are found in the Rift Valley region of East Africa, practically on the Equator. Therefore, we know that we evolved in a region of plentiful sunshine. It is improbable, then, that sunshine is solely a danger to health. Actually, when we speak about sunshine we need to break it down into the components most important to us: visible light and ultraviolet radiation. What is of interest to us in this discussion is ultraviolet radiation, in particular, the mid-range or UVB. The UVB range is from 280 nm to 320 nm. Although UVA radiation is involved in skin aging effects and tanning, the UVB range is associated with burning, skin damage, and skin cancers. The UVC radiation is even more damaging, but as almost no radiation in that range reaches the earth, it is not important to this discussion. ¹⁻³

Ultraviolet B radiation is not equally distributed over the earth either geographically or throughout the year. This is due to two factors: the angle of the earth to the sun and the varying thickness of the ozone layer around the earth. In the equatorial zones, the sun's rays are essentially perpendicular to earth for the entire year and the ozone layer is at its thinnest. This means that this region has continuous and abundant exposure to UVB radiation. For each ten degrees of latitude one moves

north or south from the Equator, the exposure to UVB radiation dramatically decreases due to an increasingly acute angle of the earth relative to the sun and an increasingly thick layer of ozone, which is thickest at the poles. Therefore, much less UVB radiation is able to penetrate the atmosphere to strike earth. Someone living in London, England or Paris, France receives 300 times less UVB radiation than does someone living in Accra, Ghana or Nairobi, Kenya. However, someone living at both a high altitude and a high latitude receives more UVB radiation than does someone living at sea level at the same latitude because the ozone is thinner at higher altitudes. Each 1000 m a person climbs in altitude increases UVB radiation exposure by 19%.³

The best way for a primate, human or ape, to adapt to high levels of UVB radiation is either to have a dense, very dark pelt of hair, as do chimpanzees, or very dark skin color, as do humans with long ancestry in the tropical zones of Africa. The reason for this is that melanin, the dark pigment in skin and hair, which is found in melanosomes (organelles of varying size occurring in skin and hair cells, produced by melanocytes), diffuses the UVB radiation striking it, allowing very little to penetrate. Individuals with very dark skin have large, closely-spaced melanosomes

that provide a very effective barrier to UVB radiation, somewhat similar to wearing continuously a SPF 15 sunscreen. ^{3, 4}

At this point, you may be thinking, OK, so all this is saying is that the sun is bad and that dark skin is a good thing. If this is the case, then why would I, the author, say that sun is a good thing? And why don't all humans have dark skin? The answer to both is that humans need UVB radiation. Yes, we need UVB radiation, especially in the range of about 290 nm. We need it because UVB radiation striking unprotected skin and penetrating to the lower levels of the skin activates a hormonal cascade that goes by the misnomer of vitamin D. Vitamin D was discovered in 1919 in cod liver oil just at the time that vital amines were being discovered in food. This was thought to be one of them, and as it was the fourth to be discovered, was given the name vitamin D. Much later, it was found that it occurs naturally in very few food items, that it has several different components, and that the active form is a hormone (1,25-dihydroxyvitamin D), but the name has stuck. ⁵

Vitamin D is essential for proper skeletal growth and maintenance. But its effects are more far-reaching as it has been shown to be involved in tumor suppression, and in the proper regulation of the immune system. Individuals with deficient levels of vitamin D may suffer from a variety of skeletal disorders including rickets, osteomalacia, and osteoporosis. ⁶⁻¹¹

Inadequate levels of vitamin D have also been associated with autoimmune diseases such as multiple sclerosis, rheumatoid arthritis, and diabetes. ¹²⁻¹⁶ Vitamin D has been used as a tumor-suppressant in the treatment of prostate cancer, and inadequate levels of vitamin D may be associated with breast and colon cancers. ¹⁷⁻²⁴ Individuals with hypertension and tuberculosis have seen improvement in their diseases when their vitamin D levels have been dramatically raised. ²⁵⁻³¹ Adequate levels of vitamin D are necessary to the maintenance of good health.

Why Skin Color Varies

Here we have the dilemma that most dermatologists ignore: too much UVB radiation can cause skin cancer, but too little can result in inadequate levels of vitamin D and all its associated health problems. How can we achieve an appropriate balance? We need to closely examine human adaptation to varying environments. We have good archaeological evidence that humans originated in the equatorial zone of East Africa. Since the equatorial zone receives the most UVB radiation and since very dark skin color protects from over-exposure to UVB radiation, we can make the logical assumption that the earliest humans had very dark skin. Vitamin D levels measured in the blood of individuals

with very dark skin color living in the tropics who spend most of their days outdoors show the average level to be in excess of 50 ng/ml (for 25 hydroxyvitamin D, the form which gives the best information on individual vitamin D status), much higher than what is currently considered the normal average of 30 ng/ml.³² Wild-living primates have much higher levels of vitamin D than do humans, further indicating that the so-called normal average level is much too low.³³

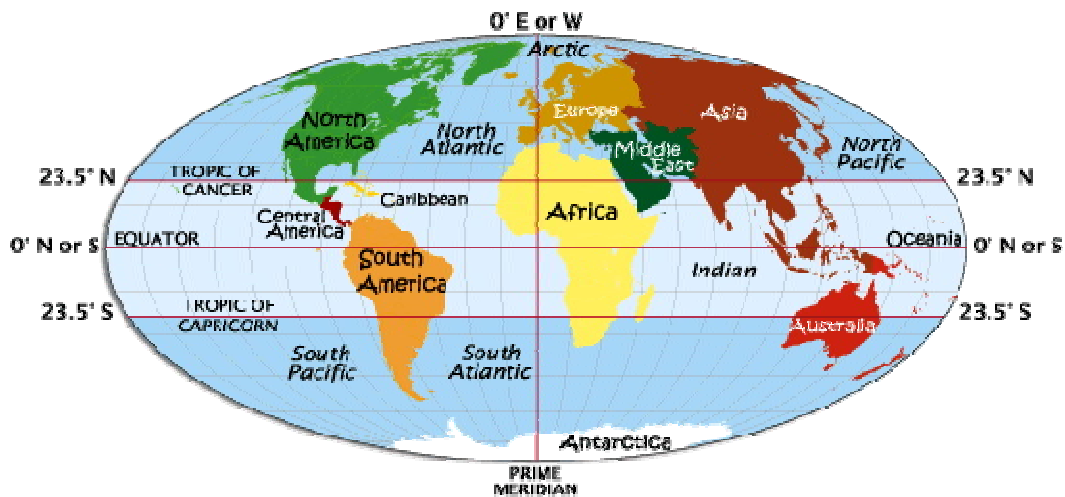
From the fact that individuals living in the tropics have high levels of vitamin D, we can deduce that although very dark skin color prevents most UVB radiation from penetrating to the lower layers of the skin, some UVB radiation does penetrate if enough time is spent outdoors in an equatorial zone, allowing the body to maintain adequate levels of vitamin D while at the same time preventing skin cancer. Dark-skinned individuals have about one-tenth the number of skin cancers found in light-skinned individuals.

This adaptation worked very well for a very long time. Humans were able to spend plenty of time in the strong equatorial sun doing their daily tasks without needing to worry about skin cancer while still having enough vitamin D to maintain good health. However, as human populations grew, they began to move into new territories. Over many thousands of years, humans gradually moved into more temperate

climates. New types of adaptation making this move possible included better tools, controlled use of fire, and clothing. But human bodies also needed to adapt to the changing environment.

The tropical zone begins at the Tropic of Cancer, crosses the Equator, and ends at the Tropic of Capricorn. The temperate zone is between the tropical zone and the polar zone, encompassing the region from about 24 degrees latitude to 66 degrees latitude. The subtropical zone is the lower portion of the temperate zone from about 24 degrees latitude to 40 degrees latitude. The temperate zone covers the United States, Europe, and Canada, about half of Asia, the southernmost parts of Africa and South America, the southern half of Australia, and all of New Zealand. The polar zones are within the Arctic and Antarctic Circles.

Figure 1



<http://www.worldatlas.com/aatlas/imagee.htm>

Since very dark skin was the best adaptation to living in an equatorial environment thousands of years ago, those who were very dark skinned were most likely to survive to have children and to pass on their genes to future generations. Skin color is a complex trait involving the interaction of multiple genes, each gene having multiple variations. This means that an extensive range of skin color is possible. Therefore, even though most individuals living in this ancient population would have been very dark skinned, on occasion someone would be born who had lighter skin color. Generally, this person would not survive to pass on her genes because she would develop skin cancer, in particular melanoma, and would die prior to being able to ensure that any children she had survived

to adulthood. High rates of melanoma occur in the 20 – 50 age bracket, the prime reproductive years.^{34, 35}

However, as groups gradually moved into higher latitudes, those who were somewhat lighter skinned actually had a better chance of passing on their genes than did their darker-skinned relatives. This is because the balance of maintaining just the right amount of UVB radiation exposure to ensure adequate levels of vitamin D while also preventing skin cancer was changing.

Light colored skin has very few melanosomes and those that it does have are tiny and tend to clump together instead of being evenly spaced. This allows most of the available UVB radiation to penetrate to the lower levels of the skin. Another way to understand the effect of melanosomes is to imagine skin color as different types of fabric. Very dark skin with its large, tightly packed melanosomes can be compared to the heavy, tightly-woven canvas used in tents and sun umbrellas. Very little sunlight is able to penetrate the canvas fabric. On the other hand, very light skin can be compared to fish net, more holes than fabric. Virtually all available sunlight is able to penetrate the loosely woven or knotted fish net. While this permits vitamin D levels to be easily maintained if there is adequate UVB radiation exposure, it also increases the risk of developing skin cancer. But in higher latitudes, UVB radiation is

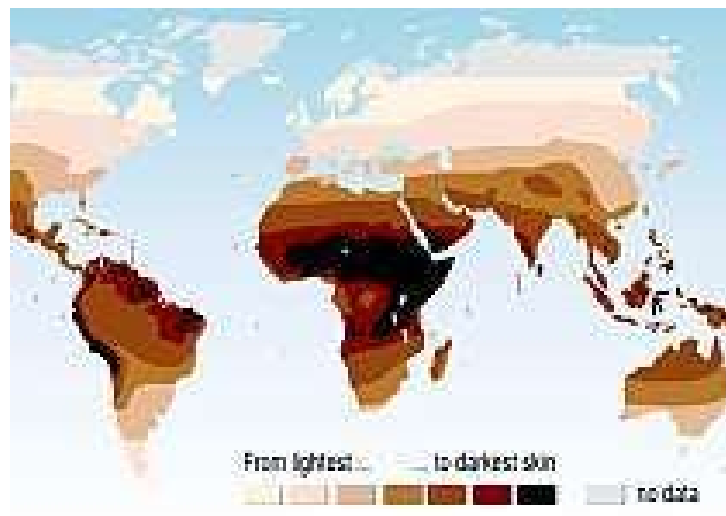
dramatically reduced when compared to that available in the lower latitudes. This means that as our ancestors gradually moved into higher latitudes, those who had very dark skin would have had difficulty maintaining adequate levels of vitamin D and would have developed a variety of health problems.

Infants who do not get enough vitamin D develop rickets. Their skeletal growth is delayed and the bones do not develop properly; the long bones are bent out of shape. Another problem that occurs is that the bones of the pelvis, the hip bones, also become improperly shaped with the result that instead of having a rounded pelvis, the pelvis is flattened. This may affect the ability to walk in males and females, but there is a worse effect in females. Pregnant women who have a flattened pelvis cannot give birth normally. In the past, this would have meant that the infant, and probably the mother, would have died during childbirth. Women with very dark skin color living at higher latitudes would have been more likely to have had rickets as an infant and would have had more difficulty giving birth as an adult than would women with lighter skin color.³⁶ The balance would have shifted.

As we can see, skin color is adapted to the differing UVB radiation levels of our ancestors' environments, darkest in the equatorial zones, and gradually lightening as we move toward the polar regions. The transition

in degree of pigmentation is smooth and gradual. Of course, this has changed in the past several hundred years with individuals from all different regions living in locations far from their ancestral homeland. In addition, with the rise of urbanization and industrialization over the past 300-400 years, humans live in an increasingly unnatural environment. These changes have had a major impact on human health.

Figure 2



http://maps.grida.no/library/files/skin-colour-map-indigenous-people_thumbnail_002.jpg

Modern Life

Humans are primates and primates are tropical species. While we have adapted, both physically (with changes in degree of pigmentation)

and culturally (with changes in technology) to non-tropical environments, these changes are not without their costs. Humans living in a region of reduced UVB radiation, even if they have a very light skin color, have a very hard time maintaining adequate levels of vitamin D. In temperate zones, UVB radiation is at its peak during the mid-summer months. It declines to virtually nothing during the winter months and only gradually builds to the summer peak during the spring. If you live in the temperate zone you need to get your entire “budget” of vitamin D during the summer months since vitamin D can be stored in the body for several weeks. However, even if you had adequate levels of vitamin D during the summer months, your levels would be suboptimal by late winter/early spring. Even the very lightest skin color in the most northern latitudes is an inadequate adaptation. Research done in coastal Finland in the 1920s found that in those villages where fish formed a major part of the diet, there was very little rickets, but in those villages where little fish was eaten, rickets occurred at very high rates.³⁷ Cold-water fish, in particular salmon, mackerel, sardines, and herring, are among the very few food items that can be eaten in normal quantities to provide supplemental vitamin D.³⁸

If you have light skin and live in a temperate zone you need to expose your unprotected skin (no sunscreen on it) to UVB radiation

between 10 am and 3 pm during the summer months for about 30 minutes per day to obtain adequate levels of vitamin D (at least 50 ng/ml for 25 hydroxyvitamin D). If you have very light skin and live in the desert Southwest or in south Florida, 15 minutes per day of UVB radiation may be enough.

If you have very dark skin and live in a temperate zone, it will be almost impossible for you to get enough exposure during the summer months to maintain adequate levels of vitamin D since you may need to expose your unprotected skin for up to six hours each day.³⁸ You will have quite inadequate levels of vitamin D by late winter.

Modern life does not take into account this need for adequate vitamin D levels since most employed individuals are at work between the hours of 10 am and 3 pm and few take their lunch break outside. Even children are spending more of this time period indoors during the summer months.

During the 1910s and 1920s, the same period that vitamin D was discovered, the importance of sunlight/UVB radiation to the prevention of rickets was also discovered. Doctors urged parents to take their babies outside each day to get some sun. In fact, in some European countries the government in effect required parents to sunbathe their infants and

children. And where previously a pale skin had been the sign of wealth, now a tan indicated that one had the leisure to be outside during the hours most others were working. Sun exposure and dosing with cod liver oil were beginning to reduce the incidence of rickets, at least among those with light skin. But because the rate was still high, in the late 1930s, the US government decided to fortify a common food product with vitamin D. After some discussion, milk was chosen because it was assumed that all children drank milk.³⁹⁻⁴¹ Several European countries chose to fortify margarine.^{42, 43} These efforts were successful. By the latter half of the 20th century, rickets was so rare among light-skinned individuals that medical students received only minimal information about it. When, as physicians, they were later confronted with signs of rickets in their practices, they didn't know what the problem was.

As with all things, balance and moderation are required. This rule was ignored when it came to sun exposure. If some was good, then more ought to be even better. The result of over-exposure to the sun has been a sky-rocketing rate of skin cancers, especially the more serious and frequently deadly melanomas, among individuals with light skin color. Since most adults work during the day and during the week, their chance for sun exposure is limited to the weekends. On the weekends, the family treks off to the beach or the park and spends the entire day outside, often

ending the day with severe sunburns. This intermittent, but intense and burning exposure to UVB radiation appears to be the primary factor in the development of melanomas. While individuals in temperate zones whose jobs require that they work outdoors, and who do so without protecting their skin, frequently develop the less serious forms of skin cancer, they rarely develop melanomas. Vitamin D (1,25 OHD) is a tumor-suppressant and has been shown to induce cellular death in some melanomas. ^{44, 45} It may be that individuals with light skin color who work outdoors have high levels of vitamin D in their blood which protect them from melanoma in temperate zones. The protection would probably be inadequate in equatorial zones where UVB radiation is several hundred times more intense.

Because of the huge increase in the numbers of skin cancers among those with light skin color, sun avoidance is now urged. In addition, parents are told that infants under six months of age should not be exposed to any sun; and once past that age, all infants and children should wear a SPF 40 sunscreen when outside. Parents are also told that they should make sure their children wear hats and cover up their skin whenever possible.

Tests have shown that a SPF 8 sunscreen blocks the skin's ability to produce vitamin D. Therefore, if one follows the dermatologists'

recommendations, infants and children will be unable to naturally produce vitamin D. This is a very serious concern since it is extremely difficult to obtain any vitamin D from the diet, let alone enough to maintain appropriate blood levels. Later chapters will discuss diet in more detail.

Although the number of rickets cases dropped dramatically in the United States during the middle decades of the 20th century, rickets never went away and has remained a problem for many populations throughout the world. And now we are seeing increasing numbers of rickets cases, even among light-skinned infants and children.¹⁰ This is largely the result of parents strictly following the new dermatological guidelines. If you as a parent wish to follow these guidelines, then you must make sure that your infant or child takes vitamin D drops. The current recommended level is 200 IU/day.⁴⁶ However, the level that was used in the past to prevent rickets was 400 IU/day.⁴⁷ This may have been adequate when infants and children also received sun exposure, but if protected from such exposure, then even 400 IU/day may be inadequate.

Current research on vitamin D levels indicates that the minimum daily dose of vitamin D for all individuals should be 1000 IU. In the more northern latitudes of temperate zones such as Canada and northern Europe, 2000 to 4000 IU/day may be required to maintain adequate blood

levels of vitamin D. ^{15, 47-49} Research in Hungary on children who had rickets found that even a daily dose of 1200 IU was not enough to prevent rickets. ⁵⁰

Although I've talked a lot about rickets, there are many other health problems associated with inadequate vitamin D levels that have also been increasing in recent years and that will likely worsen if sun avoidance becomes the norm and no change in diet and/or supplementation of vitamin D occurs. African-American males have the highest rate of prostate cancer in the world. It strikes at a younger age and in a more severe form than is true for those in other groups. ⁵¹ African-American females are also affected at a younger age and more severely by breast cancer, although they do not have the highest overall rate for this disease. ⁵²⁻⁵⁴ In addition, African Americans have higher rates of hypertension and type 2 diabetes than do most other populations. ⁵⁵ Individuals in this group have a range of skin colors from moderate to very dark. If you are in this group and follow the dermatological guidelines for yourself and your children, it is probable that your overall health and that of your children will worsen over time. In order to prevent a small number of skin cancers (skin cancer is rare in those with dark skin color) and some premature skin

aging, more severe health problems, already occurring at high rates, will worsen.

Humans and the Sun

- Humans are primates.
- Primates are tropical species.
- UVB radiation activates the vitamin D hormonal cascade.
- Primates living in the wild have much higher levels of vitamin D than current average levels in humans living in temperate zones.
- Humans living in tropical zones average 50 ng/ml of 25 OHD compared to an average of 30 ng/ml in the United States.
- Vitamin D:
 - Necessary for proper bone growth and remodeling
 - Prevents rickets
 - Prevents osteoporosis
 - Acts as a tumor-suppressant
 - Alleviates symptoms of:
 - auto-immune diseases
 - hypertension
 - seasonal affective disorder

Seasonal Affective Disorder

Another problem associated with not getting enough sun exposure is Seasonal Affective Disorder (SAD). This condition is common in the more northern latitudes where sunlight is rare throughout a good portion of the year. Individuals suffering from SAD experience varying degrees of depression and lethargy: they tend to sleep longer, are less active, and are more irritable. These symptoms lessen or disappear when individuals are exposed to sunlight or full spectrum light boxes.⁵⁶ Suicide rates are higher in the more northern latitudes where limited sunlight is most common and SAD is most frequent. For instance, those living in Greenland suffer from higher suicide rates than do those living in Denmark; Canada has higher adolescent suicide rates than does the United States; those living in the Northwest Territories of Canada have higher suicide rates than does the rest of Canada; and suicide and alcohol consumption rates are higher in northern than southern Europe.⁵⁷⁻⁶⁰

Seasonal Affective Disorder appears to be associated with the season in which you are born. Research in Japan found that the majority of those with SAD were born in the winter-to-early-spring season, and that this was especially true for women. The highest rates of SAD were among women born in March.⁶¹ In other research, individuals with SAD

were divided into two groups. One group received standard phototherapy (exposure to a full spectrum light box), while the other group received 100,000 IU of vitamin D. Those receiving phototherapy showed no significant improvement in measures of depression, but all those receiving vitamin D improved on all measures of depression. ⁶²

If you are a woman living in a temperate zone like the United States and your baby is born in winter to early spring, you are giving birth at a time when your stored vitamin D levels are plummeting and when your baby will not get any UVB radiation exposure even if you take him out in the sun. It is likely that your baby will be born with low levels of vitamin D. If you don't give your baby vitamin D drops, the amount of vitamin D in his blood will continue to decline and he could develop rickets or other health problems. Once summer comes, if you take him outside a lot, the amount of vitamin D in blood will go up. However, if you carefully follow the advice of dermatologists to avoid sun exposure and also do not give your baby vitamin D drops, the level of vitamin D in his blood will not improve and will only get worse. One of the health problems that could occur is that your baby will suffer from SAD as he grows up. If you or anyone in your family has seasonal depression (SAD), you may want to find out if they were born in the winter-to-early spring months and whether or not they get enough UVB exposure during the summer months. It appears that the

best prevention for SAD is adequate exposure to UVB radiation.

Summary

Humans are adapted to sunlight and UVB radiation exposure. If we do not receive enough exposure, our health and well-being will suffer. If we receive too much exposure, we will also have health problems. A balance must be maintained and careful consideration given to the differing health issues caused by over-exposure versus under-exposure. Total avoidance of sun exposure is no better for our health, and may, in fact, be much worse, at least in temperate zones, than is total exposure. Skin color, the latitude at which you live, your daily activities, and your diet must all be considered when you determine what exposure is best for you. Balance is critical. Achieving the proper balance for you and any family members is going to require careful thought and time and effort on your part, but it will be worth it.

Vitamin D is the Key

The missing key to health and well-being for most of us living in the United States is an adequate level of vitamin D. Vitamin D is the Key that will unlock better health. Vitamin D is not actually a vitamin. Instead, it comes in a variety of forms from prehormone to prohormone and finally to the active hormonal form. Since it is not a vitamin, it is extremely difficult to get it from food, whereas it is relatively easy, depending on your skin color and where you live, to get vitamin D by exposing unprotected skin to UVB radiation. In this chapter, you will have an opportunity to estimate how much vitamin D you are currently getting, either through your diet or through sun exposure.

Limited Exposure

The first step is to determine your current level of exposure to UVB radiation. To do so, fill in **Worksheet 1: UVB Radiation Exposure and Vitamin D Supplementation.** [See Appendix.] This information will provide you with some idea of your UVB radiation exposure during your childhood and as an adult. For instance, if you were born in February in Seattle, WA, the odds are good that you were born with a suboptimal level of vitamin D in your blood. Your vitamin D profile may have improved

during your childhood if you have light skin and spent at least 20-40 minutes between 10 am and 3 pm outside each day during the summer months without using sunscreen. However, if you have dark skin, you may have needed to spend the entire five hour period outdoors to achieve the same blood level of vitamin D that a child with a light skin color could achieve in 40 minutes.

If you were born in Phoenix, AZ during July, you were probably born with an adequate level of vitamin D if your mother had light-to-moderate skin color. If you also have light-to-moderate skin color and you spent enough time outdoors as you grew older, you have probably been able to maintain good levels of vitamin D in your blood. The highest levels of UVB radiation in the United States occur in the Southwest region and in southern Florida. Individuals living in these locations have the opportunity to achieve UVB radiation exposure for more months during the year than is true for those living at higher latitudes, such as Seattle, so it is easier for them to maintain adequate blood levels of vitamin D. However, this is not necessarily a given. If your mother was Muslim, wore traditional clothing, and kept you indoors when you were a baby and young child, then the odds are extremely high that you were born with inadequate levels of vitamin D, and this would not improve during childhood. This is true even if your mother lived in a region of high, year-round UVB radiation. Rickets

in infants and young children, and osteomalacia in adult women, are extremely common among traditional Muslim women. Muslim women in Saudi Arabia who receive essentially no UVB radiation exposure despite their location, have almost undetectable levels of vitamin D and give birth to infants similarly deprived.⁶³ This problem begins for females at adolescence as their clothing and behavior come under more cultural restrictions. Rickets reappears and is quite common among Saudi adolescent females.⁶⁴ Therefore, in addition to determining when and where you were born and grew up, you must take into account any cultural practices that might affect your UVB radiation exposure.

Receiving UVB radiation exposure solely on weekends can be dangerous. You are more likely to overexpose yourself and receive a burn. This severe, intermittent exposure appears to be associated with the development of melanoma. It is important to be very careful about your exposure on weekends. The best way to obtain adequate levels of vitamin D from UVB radiation exposure is on a daily basis for the length of time appropriate for your skin color. However, since most adults work during the hours of 10 am to 3 pm, very few are able to obtain adequate UVB radiation exposure during the week. For those who have light skin color, taking a 20-minute walk outside during your lunch break, and two 5-minute walks during the morning and afternoon breaks may be adequate.

Again, this level of exposure will be much too little if you have dark skin color.

If you suffered any severe, blistering burns as a child and/or adult, you should have your skin checked out by a dermatologist to determine whether you have any cancerous or precancerous growths. If you do have such growths, you will need to avoid UVB radiation exposure and obtain your needed vitamin D via diet and supplementation. In the United States, to obtain adequate vitamin D from supplementation may require a prescription or ordering from an on-line Canadian pharmacy. In Canada, one can obtain vitamin D in 1000 IU doses in over-the-counter formulations. If you do not have cancerous/precancerous growths, you can probably obtain your vitamin D from UVB radiation exposure. However, you must be very careful not to overexpose yourself. If you have light skin color, with light eyes, and blond or red hair, you should ensure that your UVB radiation exposure does not exceed 30 minutes per day, and that exposure should probably occur in 10 – 15 minute segments. After that, make sure to wear protective clothing and sunscreen. The deeper your skin color, and the darker your hair and eye color, the longer you can be exposed to UVB radiation without burning. And the longer you will need to be exposed to obtain adequate levels of vitamin D. Saudi children with moderate skin color, living in a region of

UVB radiation exposure equivalent to that of the Southwest United States and the Caribbean, need in excess of 60 minutes per day of UVB radiation exposure to obtain levels of vitamin D high enough to prevent rickets. ⁶⁴ A study in Libya found children there needed in excess of three hours per day of exposure to raise their vitamin D levels to the levels achieved by very light-skinned children living in Norway during their much briefer summer exposure. ⁶⁵

Although students are generally not in school during the summer months, this is changing as many school districts increase the length of the school year. In addition, some school districts are considering eliminating recess and outdoor playtime during the lunch period for those in elementary school. The reasons given for this are that recess interrupts learning sessions, and that in-class activities can be both fun and educational. Eliminating recess ignores the needs of children to have periodic breaks, to work off excess energy, and to receive UVB radiation exposure during the day. The more we ignore our natural biology, the more health problems we will have, and at earlier and earlier ages.

Calcium is relatively useless, and may even be harmful, if you do not have adequate levels of vitamin D in your blood. Taking a calcium supplement that is combined with vitamin D is an improvement, although the vitamin D in each supplement is inadequate. However, in order to

obtain adequate levels of vitamin D, one would obtain possibly dangerously high levels of calcium and/or other vitamins if taking a multivitamin. The best and safest method of obtaining adequate levels of vitamin D is through appropriate UVB radiation exposure of unprotected skin. Large doses of vitamin D via supplementation can create health problems such as kidney stones. You cannot overdose on vitamin D obtained through UVB radiation exposure. But you can overdose on supplements.

Prescription for Change

Once you have completed Worksheet 1 and carefully thought about your answers, you will have some idea of your lifetime exposure to UVB radiation and, consequently, whether your vitamin D levels may be inadequate. You can have a blood test done to determine your exact level at the time of the test, but such tests are uncommon and probably will not be covered by insurance unless you have osteoporosis. If you do choose to have the test done, make sure that the test measures the 25-hydroxyvitamin D (25 OHD) level, not the 1,25-dihydroxyvitamin D (1,25 OHD). The 1,25 OHD level can appear normal to a physician, while the 25 OHD level is actually inadequate. Such a situation is indicative of an

out-of-balance vitamin D hormonal system and is associated with health problems.

If you have the 25 OHD level tested, you may want to test it both in February and in August. Vitamin D varies by season, with the highest levels in the summer months and the lowest in late winter. Although many physicians consider any measurement of 25 OHD between 10 and 60 ng/ml to be in the normal range, this is simply because they are using data based on tests done on individuals of European descent who did not appear to have any bone disorder such as rickets, osteomalacia, and osteoporosis.⁶⁶ This range was based on prevailing levels in these individuals rather than on those levels required for optimal health. However, recent research has shown that the normal average level of 25 OHD should actually be 40 - 60 ng/ml if we base it on healthy individuals living in equatorial regions, and even higher if we use our wild-living primate relatives as the reference group.^{32, 33} Any measurement below 32 ng/ml should be considered inadequate for optimal health.⁴⁹ If you choose not to be tested, you can still have an idea of whether your vitamin D levels are adequate or not. If you have light skin color and get less than 30 minutes/day of UVB radiation exposure (between the hours of 10 am and 3 pm during the summer months) or if you have very dark skin color and get less than five hours/day UVB radiation exposure, the odds are

that your levels of 25 OHD are inadequate for optimal good health. You can make up the difference somewhat through diet, but as you will see when you fill out **Worksheet 2: Vitamin D Intake**, this is quite difficult to achieve.

Worksheet 2 lists all the food items containing vitamin D either naturally or through supplementation. Dairy and cereal products are supplemented with vitamin D. Eggs contain vitamin D because chickens are fed vitamin D-fortified feed since poultry kept indoors suffer from very high rates of rickets if they do not receive adequate amounts of vitamin D in their diet. The vitamin D is stored in the egg fats. As a point of interest, vitamin D is also added to the food given to primates and other tropical animals housed in zoos in temperate zones in order to prevent rickets.

If you plan to follow the Premiere Nutrition plan (discussed in a later chapter) and eliminate all dairy and grain products, your food options for obtaining vitamin D are essentially limited to eggs and cold water fish. If you compare the foods you eat as checked on Worksheet 2 with the amount of vitamin D in each of those foods as shown on Table 1, you will find that the best sources of vitamin D are the fish. Eating sardines and salmon provide a quadruple benefit. They are a good source of: 1) low-fat

protein, 2) omega-3 fatty acids, 3) vitamin D, and 4) calcium (through eating the tiny bones).

Eskimos have a moderate skin color and have lived in the Arctic region for about 5,000 years. This region has the lowest level of available UVB radiation in the world; therefore, you would expect that any groups living there would have very light skin color as do Scandinavians. However, Eskimos have been able to live successfully in this region because they eat at least six times more fish than do those of European descent living in the same regions, thereby providing the Eskimos with high levels of vitamin D. Eskimos who eat a traditional diet have a calcium intake primarily from fish (such as sardines, salmon, and needlefish) and kelp.⁶⁷ Those with a mixed diet (traditional and market) get most of their calcium from market foods. Osteoporosis is currently a major problem among Eskimos.⁶⁸⁻⁷⁰ It is unclear what role dietary changes have played in this problem. It may be that even a slight decrease in dietary intake of vitamin D from fish, with the fish being replaced by market goods, may be too great when a group of people lives in an environment far different than the tropical environment for which humans evolved. That the key element is vitamin D not calcium is supported by research which found that Finns who had a high dairy intake,

but ate little fish, had high rates of rickets compared with those Finns who had a low dairy intake, but ate fish several times per week. ³⁷

The amounts of vitamin D in each of the foods shown in Table 1 are listed in International Units (IU) or micrograms (mcg). Current Recommended Dietary Intake (DRI) of vitamin D for adults under age 50 is 200 IU or 5 mcg. Previously, the amount was 400 IU or 10 mcg. This is now given as the amount for those aged 50 – 70. For those over age 70, the amount is 600 – 800 IU or 15 – 20 mcg. If you are getting most of your vitamin D through exposure to UVB radiation, the DRI amounts may be fine during the summer months. But if the goal is to achieve a 25 OHD level of 50 ng/ml, the DRI amounts are too low during the winter months, and are especially too low if you are getting your vitamin D through diet. Young adults with light skin color who spend a good portion of the summer outdoors have blood 25 OHD levels of 60 ng/ml. To get such levels through diet or supplementation would require taking 5096 IU or 127.4 mcg of vitamin D₃. ⁴⁹

The minimum amount of vitamin D you get from your diet or supplementation should probably be 1000 IU or 25 mcg per day. If you live in Canada, or other far northern latitudes, researchers recommend an intake 4,000 IU or 100 mcg per day of vitamin D. If you do not eat the listed fish several times per week, it is exceptionally difficult to get 1,000

IU or 25 mcg per day of vitamin D from the diet. Obtaining 4,000 IU or 100 mcg (or more) per day from your diet is impossible unless fish are virtually your sole source of protein and/or more than 20% of your diet is in the form of protein. That is, you would need to eat as much fish as do Eskimos when they eat a completely traditional diet. Since most of us will not do that, and since even most Eskimos appear to no longer do that, supplementation is necessary.

Canadians can obtain vitamin D over the counter in 1,000 IU doses, so it would be fairly easy for them to achieve the recommended level of vitamin D supplementation. This is not the case in the United States where vitamin D generally comes in 400 IU doses bound to a multivitamin or to calcium. Higher doses of vitamin D or vitamin D alone require a prescription, or purchase through an on-line pharmacy that sells vitamin D in 1000 IU doses. As mentioned previously, a concern with supplementation is that you may develop too high levels of calcium in your blood which could create kidney stone problems. However, research was done which had subjects take 350 mcg (14,000 IU) per day of vitamin D for twelve months; no evidence of elevated levels of calcium was found.⁴⁸ Therefore, an intake of 4,000 IU per day should create no problems with calcium. Another point that needs to be stressed when dealing with supplements is that the type of vitamin D used in the supplement needs to

be vitamin D₃ also called cholecalciferol. The form generally used in North America is vitamin D₂ or ergocalciferol, a synthetic variant not produced in animals, including humans. The synthetic form has different biologic properties from vitamin D₃ and could be more toxic than the naturally-occurring vitamin D₃.⁴⁸

Summary

Adequate levels of vitamin D are critical to optimal health. Current standards for what is considered the normal range of vitamin D (25 OHD) are too low at the lower end of the range. A measurement of less than 40 ng/ml of 25 OHD is probably evidence of health problems.

The best method for obtaining adequate vitamin D is the method used for millions of years: appropriate exposure of unprotected skin to UVB radiation. In the temperate zones of North America, this exposure is primarily obtained during the summer months between 10 am and 3 pm. If the natural method is inadequate or not possible, then you can get vitamin D by eating a diet heavy in fish such as salmon and sardines and/or through supplementation. Current research indicates that the minimum daily dosage of vitamin D through diet and/or supplementation should be 1000 IU or 25 mcg per day. For those living in the more

northern latitudes, a dosage of 4000 IU or 100 mcg per day is recommended.

Okinawans have one of the longest average life spans and the largest numbers of centenarians per 100,000 of any population. Some researchers believe this is due primarily to their diet, exercise profile, and low-stress lifestyle.⁷¹ While these all play a role, it is probable that the major key to the good health of their oldest old is the fact that Okinawans are a group whose individuals have light-to-moderate skin color and who live fairly near the Equator at a latitude of 25° N. They spend a great deal of time outdoors gardening and exercising, and are exposed to UVB radiation on a year-round basis. This means that their average blood levels of 25 OHD, if tested, would probably be optimal at 50 ng/mL. The health and longevity of the oldest old on Okinawa probably owes more to their receiving adequate levels of UVB radiation resulting in optimal levels of vitamin D than to their diet, which is grain-based.

Without enough vitamin D in your blood, your health is at risk. It is extremely important that infants, children, adults, and seniors maintain appropriate levels of vitamin D if they are to avoid skeletal problems. Adequate levels of vitamin D may also suppress tumor development in prostate, colon, and breast cancers, and in the skin cancer melanoma. Symptoms of hypertension, diabetes, rheumatoid arthritis, and multiple

sclerosis, among other autoimmune problems, are reduced or eliminated by increased levels of vitamin D. Vitamin D is the Key to Optimal Health.

Your Skin Color and Your Health

So, do you have adequate levels of 25 OHD? After completing the worksheets in the last chapter and estimating your UVB radiation exposure and current intake of dietary vitamin D, many of you are probably somewhat concerned. But this book is about getting you to take real charge of your health. If you have moderate-to-dark skin color, you need to be more than somewhat concerned, you need to be seriously worried because the odds are extremely high that your levels of 25 OHD are grossly inadequate.

Americans with primarily West African ancestry suffer from several health problems at higher rates than is true of other Americans. They have an incidence of low-birth-weight infants and infant mortality which is at least double that of Americans with primarily European ancestry. Their rate of prostate cancer is the highest in the world. Breast cancer occurs at a younger age and in a more severe form than is true for American women with primarily European ancestry. Hypertension, a serious problem among Americans with primarily West African ancestry, often goes undiagnosed, clusters with diabetes, and is associated with heart disease. Both diabetes and heart disease result in higher incidences and

mortality rates among Americans with primarily West African ancestry compared to Americans with primarily European ancestry.⁷²

These health problems have multiple causes, but one which has received little attention is a life-long inadequate level of vitamin D (25 OHD). That vitamin D is a major factor and not some trait or experience specific to Americans with primarily West African ancestry is shown by the fact that these same health problems are appearing among South Asian populations living in North America and Great Britain. The characteristic shared by Americans with primarily West African ancestry and Americans or British with South Asian ancestry is degree of skin color: individuals in both groups tend to have moderate-to-dark skin color. North America and Great Britain are in the temperate zones with most of North America and all of Great Britain at the high latitudes that receive little UVB radiation, except for a few weeks during the summer months. This means that the dark skin color of these individuals prevents them from obtaining adequate levels of vitamin D through exposure of unprotected skin to UVB radiation. This is made worse by diets which contain few of the fish that are high in vitamin D, along with little or no vitamin D supplementation.

Although not mentioned in the usual lists of health problems, one that affects Americans with West African ancestry at higher rates than is true of other groups is rickets. All but a small percentage of diagnosed

cases in the United States are among Americans with West African ancestry, while in Great Britain the majority of cases are among those with South Asian ancestry. These cases of rickets are clear indications of extremely inadequate levels of vitamin D among infants and children. It is probable that a high percentage of infants and children with West African ancestry have sub-clinical rickets, but that the symptoms are not severe enough for the pediatrician to notice. The remaining infants and children probably have suboptimal levels of vitamin D which are not improved as the individual grows up and becomes an adult. A lifetime of inadequate or suboptimal levels of vitamin D provides the basis for many of the health problems that now concern public health officials.

Intriguingly, there is a health problem that occurs in one group at much higher rates than is true of the other health problems discussed here, but it is not usually thought of in the same terms. This problem is skin cancer which occurs at disproportionately high rates among those light-skinned individuals of northern European ancestry. This is particularly the case among those individuals with light skin color living in Australia, a country with high levels of UVB radiation. Individuals with light skin color have ten times the rate of melanomas that are seen in individuals with dark skin color, and the vast majority of cases of basal cell and squamous cell skin cancers are found on individuals with light skin

color. No societal or economic factor or genetic difference between populations is publicized as the cause of this huge difference in incidence rates. The disparity in skin cancer rates is quite clearly due to individuals with light skin color receiving too much UVB radiation. Why, then, is it improbable that the health disparities listed above which more severely impact individuals with dark skin color would be due not to a societal or economic factor or a genetic difference between populations, but instead due to individuals with dark skin color receiving too little UVB radiation?

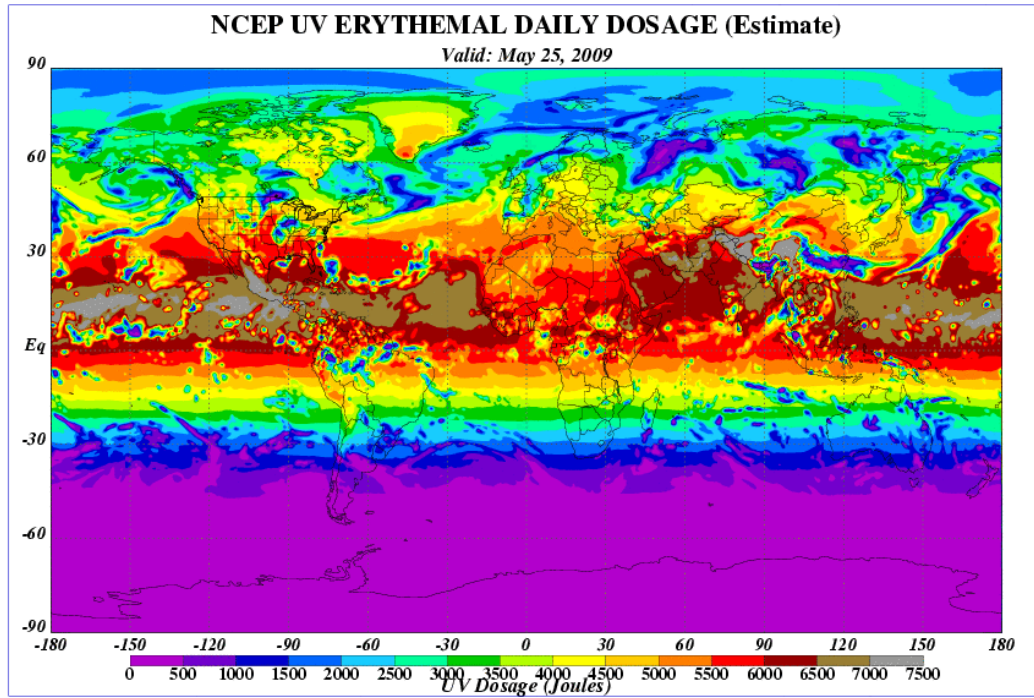
Inadequate levels of vitamin D play a role in breast and prostate cancers, hypertension, diabetes, and the intrauterine growth retardation which results in low-birth-weight infants and can lead to infant mortality.^{38, 73} The hormonal form of vitamin D (1,25 OHD) acts as a tumor-suppressant. Adequate levels of vitamin D throughout life may serve to restrain tumor growth and development, while inadequate levels allow tumors to grow undisturbed. The earlier onset and more severe prognosis of cancer among Americans with West African ancestry may well be due in part to a lifetime of suboptimal levels of vitamin D. This is supported by the lower rates of breast and prostate cancers found among those of West African ancestry living in equatorial zones. These individuals have the opportunity for exposure year-round to extremely high levels of UVB radiation and so are better able to maintain optimal levels of vitamin D.

Increased levels of vitamin D from infancy on may well reduce the incidence and severity of breast and prostate cancer.

Hypertension also shows a latitudinal effect: lower rates occur in equatorial zones than in temperate zones. At one time this was thought to be related to temperature changes, but it is now clear that the factor is differing levels of UVB radiation exposure. Individuals with hypertension were able to lower blood pressure levels after exposure to full body UVB radiation resulting in raised levels of vitamin D. There is a clear gradient of hypertension among those of West African ancestry. Of three populations examined, the lowest rates were among Nigerians, higher rates were found among Jamaicans, and the highest rates of hypertension were found among Americans.⁷⁴ It therefore appears that increasing exposure to UVB radiation and/or increasing blood levels of vitamin D should result in lowered blood pressure. This would also reduce the incidence of heart disease, the major cause of death in the United States.

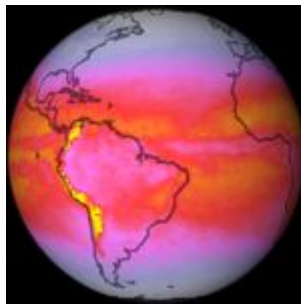
28, 30, 75, 76

Figure 3



http://www.cpc.noaa.gov/products/stratosphere/polar/gif_files/uv_dosage_world_est.gif

Figure 4



UVB Radiation Exposure in March

<http://veimages.gsfc.nasa.gov/7144/uv.toms.199303.023.thumb.png>

Diabetes is an autoimmune disorder, as are multiple sclerosis and rheumatoid arthritis. Increased blood levels of vitamin D have been associated with improvements in these diseases. While type 2 diabetes is primarily associated with obesity and a diet with a high glycemic index (see Premier Nutrition Chapter), it may well be that suboptimal levels of vitamin D disrupt glucose metabolism, setting the stage for the later development of diabetes.

Population-based studies have found that individuals with low blood levels of 25 OHD have a higher risk of developing type 2 diabetes than do those with normal levels because vitamin D is involved in insulin release and normal glucose tolerance. ^{14, 77, 78} In order to prevent diabetes, it appears that adequate blood levels of 25 OHD must be maintained throughout life, although a determination of “adequate” in this case has not yet been made. Once diabetes becomes established, raising 25 OHD levels has only limited effect. ^{14, 77, 78} Therefore, in order to prevent diabetes, it would appear that in addition to maintaining appropriate body weight and eating foods with a low glycemic index, you should also make sure to maintain optimal levels of vitamin D. The best way to do this is to eat according to the Premier Nutrition plan and to get appropriate exposure to UVB radiation and/or vitamin D supplementation. Later chapters will provide more complete information.

Intrauterine growth retardation and premature delivery are among the primary factors in the incidence of low-birth-weight infants; and being of low birth weight is one of the main factors associated with infant mortality. American infants with primarily West African ancestry are about twice as likely to be of low birth weight and are about twice as likely to die as are American infants with primarily European ancestry. This gap has remained unchanged since the first article on this topic appeared in 1904.

⁷⁹ Medical care, prenatal care, and overall health have improved tremendously since 1904, but the gap remains. What has remained unchanged over the past century is that individuals with dark skin color living in the United States, particularly in northern urban centers, have much greater difficulty in maintaining optimal levels of vitamin D than do individuals with light skin color living in the same regions.

Fetal development is dependent on the mother. In an effort to maintain appropriate blood vitamin D levels, the fetus, via the placenta, draws on the mother's stores of vitamin D. Pregnancy and lactation are major stressors on the woman's stores of vitamin D and calcium. Even well-nourished women who breast-feed can lose 5% of bone mineral density, as measured at the femoral neck and lumbar spine, although bone mineral density recovers when breast-feeding ceases. ⁸⁰ Blood

vitamin D levels in pregnant and lactating females are critical to the health and development of the fetus and infant. ⁸¹

During pregnancy, primarily in the last trimester, approximately 30 grams of calcium are transferred from maternal stores to the fetus via the placenta, a process aided by appropriate levels of 1,25 OHD in the mother's blood. ⁸² Animal studies have found a significant correlation between the mother's levels of 25 OHD in her blood and what happens during pregnancy and delivery. ⁸³ Females who were vitamin D-deficient had difficulty maintaining a pregnancy and had much higher rates of poor birth results (small litters, dead litters, or mothers dying prior to or during delivery) than did vitamin D-sufficient females. ⁸² A recent study found that premenopausal women who were vitamin D-deficient suffered from problems with calcium regulation which resulted in an inability to ovulate. After undergoing vitamin D therapy, 54% began having normal menstrual cycles and two became pregnant. ⁸⁴

Pregnant women who were severely vitamin D-deficient and who were given 600,000 international units (IU) of vitamin D in both the seventh and eighth months of pregnancy not only increased their own levels of vitamin D, but gave birth to heavier infants than would otherwise have been the case. ⁸⁵ Women who begin pregnancy with extremely

low levels of vitamin D and who do not receive vitamin D supplementation during pregnancy show an interesting birth pattern. Infants born in winter months have greatly reduced bone mineral content compared to those born in summer months. This indicates that even a slight improvement in a mother's vitamin D levels during the months of greater UVB radiation exposure can improve the health of the infant. However, the pattern is different for mothers who receive vitamin D supplementation during the second and third trimesters of their pregnancies. For mothers whose first trimester was during the winter months, infants born in the summer months had lower bone mineral content than did infants born in winter months whose mothers' first trimester occurred during the summer months. This is because many women do not realize they are pregnant right away and do not begin taking vitamin D supplementation until the second and third trimesters, but women who become pregnant during the summer months are at their peak level of vitamin D for the year.⁸⁶

Researchers in Sweden found that women of African origin (primarily from Somalia) were four times more likely to die during childbirth or soon after than were women of Swedish origin. In addition, infants of women of African origin were more likely to be preterm and small for their age. These differences were not explained by differences in risk factors.⁸⁷ However, it is likely that the darker-skinned women of Somali

origin had much lower levels of vitamin D in their blood compared to lighter-skinned Swedish women due to the fact that Sweden is so far north that it receives very little UVB radiation most of the year. If the mothers' level of vitamin D is too low, their infants will be born with problems.

Mothers who die during childbirth are still a problem in the United States, particularly for women with West African ancestry. Their death rate is three to six times that of women with primarily European ancestry. Even when controlling for a variety of known risk factors, this difference in death rates is still not fully explained.⁸⁸ It may be that vitamin D deprivation also plays a role here since it has been shown to do so in animal studies.⁸²

A study of hypertension among women of childbearing age found that the women with West African ancestry had twice as much hypertension compared to women with European ancestry and that this was one of the reasons there were twice as many low-birth-weight infants born to American women with West African ancestry.²⁹ Hypertensive problems during pregnancy are among the five leading causes of maternal death in the United States.⁸⁹ Hypertension is related to the interaction of skin color with latitude and is not due to genetic differences. This is supported by research done in Vancouver, Canada on an obstetric

population subdivided into groups described as White, Oriental, East-Indian, and Aboriginal. The East-Indian women (who have darker skin color than women in the other three groups) had much higher rates of small-for-age infants than did the other groups. As I mentioned before, one factor causing small-for-age infants is a mother with hypertension. In addition, the average birthweight for East Indian infants was about 200 grams less than that for the infants in the White subgroup.⁹⁰ American infants with West African ancestry also weigh about 200 grams less than American infants with European ancestry.⁹¹⁻⁹³

If you are a women and you are thinking about becoming pregnant, especially if you have moderate-to-dark skin color, you live in the temperate zone, you receive little UVB radiation exposure, and/or you get little vitamin D from your diet or from supplementation, you should seriously consider having your blood levels of 25 OHD checked. If your levels are below 40 ng/ml during the summer or 32 ng/ml during the winter months, then you should consider delaying getting pregnant until you've managed to reach those levels. Levels of 50 ng/ml or higher are best. If you are already pregnant, make sure to take vitamin D supplementation prescribed by your physician, although what your physician prescribes will probably be too low. A supplement of 1000 IU of vitamin D₃ each day should be the minimum dosage. If possible, appropriately expose

unprotected skin to UVB radiation during the summer months. Eating sardines two to three times per week would also be great, especially if you have dark skin color since you will have great difficulty getting enough exposure to UVB radiation to sufficiently raise your vitamin D levels.

Health Problems and UVB Radiation

Subtropical and Tropical Zones:

- **High levels of UVB radiation**
- **Light-skinned individuals need to take care to avoid overexposure and/or heavy intermittent exposure to UVB radiation that could result in the development of skin cancers.**

Temperate Zones:

- **Low levels of UVB radiation**
- **Dark-skinned individuals will have trouble obtaining adequate exposure to UVB radiation thereby causing them to have suboptimal levels of vitamin D.**
- **Suboptimal levels of vitamin D are a factor in:**
 - **Hypertension**
 - **Diabetes**
 - **Breast cancer**
 - **Prostate cancer**
 - **Rickets**
 - **Low-birth-weight infants**
 - **Neonatal mortality**

Summary

Americans with primarily West African ancestry have much higher rates of diabetes and hypertension than do Americans with primarily European ancestry. The highest rates in the world for prostate cancer are found among American men with primarily West African ancestry, while American women with primarily West African ancestry have earlier onset and more severe progression of breast cancer than do American women with primarily European ancestry. Low-birth-weight infants and infant deaths occur at twice the rate among Americans with primarily West African ancestry compared to Americans with primarily European ancestry. Americans with primarily European ancestry have ten times the rate of melanomas as are found among Americans with primarily West African ancestry. These health disparities, although having many causes, are also all associated with UVB radiation either through underexposure or overexposure. Therefore, they are also related to blood levels of vitamin D.

Melanomas occur at far, far higher rates among individuals with light skin color who receive sporadic, but intense exposure to UVB radiation. Because the exposure is irregular and occasional, it is likely that these individuals also have suboptimal levels of vitamin D. Due to this, the tumor-suppressant ability of 1,25 OHD does not function well.

This allows the DNA damage created by the intense overexposure to UVB radiation to develop into melanomas. The other health problems are caused in part by too little UVB radiation exposure which results in blood levels of vitamin D that are too low.

Over thousands of generations, humans have adapted to different types of environments. When an individual whose body is adapted to a particular type of environment is placed in a very different environment, problems will occur. Some of these problems can be fixed through cultural behaviors or technology such as wearing warm clothing or having a heating source during the winter, or wearing a hat to protect your face from sunburn during the summer. Individuals with very light skin color are adapted to environments in the far northern latitudes where they receive little or no UVB radiation for most of the year. However, with proper clothing, sunscreens, and adjustments in behavior and activities, they can live successfully in equatorial zones of intense UVB radiation.

Individuals with dark skin color are adapted to the intense UVB radiation of equatorial zones, but with appropriate adjustments, such as a diet which includes lots of cold water fish such as salmon, sardines, and mackerel, they can live in temperate zones. In the past few decades, this has been made easier through the use of vitamin D supplements,

particularly in Canada, and now on-line, where you can get over-the-counter supplements in 1000 IU doses.

Health disparities could be dramatically reduced if every individual could get his or her blood levels of vitamin D (25 OHD) raised to at least 50 ng/ml. Optimal levels of vitamin D would aid in reducing the incidence of melanomas among those who have light skin color. For those who have dark skin color, optimal levels of vitamin D would reduce the incidence and severity of breast and prostate cancers. Reducing the incidence of diabetes and hypertension by maintaining optimal levels of vitamin D would also reduce the incidence of the major cause of death: cardiovascular disease. Finally, it is critically important that mothers maintain optimal levels of vitamin D prior to becoming pregnant and throughout their pregnancy and beyond if we are to reduce the rates of low-birth-weight infants and infant mortality. Maintaining optimal levels of vitamin D throughout the lifespan will improve health on a number of measures and will aid in eliminating health disparities. Taking a walk in the sunshine will help maintain optimal vitamin D levels.

Here's the bottom line: skin color matters, but "race" does not. What matters is your individual skin color, where you live, what type of work you do, what you eat, and how much UVB radiation exposure you get. If you have very light skin color, you need to be especially careful of

getting too much intense, intermittent exposure. Don't go out on the weekends and bake yourself. It is much better to get 20 – 30 minutes of exposure each day than a massive dose once a week. You are more likely to optimize your vitamin D levels that way and to have enough vitamin D to act as a tumor suppressant which will prevent melanomas. If you want to avoid sun exposure, then make sure to take a vitamin D supplement of at least 1000 IU/day.

If you have moderate-to-dark skin color then in all probability you have blood levels of vitamin D that are far too low for optimal health. You are at great risk of developing various types of cancer, hypertension, or type 2 diabetes. If you are a pregnant woman, you have a much higher risk of giving birth to an underweight baby who will be starting life at a disadvantage with low vitamin D levels. Given the fact that most of us work indoors during the prime UVB radiation hours and the fact that dark skin color prevents the penetration of most UVB radiation, thus limiting vitamin D production, those with dark skin color must take, at a bare minimum, 1000 IU/day of vitamin D. It is highly probable that higher doses will be needed to optimize vitamin D levels. If you have dark skin color, work inside, and live in the northern states or Canada, you should probably take 4000 IU/day of vitamin D₃. Skin color is a factor that has to

be considered when we are working to optimize our health. If you ignore it and pretend that it doesn't matter, you put your health at risk.

Walk, Don't Run!

“Why do we walk on two legs?” “So that we can run faster!” answer many college students. Other answers are also given, but the “running faster” answer always gets strong agreement from the students, who seem to feel it makes perfect sense. As you are reading this, you might also believe it makes perfect sense. After all, it is obvious that humans can run very fast. We long ago broke the four-minute mile barrier. Runners can do a marathon in slightly over two hours. Clearly, humans, at least some of them, are very fleet of feet.

But if running fast were an important adaptation for our species, we would have remained at least semi-quadrupedal, as are our relatives, the great apes. Furthermore, if running our prey to the ground were the hunting method of choice of our earliest ancestors, the fully quadrupedal adaptation of baboons would have been far more appropriate than the bipedal stride that we have instead. Baboons successfully co-opted the niche of savanna primates who hunt as individuals by the fast snatch and grab method, or use a relay team of a small group of males to run their prey to the point of exhaustion, at which time they move in for the kill. Human bipedality, moving around on two legs, is simply not as efficient as

quadrupedality, moving on all fours, in these circumstances. In that case, what is the point of bipedality?

The skeletal remains of the earliest hominids, our bipedal ancestors, are found in or near ancient lakes, streams, and swamps. In part, this is due to the fact that skeletal material is more likely to fossilize in still water than on land. A hominid who died on the savanna would have been quickly torn apart by scavengers. The bits and pieces that remained were exposed to the destructive effects of sun, wind, and rain. Any skeletal pieces not destroyed by weathering would have been pulverized by herds of elephants and wildebeests. Given these destructive events, it is not too surprising that most of the hominid remains we have come from what were ponds, lakes, or still streams where the dead individual would have been hidden from scavengers and quickly covered with silt.

While there is a bias towards finding fossils in areas that had once been the edges of lakes, streams, or swamps, these environments also may have played a major role in the development of bipedality. Quadrupedal locomotion is obviously a very successful adaptation since almost all land-based mammals are quadrupeds or semi-quadrupeds. Therefore, there has to be a significant change in the way in which our ancient pre-human ancestors interacted with the environment that would propel them along the path of adaptation to bipedalism.

Fish, Shellfish, Eggs, and Bipedality

The earliest hominids had small brains, much smaller than our own. The brains are near in size to those of chimpanzees, but somewhat larger. It may well be that this small, but important increase in brain size is directly associated with the development of bipedality. Omega-3 fatty acids and protein are important to brain growth and development. Fish and shellfish are excellent sources of omega-3 fatty acids, eggs have varying levels, and all three are high quality sources of protein.

The edges of lakes, streams, swamps, and seacoasts are rich sources of easily gathered foodstuffs. Nesting waterfowl provide an easy supply of eggs, not to mention the occasional bird. Fowl who have a diet heavy in fish and shellfish have higher levels of omega-3 fatty acids in their eggs than do other fowl. The various plants edging the shores offer a diverse source of nutrients. Shellfish and fish can be easily collected from shallow pools. For instance, a hominid ancestor would discover that dragging a scavenged bone that had bits of attached flesh through the water was a simple way to catch crabs that would be attracted to the meat and latch onto the bone. The collection of these rich and diverse foodstuffs is made much easier if one is willing to wade out a few feet from shore and continue wading along the shoreline. It is far easier, and the results of the efforts are more successful, if the wader moves bipedally.

Origins of Bipedality

Although most chimpanzees are not fond of wet environments, bonobo chimpanzees frequently travel through swampy regions in their search for food. Beginning around 8 million years ago, the environment of our earliest ancestors was changing from a densely-forested one to one with more sparsely-forested areas separated by and surrounded by grasslands watered by lakes and streams. For females with young ones, the most easily-gathered resources would be along the shores of lakes and streams. But in order to do this effectively, especially if the female had an infant, it would require that she move along the shores bipedally.

The Japanese macaques on Koshima Island began, in the 1950s, to use seawater to wash their food. Later, they taught themselves how to swim, both by paddling with their head above the water and by swimming under the water. Swimming is now a frequent activity on hot days. Both washing food and swimming began with juveniles and their mothers. It seems probable that gathering foods by wading along the shore would begin with the juveniles and mothers of our earliest ancestors. As generations passed, this method of obtaining food would become a normal activity for all group members. Those individuals who could wade most easily along the shore would be the most successful. They would

obtain the best foodstuffs, would be the healthiest, and would leave the most offspring. Their successful genetic traits would be passed on to future generations, while those who were less successful at bipedal wading would leave fewer offspring; gradually, their genetic traits would cease to be passed to future generations. Over many thousands of years, the waders would become more and more bipedal until finally they were fully adapted to bipedality and were then hominids.

Due to their diet rich in fish, shellfish, and eggs, these hominids also had larger brains and were smarter than their chimpanzee relatives. This increased intelligence, although slight, was enough to set into motion the development of the hominid line that eventually led to us. However, this was a very slow, gradual process; a process that could have ended at any point in time if the environment changed too rapidly for our ancestors to adapt. Our existence was not foreordained.

Bipedal Efficiency

Standing upright and moving around on two legs is more energy-efficient if the thighs angle inward under the hips, placing the legs under the torso instead of to the sides of the torso, as is the case when chimpanzees walk bipedally. For individuals who needed to be bipedal

during food gathering activities, those whose legs were more angled inward would use less energy in obtaining food than would those whose legs were more perpendicular or straight down from the hip joint.⁹⁴ Less energy used for food gathering meant more energy to devote to other activities such as mating and child rearing. Therefore, the more bipedal an individual was, the more successful he or she would have been as measured by having more of their offspring survive.

Among tropical/subtropical foraging populations, 60 – 70% of the food is provided through gathering activities. Gathering does not require speed, but it does require efficiency and stamina. Even most hunting activities primarily require efficiency, stamina, and stealth to track game over long distances, kill it, and carry it back to the home base. Once our hominid ancestors were fully bipedal and began expanding their territory into more varied environments, they would have spent most of their day in walking from one food site to the next, gathering various items, eating them along the way. On the rare occasion when an animal was caught and killed, the group might gather to share the meat, as happens among chimpanzees. However, on most days, food would have been gathered by wading along the shorelines to collect eggs, shellfish, fish, and waterfowl, picking berries from bushes, digging for tubers, gathering fallen ripe fruits and nuts, and, possibly, climbing trees for other fruits and nuts.

Speed was not necessary, but an efficient, steady walking pace from one food site to the next was.

Our hominid ancestors probably walked several miles each day in their quest for food. Running, particularly for adult females, played very little role in their daily activities. In fact, the wide hips of women, necessary for easing childbirth, make running inefficient and even awkward. Running also puts tremendous stress on feet. If feet and ankles become injured, then food collection activities become more difficult, putting the individual's life at risk.

Even for hunters, strategy and stealth were more important than speed. Group hunting by West African chimpanzees involves driving the prey in a particular direction while blocking escape routes. Only at the very end, when the prey reaches the "collection" point, is speed necessary. Prior to that, the chimps move at a steady quadrupedal walking pace. Based on the evidence presented here, we can conclude that our major form of exercise should be walking, and that we should try to walk several miles each day.

Exercise and Health

Other forms of exercise can be beneficial, but, except for swimming, the other forms tend to put undue stress on our joints and cause repetitive motion injuries. The knees are particularly easy to injure. Chimpanzees have a more stable knee joint than do humans because the thigh bone meets the leg bone squarely: there is no angle between the two bones. On the other hand, the human thigh bone is sharply angled relative to the leg bone. This angle, while making bipedal walking more efficient, also makes the knee joint more vulnerable to twisting and to torn ligaments. Our bodies were modified for walking.

The adaptation for bipedality, swinging the legs under the torso, also streamlines our bodies for efficient swimming. The buoyancy of water prevents undue stress on our joints. Therefore, swimming is also an activity for which we are adapted. It is probable that, as with the Japanese macaques, our hominid ancestors also enjoyed a cooling swim on occasion, interspersed with their gathering/wading activities.

Walking and swimming are low impact activities that individuals of any age can participate in to improve overall health. They are also the activities, especially true of walking, that were most frequently engaged in by our hominid ancestors. During the course of each day, our ancestors

did a great deal of stretching while obtaining their food and taking care of young. This stretching kept them agile and flexible. Unlike our ancestors, we can do an entire day's work while barely moving from the computer desk. Because of this, we tend to be much less agile and flexible: our muscles and joints are tighter and do not move freely. In order to correct this, we should begin each day with a series of flexibilities: exercises designed to keep the muscles stretched and the joints loose. At first, you may be so tight, that you can barely move in some of the suggested positions. But if done faithfully, you will gradually loosen up and will be able to stretch further and further. In order to maintain this flexibility, the exercises must be done each day, preferably soon after rising. The exercises will get rid of the kinks that occur during sleep. See the Appendix for directions for doing the **Flexibilities** routine.

Once you are loose and flexible, you are ready for walking or swimming. Exercise has many health benefits. Those related to weight loss and cardiovascular health are probably familiar. Women who maintain a high level of physical activity do not develop an age-related decline in their resting metabolic rate, although sedentary women do. Maintaining a higher metabolic rate allows active women to avoid the increases in body fat found among sedentary women. ⁹⁵

Interestingly, physical activity appears to aid in the prevention of Alzheimer's Disease. One study found that those who were inactive in terms of intellectual and physical activities were about five times more likely to develop Alzheimer's Disease.⁹⁶ Those who are sedentary and spend their time watching TV are not only more likely to have excess body fat, they are predisposed to developing Alzheimer's Disease as they age. The dangers of a sedentary life-style have even led to the coining of a new disease syndrome: Sedentary Death Syndrome or SeDS. There may be 250,000 Americans suffering from SeDS⁹⁷ who are running a high risk for a shortened life span and/or a life of diminished mental abilities.

Postmenopausal women who maintain an active lifestyle achieve many benefits. In support of the Alzheimer's study discussed above, another study found that older women who walked several miles each week suffered less cognitive decline than did women who walked very little. Number of miles walked each week by the women ranged from less than one mile to 18 miles. Each extra mile walked resulted in a 13% less probability of later mental decline. The more you walk, the better off you are. Similar benefits can be achieved by men, but they probably need to increase the number of miles walked compared to women.⁹⁸ Since the weight-bearing exercise of walking aids in maintaining and even increasing bone mineral density (BMD), degree of BMD and osteoporosis

can be indicators of cognitive decline.⁹⁸ Of course, adequate blood levels of vitamin D are also necessary to maintain bone strength. Taking a daily walk in the sunshine will improve your mood and your health in multiple ways, especially since this is the best method for getting adequate UVB radiation exposure.

When planning your daily walk, take into account the time of the year, your skin color, and where you live. If it is summer in Phoenix and you have very light skin color, you should probably limit your walk to ten minutes without sunscreen. For longer walks, you should apply sunscreen to prevent burning. Since this will also prevent vitamin D production, you may need to schedule several short walks into your daily schedule. The appropriate amount of exposure should result in, at most, a minimal tan. For the person with very light skin color living in Seattle, you may be able to take 20-minute walks during the summer without needing sunscreen. In all cases, wearing a hat is recommended. This will protect your face and decrease skin wrinkling. However, since your face will be protected, this means that you may need to be out in the sun about one-third longer in order to activate enough vitamin D production from exposed, unprotected skin on arms and legs. Individuals with very dark skin color are both able to and need to take long walks in the sun each day without sunscreen on their arms and legs. Those living in the northern latitudes will also need to

eat foods containing vitamin D and take vitamin D supplements since even the longest walks may not provide them with adequate levels of vitamin D.

Walking can increase bone mass, but swimming does not since it is not weight bearing. However, swimming does improve the strength of shoulder and back muscles.⁹⁹ In addition, for those who have injured their ankle, knee, or back, water exercises can maintain fitness while the injuries heal.¹⁰⁰ Alternating long walks with swimming laps will maintain all around fitness. These activities appear to be the ones for which our bodies are adapted.

Exercise is necessary, but very strenuous exercise over a long period of time can actually be detrimental to your health, particularly if you are a woman. Young female athletes are especially prone to problems resulting from the “female athlete triad.” This triad is composed of diet and eating habits, the menstruation cycle, and bone strength and mass. Young women who are under intense pressure to perform at high levels tend to have eating disorders including bulimia and anorexia. The poor and inadequate diet, along with intense exercise, can cause menstrual irregularities including the complete termination of menstruation and ovulation. These factors can lead to inadequate bone mineralization with the result that women in their late teens and early twenties can have the

bone mass and structure of elderly, osteoporotic women. This bone loss may be permanent even if hormonal therapy is begun. 101

Summary

Your body is adapted for walking. Our ancestors probably walked at least 20 miles each week during their food collection activities. Walking provides numerous benefits. It is low impact and so is unlikely to cause injury. Bone mass is enhanced since it is a weight-bearing activity. Cardiovascular fitness is maintained. It allows for vitamin D production through exposing unprotected skin to UVB radiation while on the walk. An active lifestyle also prevents a reduction in the resting metabolic rate so fat accumulation is avoided, and it is associated with a reduction in the incidence of Alzheimer's Disease.

Bipedal wading for food was probably the primary factor in the development of our bipedal posture. Having our legs under our torso also allows for efficient swimming. Since our ancestors spent time near water sources, it is probable that swimming was one of the activities they enjoyed. Swimming provides cardiovascular fitness and improves upper body strength.

Let's get real. Exercise is vital for good health. If you don't exercise, you put your health and even your ability to think clearly as you age at risk. So get out there and exercise! But make sure it is the exercise that is best for our bodies. To maintain good health while minimizing risk of injury, we should try to walk or swim at least two miles each day. Careful UVB radiation exposure during these exercise periods will also maintain adequate levels of vitamin D. These legs are made for walking.

The Staff of Life?

Probably everyone reading this book is familiar with the phrase “The Staff of Life” and has never really given it much thought. But if bread is, indeed, the staff of life, how did humans survive before the grains were domesticated and we learned how to bake? In the long history of human existence, agriculture is a relatively recent invention. In fact, it never may have been invented if environmental changes had not forced it upon certain groups.

Until around 10,000 years ago, the world was in the grip of an Ice Age. The sea levels were about 300 feet lower than today because so much water was locked into massive ice sheets which covered a large portion of the northern hemisphere. Since there are more archaeological and skeletal materials for the Eurasian-circum-Mediterranean region, this discussion will focus on that area. However, environmental changes occurred worldwide and agriculture developed independently in many different regions of the world between 5,000 and 10,000 years ago.

Prior to 10,000 years ago, the portion of Europe not covered by ice sheets was a relatively treeless, tundra-grassland environment populated by herds of extremely large animals including the mammoth, reindeer, and giant elk and cattle. Big-game hunting was the rule, although other foods

were also gathered. The average male height was 5'10" with females averaging 5'6", about what it is today in the 21st century in the United States and northwest Europe.

The eastern Mediterranean region of southwest Asia was covered by grassland interspersed with forests of nut trees such as oak and pistachio. Along the rivers was dense vegetation. Based on archaeological material found in the region, the people made heavy use of nuts, the plants along the river's edge, and the gazelle herds which migrated through the grasslands on their yearly cycle.

When the ice sheets began to melt and retreat, the climate became warmer and the vegetation changed. The tundra grasslands retreated northward in Europe and were replaced by dense forests. The giant herd animals could not adapt well to the changing environment and most became extinct. Only the reindeer survives in far northern Europe. Big game hunting was no longer the way to make a living, but there was plenty of other types of foods available: smaller game, nuts, berries, fish, shellfish, eggs, etc. The people of Europe continued to be well-fed and healthy. The same would not be true for those living in southwest Asia.

The change in climate in southwest Asia caused the nut trees to retreat to higher ground and for the forests to thin out. The people needed to stay near the rivers and other water sources in the lowlands, but doing

so caused them to lose the major staple of their diet: nuts. They were forced to turn to collecting the seed heads of the grasses. This had been done to a limited extent for a long time, but as a great deal of labor was involved for relatively little return (the seed heads were too easily knocked to the ground as the individual moved through the fields), grass seeds had never been an important part of the diet. But that was to change.

Domestication of Grains and Animals

Limited options forced a dietary change that was to have a major, far-reaching impact on the future of the world's populations. The gradual domestication of plants (seed grasses) and animals (sheep, goats, pigs, cows, etc.) led to permanent settlements. Very quickly, wild resources were wiped out in the vicinity of the villages so that villagers were even more reliant on their crops and herd animals. When times were good, there was plenty to eat and population boomed. But when droughts occurred, the villagers were trapped with little to eat. Unlike their ancestors, they could not move to a new place and start over. But droughts were only one of many problems for the villagers.

Permanent settlements made it easier for women to be pregnant. They did not need to worry about traveling long distances on a daily or weekly basis. When there is plenty to eat, it is easier to maintain a

pregnancy. Older individuals who could not help with the crops or the herds were available to take care of small children. The result was that the time period between births dropped from about four to five years to about two years. This allowed the population to rapidly double.

A rapidly-increasing population required even more investment in grains since they could be easily stored for future need, unlike other foodstuffs. The variety of foods available to eat became narrower as the population grew. Unlike the populations living in Europe at this time whose very diverse diets contained a wide variety of nutrients, the villagers relied for the majority of their nourishment on grains in the form of breads, porridges, and beer, among other grain-based food items. You may be wondering, "But what about the herd animals?" Animals actually provided only a limited portion of an individual's daily nutrients. Milk, and later cheese, were available, but since the major herd animals in southwest Asia were sheep and goats, the quantities were limited. Also, animals were wealth, so killing an animal was destroying your wealth. Meat formed a very limited part of the diet. While whole grains do provide nutrients, a heavily grain-based diet is inadequate to maintain good health.

The skeleton is affected by chronic disease and malnutrition which means that scientists who analyze skeletal remains have enough information to determine the general health status of that individual.

When they analyze the skeletons of these early villagers they find that the villagers were in very poor health. One sign of poor health in a population is the number of infant and child skeletons relative to adult skeletons. At least 50% of all infants and children died by age five in village populations. There was a peak in death rates around age two. Remember, the period between births was cut to two years among villagers. When a new baby was born, the toddler was weaned to cereal gruel. This provided the toddler with only limited nutrition, making her more susceptible to disease and death. Adults also showed signs of poor nutrition.¹⁰²

Among the foragers of Europe, the average male height was 5'10". Prior to the development of agriculture, this had also been the case in southwest Asia. After villagers became totally reliant on agriculture and, in particular, on grains, height plummeted to an average of 5'2" for males. The skeletons show other signs on the skull and long bones of malnutrition, which, as with children, made them susceptible to death from disease.

Diseases, particularly contagious ones, were not much of a problem for foraging populations. Since they did not live in permanent villages and since their population was kept low, waste products did not build up. This was not true of villages where ever-growing waste piles created inviting habitats for rodents and other vermin, the source of many

diseases. In addition, the villagers lived close to their herds; in some cases, separated by only a wall. Many of our contagious diseases came from our close contact with infected animals and include measles, smallpox, and influenza.¹⁰³

If we compare the diets and health of foragers to villagers, we will find that the foragers had a very diverse diet which included many types of fruits, nuts, berries, and other vegetation along with many sources of protein including game, fish, shellfish, birds, and eggs. Grains played little or no role in their diet unlike that of the villagers for whom grains were the major portion of their diet. Foragers were tall and healthy while villagers were short and sickly.

From this analysis we can conclude that bread is the staff of life only when there is little else to eat. If you want to remain healthy, your diet must be quite diverse and include a good variety of proteins. Grains do not need to be included at all. This may be difficult to accept since grains (wheat, oats, barley, rye, corn/maize, rice, and millet) form the dietary basis for most populations. But if we take a historical perspective, it is clear that grains play this dominant role not because they are particularly healthy for us but because they are relatively cheap, and are easy to grow and store in large quantities. Huge populations can be fed

with little effort or cost. Of course, the populations will probably not be particularly healthy, but high birth rates compensate for high death rates.

Domestication led to:

- Settled villages
- Rapid population growth
- Living near waste/garbage
- Exposure to vermin and their diseases
- Exposure to herd animals and their diseases
- Spread of infectious diseases
- Reduced stature
- Increased mortality
- Reduction in the quality of life for most individuals

Dairy products also play no role in the diets of foragers. Foragers breast feed their children for four to five years after which no milk or milk products are eaten. Individuals in most human populations, particularly those with no history of dairying, cannot process the milk sugar lactose after weaning from the breast. An enzyme, lactase, is needed to break down the lactose, but production of this enzyme virtually ceases by age

five in most human populations. Without the enzyme, eating or drinking milk products causes great gastric distress and, in extreme cases, can result in death. Even among those populations using dairy products, in only a very few of these populations can the majority of individuals drink fresh milk. In most populations they must first process the milk into cheese and yogurt before it can be eaten without causing gastric distress.

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Dairy products are advertised as the best source of dietary calcium, and that may well be true. But foragers do not consume dairy products and yet analysis of their skeletons shows that they were strong, sturdy, tall, and without chronic disease, except for arthritis caused by overusing certain joints. Vegetation, particularly dark green, is a good source of calcium. But, and this needs to be emphasized, the amount of calcium eaten is less important than the blood levels of vitamin D because vitamin D is needed to properly use the calcium.

Vegetarian diets are being pushed as the most healthy and environmentally conscious diets for humans. While such diets might be environmentally conscious, humans are not adapted for a vegan diet. We are not herbivores or plant eaters. We also are not carnivores or meat eaters. Humans are omnivores which means we can eat pretty much

anything that is edible and that we require a balance between vegetable and animal foods in order to be optimally healthy.

The body is composed of a huge variety of proteins. Proteins are constructed from twenty different amino acids, nine of which we must obtain from our diet. The most efficient way to get the needed amino acids is to eat animal protein: fish, shellfish, fowl, red meat, etc. Amino acids can be obtained from non-animal sources, but it is much more difficult to get them that way because foods must be eaten in certain combinations such as beans with corn tortillas or peas with rice. If the diet does not provide the necessary amino acids, the body itself will be used, beginning with the muscle tissue. Vegetarians are often thin in part because of their low-fat diet, but also because they have a thinner muscle mass.

We also know that we need animal protein in our diets because of our large brains. There is a trade-off in organ size between the brain and the gut. Animals who eat only a vegetarian diet (herbivores) have a relatively large gut and a relatively small brain to body ratio. The large gut is needed because vegetation (particularly leafy vegetation) requires much more processing to obtain the needed nutrients than does animal protein. So long as an animal's diet requires extensive processing, the resources do not exist to provide for brain growth because that requires a nutrient-

dense diet.¹¹⁴ Fruits and nuts are nutrient-dense vegetable products, and monkey species eating primarily fruits and nuts have a much larger brain/body ratio than do monkey species eating primarily leaves.¹¹⁵ Chimpanzees (an ape species) have a diet that is about 80% - 90% (depending on season) fruits and nuts, but they also eat 10 - 20% animal protein in the form of eggs, monkeys, and bush pigs, among other animal sources. This diet results in an even better brain/body ratio than that of fruit-and-nut-eating monkeys.

Early in human evolution, our brain/body ratio wasn't much better than a chimpanzee's so we can assume that the human diet was pretty similar to that of the chimpanzee. However, by 1.5 million years ago, human brain size was at least double that of chimpanzees and there is strong archaeological evidence that humans were hunting sizeable game by this time. Over the course of the next million plus years, human brain size gradually grew until it reached the modern size by around 300,000 years ago. Ancient human remains are frequently found near streams, ponds, lakes, and along the coastal shoreline. This, along with the finds of harpoons and large shell piles (middens), indicates that fish and shellfish also played an important role in the diet. In fact, fish and shellfish may have had a bigger role to play in brain expansion than did large game

hunting. The omega-3 fatty acids in fish and shellfish appear to play important roles in brain function. 116, 117

The diet which best will maintain human health is the one to which humans have adapted over the course of the past 1.5 million years and which was eaten by all foraging populations prior to the development of agriculture. The evolved diet is about 70% - 80% fruits, nuts, and vegetation and 20 - 30% animal products such as eggs, fowl, fish, shellfish, and lean red meat. Grains and dairy products were not eaten and, therefore, are unnecessary as long as the other foods are eaten in appropriate quantities.

The major catch with this diet is that it can be more expensive than the grain-based diet typical of agricultural societies. However, with modern world-wide market distribution, it is now possible for those with adequate income to have the healthy diet of our forager ancestors on a year-round basis.

Summary

Agriculture developed as a last-ditch effort to survive in an environment that could no longer provide a diverse diet to settled populations with accelerated population growth. Many benefits can be traced to the settled lifestyle and population growth that resulted from

domestication and agriculture. But the negative consequences of agriculture are also with us.

Agriculture laid the foundation for overpopulation, the spread of disease, and the burden of massive poverty. Disease and poor overall health are so much a part of our lives that in some respects they are considered normal. However, the modern diet with its heavy reliance on grains and dairy products, a direct result of agriculture, is actually abnormal, inadequate, and inappropriate for maintaining optimal health. Replacing this diet with the one for which humans evolved will increase the chances that each of us will live a long, healthy life. Bread isn't the staff of life and every body doesn't need milk.

Premier Nutrition

In the previous chapters I presented evidence that contradicts currently accepted ideas about diet and sun exposure. Yet, it is the evidence in these chapters that provides a truer picture of what is appropriate for our health than what is commonly accepted. Grains and dairy products are relatively recent additions to our diet. We haven't really adapted to these foods so we experience a variety of health problems when they form a major part of our diet. Sun avoidance is so recent that, taken to extremes, it is absolutely harmful to your health. This chapter will discuss in more detail the health consequences of a diet for which humans are not adequately adapted and provide information on appropriate nutrition for maintaining optimal health.

Dairy Products

For decades, milk has been advertised as the perfect food. Certainly this is true for breastfed infants: there is no better food for an infant than her mother's milk. But what is true for infants is not necessarily true for adults. There has been a great deal of research done on the health benefits of milk and other dairy products, but close examination of the researchers and/or sponsors of the research shows that the major

portion of this research is funded by various dairy and milk producers associations or organizations. This does not mean that this research is necessarily flawed, but it does mean that the results are presented in such a way as to support the conclusions most beneficial to these groups. For instance, a study on the benefits of calcium versus vitamin D was done in rats several years ago. There were three groups of rats: two groups were vitamin D-deprived and one group was vitamin D-sufficient. Of the two vitamin D-deprived groups, one group was given large supplemental doses of calcium. The calcium-supplemented group had better bone growth than the non-supplemented group. Curiously, neither of the vitamin D-deprived groups was directly compared to the vitamin D-sufficient group which had dramatically better bone growth than did the vitamin D-deprived, but calcium-supplemented group. This vitamin D-sufficient group was ignored in the discussion and conclusion which stated that vitamin D was not really needed for bone growth; calcium alone was sufficient. That is not at all what the study actually showed.¹¹⁸ But since the research was supported by a dairy group, emphasizing the benefits of calcium to the exclusion of vitamin D was probably viewed as necessary if their funding were to continue.

It is only recently that concern has been raised about the true effects of milk on health. Many of us grew up on milk. A family with

adolescents who like milk probably goes through a gallon of milk each day. Advertising encourages us to believe in the benefits of dairy products, particularly that they are the best source of calcium. However, research into adaptation and disease makes it clear that the benefits of dairy products have been oversold. It is fairly easy to quit eating dairy products. And when you do you will find that fruits and vegetables taste better to you, so it will be easy to add more of these foods to your diet. Dairy products can have a negative effect on the taste of other foods, foods that are much more important to our health than are dairy products. It may be that the creamy fats and sugars of dairy products “seduce” the taste buds from the tastes of fruits and vegetables. Or it may be that dairy products leave an aftertaste in our mouths that conflicts with the taste of other foods.

Dairy products *are* an excellent source of calcium and calcium *is* necessary for proper bone development, but calcium alone is insufficient. If an individual’s blood levels of vitamin D are too low, the excess calcium will simply be passed in the urine. ¹¹⁹ One reason that milk is fortified with vitamin D is because adequate vitamin D levels are required to properly use calcium. However, studies have shown that the vitamin D levels listed on the label are not necessarily found in the actual milk product. Whole milk products are more likely to have the listed amount of

vitamin D than are skim milk products, many of which tested out to have no vitamin D. ¹²⁰⁻¹²³ This is because vitamin D is fat soluble: as the fat is processed out of the milk to make lower fat versions, vitamin D is lost from the milk product. Other milk products, such as cheese and ice cream, are not required to be fortified with vitamin D. Therefore, an individual could be eating large amounts of dairy foods to obtain calcium, but because he has low vitamin D levels, he will not be benefiting from the extra calcium.

Calcium and Prostate Cancer

In addition, too much calcium may be a source of health problems, particularly in men. Several studies have found a positive association between eating large amounts of dairy products and an increased risk of prostate cancer. ^{124, 125} It is the calcium in dairy products that is the risk factor. ¹²⁶ And the risk is greatest for cases of advanced prostate cancer. The hormonal form of vitamin D, 1,25-dihydroxyvitamin D (1,25 OHD), acts as a tumor suppressant in prostate cancer. High levels of calcium have been shown to depress the levels of 1,25 OHD by preventing conversion of 25 OHD to 1,25 OHD. This allows tumors to develop. Sweden has one of the highest rates of prostate cancer in the world among men with light skin color. It also has one of the highest rates

of dairy product consumption, particularly of fresh milk and cheese.¹²⁶ Although the primary factor in the high rate of prostate cancer in Sweden is probably a lifetime of inadequate exposure to UVB radiation which leads to inadequate levels of vitamin D, this problem would be made worse by eating large amounts calcium-rich dairy products. These foods would interfere with the conversion of 25-OHD to 1,25 OHD. This effect of calcium also holds true for those taking calcium supplements. The rats in the study described earlier were killed in order to analyze their bone content, but it would have been intriguing to determine whether the vitamin D-deficient, but calcium-supplemented rats had higher rates of prostate cancer than the rats in the other two groups.

As long as you have adequate blood levels of vitamin D, your body can adjust to low levels of calcium intake. In fact, calcium intake levels which would be considered inadequate in the United States (around 500 mg/day) are adequate among individuals living in equatorial countries who receive appropriate UVB radiation exposure. These countries also have the lowest rates of osteoporosis, indicating that calcium supplementation is not the best prevention measure for this disorder.¹²⁷ Women in Japan have a lower intake of calcium than do women in the United States and Europe, but a higher intake of fish, resulting in higher average blood levels of vitamin D. They also experience lower rates of osteoporosis.¹²⁸

It is intriguing that individuals from northern European populations not only have the highest intake of dairy products among the world's populations, but also have the highest rates of osteoporosis. If calcium were the most important factor in preventing osteoporosis, surely this would not be the case.

Men living in West African countries, with low calcium intakes, have much lower prostate cancer rates than is true of American males of primarily West African ancestry who have the highest rates in the world. If you are a man, of any ethnicity, and you wish to reduce your chances of developing prostate cancer, you would be wise to quit eating dairy foods and to raise your blood levels of vitamin D, either through careful UVB radiation exposure based on your skin color, or through vitamin D supplementation.

Fat from the dairy products does not appear to play a role in prostate cancer. This is supported by several studies, including one of Saudi Arabian men. Despite high levels of fat consumption, Saudi men have extremely low rates of prostate cancer. They are also exposed to very high rates of UVB radiation, indicating that they probably have high blood levels of vitamin D. 129

Dairy Consumption and Breast and Colon Cancer

Unlike prostate cancer, calcium plays a protective role in breast and colon cancers. One study found that eliminating all dairy products from the diet radically reduced calcium intake in the diet and appeared to promote harmful changes in the colon tissue cells.¹³⁰ However, the subjects in this study not only lowered their calcium intake, but virtually eliminated their vitamin D intake by eliminating their milk consumption. No vitamin D supplementation was supplied to the subjects. Since vitamin D is a tumor suppressant, the negative changes observed in the colon could well be due to inadequate levels of vitamin D and not to the reduced calcium intake. Several studies have been done to attempt to determine the effect of calcium and/or vitamin D on colon cancer with conflicting results, some showing a protective effect and some showing a minimal or neutral effect.¹³¹⁻¹³⁵ In none of these studies were the initial blood vitamin D levels of the subjects determined, therefore conclusions about vitamin D intake levels and their effects on colon cancer are flawed. Since the high saturated fat content of dairy products is associated with higher breast cancer and mortality rates,¹³⁶ only low-fat dairy products should be used. However, low-fat dairy products have limited or no vitamin D fortification. Therefore, expecting protective effects from the calcium in those products may be futile. Given the mixed results concerning dairy

products and breast and colon cancers, and the fact that calcium promotes prostate cancer, it would seem best to eliminate dairy products from the diet and obtain vitamin D from other sources. Adequate vitamin D levels compensate for low calcium intake.

Dairy Products and Hypertension

Research has shown that blood pressure can be reduced if study subjects eat low fat dairy products while also eating more fruits and vegetables and limiting their fat intake.^{137, 138} However, other research has indicated that levels of fat intake do not appear to be associated with blood pressure. Therefore, some other component of the dairy products seems to be involved in blood pressure reduction. It was concluded that the major factor in blood pressure reduction was the increased calcium intake from eating dairy products. As in other research on benefits of dairy products, baseline blood vitamin D levels were not measured in any of the subjects, nor was the vitamin D content of the dairy products determined. Other studies have shown that elevating blood vitamin D levels dramatically lowers blood pressure, regardless of calcium intake.³⁰ It seems probable that the improved blood pressure profile of those eating more dairy products was due to an increased intake of vitamin D derived from the milk the subjects drank. Although low fat milk products may

contain less than the stated level of vitamin D, any increase in vitamin D intake would have a beneficial effect for those whose blood vitamin D levels were probably sub-optimal. In addition, the subjects who had the better diet also ate more fish. The omega-3 fatty acids in fish, along with the high levels of vitamin D in fish such as salmon and sardines, would also provide an improved blood pressure profile. Although the research concluded that calcium was key to blood pressure reduction, the studies are flawed because they did not take into account baseline blood vitamin D levels of the subjects nor dietary intake of vitamin D. If hypertension is a concern, one might be better advised to increase her blood level of vitamin D than to increase her intake of dairy products.

Dairy Products

- Dairy played no role in the diet of our ancient ancestors.
- Dairying began in Southwest Asia and spread to Europe between 5,000 – 8,000 years ago.
- The traditional diets of most of the world's populations do not include dairy products.
- Most individuals in the world cannot adequately process the lactose in dairy products once they are weaned.
- Too much calcium may be more problematic for health than too little.
- As long as you have adequate blood levels of vitamin D, your body can adapt to a low intake of dietary calcium.
- The fats in dairy products are associated with a number of health problems.

Grain Products

Nutrition models have changed over the past thirty or so years from the 4 Squares to the pre-2005 Pyramid to the current pyramid version called My Pyramid. In all three models, grain products play an important role. Grains include wheat, oats, barley, rye, millet, rice, and corn/maize, among others. Because corn is often packaged as a vegetable (for

instance, in a bag of frozen peas, carrots, and corn), many do not realize that it is actually a grain product, until they are reminded of tortillas and corn bread.

As I discussed in the previous chapter, grains initially became an important part of the diet only when there was little other option. Later, when it was realized that grain crops could be grown in quantities large enough to provide for future needs, many other populations began to adopt agriculture. However, grains have been a widespread part of the human diet for only the past 2,000 – 5,000 years: a mere blink of the eye in terms of human history. Our bodies are not adapted to a diet in which grains play a major role. If we want to model appropriate nutrition in terms of a pyramid, then the base or largest section of the pyramid should be composed of fruits, nuts, and vegetables, of which we need to eat at least ten servings per day.

Grains and grain products play such a major role in our diets because they are relatively cheap, versatile, and filling. This last is quite important. For instance, one-quarter cup of unpopped corn kernels costs only pennies, but will pop to fill a large bowl and an empty belly. Unfortunately, there isn't much nutrition in a bowl of popcorn, but if I am very poor and very hungry, my major concern is to stop the gnawing hunger pangs, not with whether my "meal" is well balanced or not.

Throughout history, those who were well off were always able to enjoy a better diet, but the poor had little choice but to rely on cheap, filling grains, even if the long-term effects on their health were negative.

The grain-based diet of the original agriculturalists resulted in reduced stature and a weakened body easily conquered by contagious diseases. We can see other negative effects of a grain-based diet when we examine the teeth of these early agriculturalists. The teeth show signs of rapid and severe wear, dental caries (cavities), and tooth loss. Tooth wear was due to the bits of grit that became part of the flour/meal as the grains were ground on stone. We no longer worry about grit in our meal, but dental caries and tooth loss continue to be a problem. Grains form a paste in our mouths when moistened by saliva. This paste sticks to our teeth and gums, providing a nourishing habitat for micro-organisms, leading to dental decay. When grains are eliminated from the diet and hard fruits and vegetables such as apples and carrots are added, teeth stay much cleaner and dental decay is greatly reduced.

Analysis of the skull and long bones indicates that these early agriculturalists suffered from malnutrition and disease. Porous skull bones, particularly of the eye sockets, are associated with anemia and poor health. Pits and ridges on the teeth (hypoplasias) and lines perpendicular to the axis of long bones (Harris lines) indicate that during

childhood the individual suffered episodes when growth ceased, and later resumed. These episodes would have been caused by malnutrition and/or disease. 139

As with research on dairy products, much of the research on grain products is supported by the agriculture/foods industry. Again, this does not mean that the research is inappropriate, but it does mean that the results should be carefully scrutinized. There is an automatic acceptance, based on the past few thousand years during which grains formed a major component of the diet, that grains must be beneficial for human health. However, the main benefit of grains and grain products is, and has been, as a filler: grain fills the empty stomach and pads out a meal that includes a small portion of meat and/or vegetables. Although grains are highlighted as a source of fiber, most grain products eaten in modern societies are made of refined flours that provide little, if any, fiber. The best sources of fiber are in fruits and vegetables which also provide many other nutrients and micronutrients important to the maintenance of our health.

Carbohydrates provide a necessary base to the diet, but when grains form the major portion of carbohydrates eaten, nutrition suffers. The carbohydrates from grains (and white potatoes) have a high glycemic index which is associated with an increased risk of coronary heart disease. On the other hand, the carbohydrates from fruits and vegetables

have a low glycemic index, providing heart-healthy benefits.¹⁴⁰ Grain products cannot adequately substitute for the carbohydrates and numerous other nutrients obtained from fruits, vegetables, and nuts.

Increased amounts of grain are frequently used to replace protein from meat in the diet. But using grains as a protein substitute requires a careful matching of foods so that all the required amino acids are obtained. For instance, you can combine peas and rice, or beans and corn tortillas. Children fed a primarily grain-based vegetarian diet with little or no protein from animal sources will tend to fail to reach their full potential in height. Height is a complex trait involving the interaction of perhaps dozens of genes and the environment. Identical twins with the same genetics, but raised on very different diets, one with adequate protein and amino acids and one without, will be unlikely to achieve the same height when they reach adulthood. The impact of diet on stature can be easily seen in the children of immigrant parents who after moving to the United States adopted a western diet containing more protein than was typical of the diets of their homeland: the children tend to be several inches taller than their parents. This is not a recommendation for adopting a western style diet since there are health problems associated with it, as discussed here. However, it is a recommendation for the inclusion of adequate levels of low-fat, high quality proteins in the diet such as can be

obtained from eggs, fish, and shellfish. Remember, our ancestors prior to the development of agriculture and a heavy reliance on grains were tall: males averaged 5'10" and females 5'6" in stature; heights we are only now regaining after thousands of years of agriculture.

Unlike dairy products which are fairly easy to eliminate from the diet, it is much more difficult to wholly eliminate grains since they quite literally form the base of most main meals in most modern cultures. It can be done, however, if you keep in mind that the largest section of the Food Pyramid should be fruits, nuts, and vegetables and that grain products are fillers. Instead of a plate of pasta with a little sauce, have a little pasta with a large amount of a tomato-based sauce rich in other vegetables and some low-fat meat such as chicken. Do the same with other grain-based dishes. Eventually, you will realize you do not need the pasta or rice or whatever grain to feel full and to be healthy. If you wish to continue to have grains in your diet, then they should be whole grain products, but these are more difficult to obtain; whole wheat bread is not the same as whole grain bread. Read the labels carefully.

Grain Products

- Grains played little or no role in the diet of our ancient ancestors.
- Grains were initially domesticated in Southwest Asia and became an important part of the diet at a point in time when other food items were no longer available.
- Early agriculturalists whose diet was grain based had extremely poor health as shown by:
 - Dramatically reduced stature
 - High mortality rates
 - Signs of malnutrition on the skeletons
 - Dental cavities
- Grains are relatively cheap and easy to grow and can be stored for future use.
- Grain products provide a cheap way to keep the masses fed, if not healthy.
- Whole grains provide benefits, but most grains that are eaten are refined.
- Refined grains have a high glycemic index that is associated with heart disease and diabetes.

“My Pyramid”?

The US Department of Agriculture (USDA) has issued a new pyramid; actually, a collection of pyramids that are purported to be individually tailored. Unlike earlier pyramids, this one acknowledges the

importance of exercise in maintaining good health, so daily exercise is included in their individualized recommendations. But as with prior pyramids and other dietary recommendations, they continue to focus on the same food groups: grains, dairy, fruits, vegetables, and meats. It should never be forgotten that one of the major purposes of the USDA is to aid those involved in agriculture. They are particularly beholden to agribusiness. This probably accounts for their grains recommendation which states that at least half of the recommended servings be of whole grain. This is clearly a concession to cereal producers and others who produce refined grain products. An unbiased recommendation would state that if grains are to be eaten, they should be whole grains, not refined.

Since the dairy producers are important partners to the USDA, it is not surprising that the pyramids recommend several servings of dairy each day. In testing out the “my pyramid” feature, I input information for individuals of a wide variety ages, both sexes, and differing exercise patterns. In every case, the recommendation for dairy was 3 cups each day. Hmmm... The vast majority of individuals in the world cannot process the lactose in dairy after age five. This includes about 75% of Americans of West African ancestry, 90 – 100% of Americans of Asian ancestry, and 90 – 100% of Americans of American Indian ancestry. Most

southern Europeans and others in the circum-Mediterranean region also cannot process lactose. In order to follow the USDA's recommendation large numbers of individuals will either suffer from gastric distress or have to medicate themselves first. Why does the USDA think dairy is so important (other than the obvious, that it is beholden to dairy producers)? Because dairy provides calcium. Why do we need so much calcium? We do not. The European countries with the highest dairy intake are also the countries with the highest rates of osteoporosis. Hmmm... again. What we need is plenty of vitamin D, something not mentioned in the new pyramid, except in passing when describing fortified dairy and cereal products, neither of which is a particularly good source of vitamin D.

As mentioned, I "tailored" my pyramid, and also did ones for a number of fictional individuals. The main differentiations seem to be based on age, sex, and activity level. That is, the same basic percentages are given for each individual. The amounts of each category differ by caloric intake. Except, of course, for dairy which is the same for everyone.

This link will allow you to tailor a pyramid for yourself: <http://www.mypyramid.gov/> Then test out some other individuals and see what you find.

The website is very slick. It does include some good, basic information. But don't be fooled into thinking that following the guidelines will guarantee you good health. It is an improvement over previous iterations, but only a modest improvement.

Dairy and Grain Products and Auto-Immune Diseases

Diabetes: Refined grains are associated with an increased insulin response. An increased insulin response and resulting insulin insensitivity are implicated in the development of type 2 diabetes and in obesity. Whole grain products limit this risk, ^{140, 141} but eliminating all grain products and substituting fruits and vegetables may be an even better protective measure. In several studies, the development of Type 1 diabetes in children was associated with an allergic reaction to cow's milk that was given to infants prior to four months of age, and who then received little or no breastfeeding. ^{142, 143} Researchers based in a dairy research center analyzed various studies on the association of Type 1 diabetes and drinking cow's milk and found the evidence inconclusive. ¹⁴² Given their source of support, this is not a surprising conclusion. The high fat content in milk may be a causal factor since eating large amounts of meat protein, often high in fat, has also been associated with an increased

incidence of Type 1 diabetes. ¹⁴⁴ Type 2 diabetes is strongly associated with a high fat diet. ¹⁴²

Multiple sclerosis: Multiple sclerosis, another auto-immune disease, has also been associated with milk consumption. The highest prevalence rates are in those regions with the largest cow's milk consumption. ¹⁴⁵⁻¹⁴⁷ Again, there may be some association with excess animal fats in the onset of the disease. ¹⁴⁸ The severity of symptoms in rheumatoid arthritis may also be related to eating dairy products, at least in some individuals. When the dairy products were eliminated, the symptoms markedly improved. ¹⁴⁹ Although not characterized as an auto-immune disease, autistic children have shown significant improvement in their behavior when dairy and grain products were eliminated from their diets. ¹⁵⁰ Allergic reactions to the gluten in grains and grain products (particularly wheat, but also barley and rye) often occur as abdominal distress after eating these products. More severe reactions involve problems with the central nervous system and include headache and difficulty walking. Exercise after eating foods with gluten can lead to heightened sensitivity to gluten and allergic reactions. Allergic reactions to corn, millet, and rice have also been noted. ¹⁵¹⁻¹⁵³

Lactose Intolerance and Children

Children need vitamin D to prevent rickets and vitamin D-fortified milk has been a major factor in the reduction of rickets in the United States. In addition, children need fat and protein for appropriate growth and development which are easily supplied by dairy products. It would seem, then, that since the evidence associating dairy products, particularly milk, with Type 1 diabetes and autism is limited, that milk and other dairy products should be a part of a child's diet. This ignores the fact that, as discussed in the previous chapter, the majority of individuals in the world suffer from lactose intolerance/malabsorption.

Children from populations of northern European descent are among the few in the world who can tolerate lactose past weaning age. This is one reason why fortification of milk with vitamin D was so successful in eliminating rickets among the European-descent population in the United States. However, 80% of Americans of West/Central African ancestry are lactose intolerant/malabsorbers, as are 90-100% of those of American Indian or Asian ancestry.¹⁰⁷ Research funded by dairy groups suggests that if ingested in small doses, anyone can drink a cup or two of milk per day without gastric distress.¹⁵⁴ However, there is a large body of research on lactose intolerance/malabsorption that strongly suggests

otherwise. 106-112 And anyone who has suffered severe gastric distress after drinking or eating dairy foods is unlikely to wish to repeat the experience. Since milk is an iffy proposition for the majority of infants and children, the best methods of insuring that they have appropriate levels of vitamin D to prevent rickets is through a vitamin D supplement and/or careful UVB radiation exposure.

Fish, Nuts, and Omega-3 Fatty Acids

Modern diets contain too much fat. Our ancestors had very low fat diets compared to our own. Much of the fat in our diets comes from two sources that were unknown to our hunter/gatherer ancestors: dairy products and meat from domesticated cattle. Wild animals are extremely lean compared to farm-raised animals, in large measure because they have to make an energetic effort to find their food. This is also one reason late 20th-early 21st century industrialized populations have high rates of obesity: we need expend very little effort to eat.

Although excess fat is dangerous to our health, some fat in the diet is necessary to properly digest our food and for cell membrane maintenance. These necessary fats, omega-3 polyunsaturated fatty acids, are found in fish, particularly in salmon, mackerel, sardines, tuna, and anchovies, among others. They are also found in almonds and

walnuts. Omega-3 fatty acids are used to make cell membranes elastic. This is particularly important for heart health as omega-3 fatty acids can reduce atherosclerosis. Among Seventh Day Adventists, those who ate four or more servings per week of tree nuts had a significantly lower risk of heart disease than did those who did not eat nuts or ate them less than once per week. ¹⁵⁵ Omega-3 fatty acids also appear to reduce joint stiffness in those suffering from rheumatoid arthritis and, when taken with their medication, allow those with Crohn's disease to remain symptom-free. In one study of 80,000 nurses, those who ate fish five times per week had their risk of stroke cut in half compared to those who ate fish only once a month. There is even evidence that fish oil can reduce the symptoms of depression. ¹⁵⁶ Eating fish has also been associated with reduced incidences of prostate and colon cancers. ^{157, 158} Data on foraging/horticultural populations collected in the early decades of the 20th century showed that in all cases studied, fish and shellfish formed a major portion of the diet. If the population lived far from coastal regions, they traded with those on the coasts in order to obtain adequate supplies of fish and shellfish. If unable to obtain these foods, their health suffered. ¹⁵⁹

Compared to meats, even fatty fish are low in fat. Therefore, if you want a high-quality, low-fat source of protein that provides numerous other

health benefits, you would be wise to eat a serving of fish, especially salmon, mackerel, and sardines, at least once a day. Pregnant women need to be concerned about methylmercury in fish since the toxin can cause problems for the developing fetus. However, this toxin is primarily a problem in certain long-lived fish.¹⁶⁰ Therefore, pregnant women should be safe eating sardines and herring.

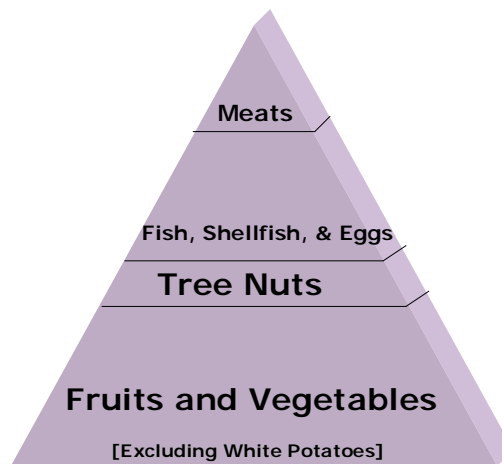
Tree nuts bridge the margin between the fruit and vegetable base of the Premier Nutrition Pyramid (see Figure 3) and the next level of fish, shellfish, and eggs. Peanuts, a legume (as are green peas and beans), are not true nuts and probably played a more limited role in our ancestral diet. On the other hand, we have clear ethnographic and archaeological evidence that tree nuts played a major role in the ancestral diet as a dietary staple. Almonds and walnuts have a fairly high fat content, but since a major portion of this fat is the omega-3 fatty acids, and since these nuts are also a good source of protein and fiber, adding about a one ounce serving as a snack twice each day will also improve your health profile.

Eggs are high in cholesterol, but if eaten as part of a low fat diet that excludes dairy products and high fat meats, two eggs per day should present no problem to healthy individuals. In cultures where fats are kept

to less than 20% of the diet, high dietary intake of cholesterol does not lead to heart health problems. 161

Figure 5

Premier Nutrition Pyramid



Fruits and Vegetables

Our major source of antioxidants, most vitamins (vitamin D is not actually a vitamin), and a variety of other important nutrients is fruits and vegetables. The largest number of servings of any food group that we eat daily should consist of fruits and vegetables, preferably eaten fresh or lightly steamed since nutrients are lost through over-cooking. While juices can be healthy, if no sugar is added, eating the whole fruit and vegetable

is much better because more of the nutrients remain along with fiber. As opposed to refined grain products which contain little if any fiber, fruits and vegetables are excellent sources. They are also low in calories. However, white potatoes, particularly in the form of French fries and mashed potatoes, do not count as quality vegetables since they are primarily starch and raise the glycemic index. Sweet potatoes are a healthier option.

Dark green leafy vegetables are a good source of calcium. However, to obtain 1500 mg of calcium from this source would require eating pounds of green vegetation. Some researchers believe that this is what our ancient ancestors did.¹⁶¹ This seems improbable. The only regions where one could obtain dark green leafy vegetation year-round would be in the tropical and subtropical zones. These zones also have a wide range of fruits and nuts which provide a better energy and nutrient return for the eating investment and are more important for brain development than is vegetation.

Of the ape species, only gorillas subsist on a largely leafy diet. This means that food must be more thoroughly processed in the gorilla gut than is true for chimpanzees and humans so that gorillas will be able to obtain more nutrients from their vegetation diet. Chimpanzees eat very few leafy vegetables, and then mostly when they eat meat. Their primary

source of nutrients is from fruits and nuts. This would also have been the case for the earliest humans. This high-energy diet means that both chimpanzees and humans are able to be much more energetic and social than is possible for gorillas on their low-energy diet of leafy vegetation.

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Almonds are a very good source of calcium. There are about 140 mg of calcium in two ounces of shelled almonds. The total calcium obtained from the Sample Menu shown at the end of this chapter is about 770 mg, with almost 500 mg from fruits, vegetables, nuts, and eggs. The average intake among a variety of populations throughout the world is 500 - 700 mg of calcium. It is evident from analysis of chimpanzee diets and those of humans living in tropical zones that larger doses of calcium are not necessary in the diet as long as one has adequate levels of vitamin D. Vitamin D is more critical than calcium.

Lycopene, a potent anti-oxidant protecting against prostate cancer, is found in tomatoes. The lycopene is more readily released when the tomatoes are cooked.¹²⁵ Recent research has found that eating fruit provides protection from lung damage, particularly for chronic bronchitis and emphysema.¹⁶³ The multiple benefits of fruits and vegetables are so readily apparent that their position at the base of the food pyramid

should be obvious. One wonders why grains with their more problematic benefits are given this pride of place in the standard food pyramid.

Summary

Premier Nutrition is that which is first and foremost in providing for the health and well-being of the human population. Humans adapted to this diet over tens of thousands of years. The current diet eaten by most industrialized populations is one that developed out of scarcity and the need to feed large numbers of people economically. Grains, while filling, are a poor substitute for the nutrients found in fruits, vegetables, nuts, eggs, fish, shell-fish, and lean meats. The lactose in dairy foods can be easily processed by only a fraction of the human population. Eliminating grains and dairy products provides room in the diet for more of the foods that keep us in peak health.

For those with little time or interest in cooking, Premier Nutrition is the perfect diet since food is eaten as fresh as possible and involves little preparation. See the **Sample Menu** in the Appendix for an example of one day of Premier Nutrition. To determine how your current diet stacks up to the Premier Nutrition plan, fill in **Worksheet 3: Premier Nutrition Pyramid** in the Appendix.

To Sleep...

Sunrise, sunset... daily activities follow this natural cycle.

In the tropics, the sun rises at about 6 am and sets at about 6 pm. There is no variation between summer and winter in this cycle. This is not the case for the temperate zones where the sun may rise around 6 am during the summer and set at 9 pm, but rise at 8 am during the winter and set at 4 pm. But it is in the tropics that humans have their origins, and a tropical lifestyle to which humans are originally adapted. To understand sleep we must examine the impact the day/night cycle had on our hominid ancestors.

Our Ancestors and Sleep

Although our earliest adult ancestors were fairly large and could accurately throw stones as weapons, they were still vulnerable to large predators, particularly cats who hunt at night. There is no evidence of use of fire prior to about one million years ago; and the evidence for controlled use of fire dates to about 500,000 years ago. For our ancestors, particularly the vulnerable young, night was a time of potential danger best met by finding a secure place to sleep and going to sleep soon after

sunset. When the sun rose again in the morning, it was time to begin a new day's activities. Prior to 500,000 years ago, our ancestors probably slept for ten to eleven hours each night. Once they were able to create fire at will, humans would have been able to extend some activities into the night time hours. However, the main benefits of controlled use of fire were the abilities to cook foods, to stay warmer on chilly nights, and to ward off predators while sleeping out in the open. These abilities allowed our ancestors to move into environments that previously had been closed to them. Although campfires may have permitted our ancestors to extend their activities, it is probable that most still slept around ten hours each night simply because their active lifestyle would have resulted in them being too tired to remain awake longer.

Once humans had the ability to control fire, they began to move into the temperate zones. In the temperate zones, the day is longer in the summer and shorter in the winter than is the case in tropical zones. The longer summer days meant that our ancestors probably slept less in the summer, but may have slept more in the winter. It is possible that during the summer, our ancestors in the temperate zones slept for only eight hours each night, but closer to eleven hours each night during the winter months.

This pattern would have changed very little for most individuals until quite recently. Those who managed to stay up far into the night with the aid of artificial light sources, probably slept far into the day to make up for this. We can conclude, based on archaeological evidence and the study of less technologically advanced groups, that humans are adapted to and need between eight and ten hours of sleep each night. Unfortunately, our modern 24/7 culture plays havoc with our sleep needs, adversely affecting our mental and physical health and well-being.

The 24/7 Culture and Sleep

In our fast-paced culture where working more than 40 hours per week is considered the norm by many, it may appear that an easy way to gain more time for additional activities is by cutting back on hours slept. This, in fact, seems to be what we are doing. In 1910, Americans averaged nine hours of sleep. But today, around seven hours of sleep is the norm.^{164, 165} This reduction in hours slept is true not only of adults, but of children and teens whose growing bodies require ten to twelve hours of sleep each night.

During sleep, our bodies not only rest, but actually build, rebuild, and maintain themselves. Shortchanging our sleep short circuits these

activities with detrimental effects to our health. Research has found that a peptide in the stomach that prevents ulcerations by protecting the cells lining the stomach is at peak production during sleep, but at very low levels while eating. Sleep deprivation may lead to ulcers and other stomach problems due to inadequate production of effective levels of this peptide. ¹⁶⁶

The immune system functions best in a well-rested body. Those who continue to press forward on their work schedule despite an illness will find that their illness lingers and may, in fact, worsen, possibly leading to death. The death in 1990 of Jim Henson, of Muppet fame, due to an untreated bacterial infection, should be a cautionary tale to all those who think they cannot take the time from work to rest and regain their health. Even the loss of sleep of one hour per night for a week can weaken the immune system to the point where a cold virus can take hold. The best cure for a cold is plenty of rest. So, one way or another, the body will strive to get the rest and sleep it demands. During the lighter sleep stages, particularly during REM sleep, there is an increase in the circulating levels of interleukin-6, part of the immune system. Inadequate sleep of this type (associated with dreaming) disrupts the effectiveness of the immune system. ¹⁶⁷

Cancer prevention appears to be associated with adequate levels of sleep in a darkened room. Research shows that melatonin, a hormone produced by the pineal gland during sleep, suppresses tumor growth.¹⁶⁸ Since the pineal gland is affected by light, individuals who stay up into the night under artificial light have reduced production of melatonin.¹⁶⁹ Research comparing breast cancer risk among sighted and visually-impaired women found that those with visual impairments, who would be less affected by ambient light, had a significantly lower risk of developing breast cancer compared to normally-sighted women.¹⁷⁰ Melatonin's tumor-suppressant effects have been examined in breast, prostate, colon, and uterine cancers. It seems probable that melatonin also has a beneficial effect on other cancers.¹⁶⁸ While we sleep, our body heals.

Although everyone needs adequate sleep, it is especially important for children and teens. Learning is enhanced with adequate hours of sleep. A study done on cats found that those who were allowed six hours of sleep after a learning challenge, had twice the brain development as did those who continued to be exposed to that challenge for an additional six hours. Sleep evidently provides the brain with the time it needs to firmly embed learning and experiences into usable memory.¹⁷¹ For teens and young adults, pulling all-nighters and cramming for exams are probably

counter productive efforts since the information does not have a chance to become embedded in brain circuitry and can vanish into the ether when the student is confronted with a blank test page. If parents really desire educational success for their children, they should make sure that the children and teens get 10 – 12 hours of sleep each night, especially before an exam.

Students who are not well-rested not only do poorly on exams, they are less able to concentrate during class, are more disruptive, and are more prone to illness. This also holds true for the adult workforce. Workers lacking sufficient sleep are more irritable, error-prone, and subject to illness than are their well-rested colleagues. This is particularly true for shift workers who work on cycles that conflict with the individual's internal clock and biological rhythms.¹⁷² An individual who works on a day shift during one two-week period and the night shift the next two-week period does violence to his emotional and physical health primarily through disruptions of the natural sleep cycle. As the workers age past 40, their health steadily and significantly worsens when compared to those who work only during the day. Shift workers are far more likely to suffer from cardiovascular disease and gastro-intestinal problems, which are associated in these workers with sleep disturbances.¹⁷³ Stress levels

are exacerbated by inadequate sleep. Since stress is associated with an increased risk of contracting an infectious illness,¹⁷⁴ we have yet another reason to make sure we obtain adequate hours of sleep. Unfortunately, individuals from the lower socio-economic levels who tend to live with the highest levels of stress also have the most difficulties getting adequate levels of sleep. This is reflected in their poorer overall health profiles. Chronic sleep deprivation could be a factor in type 2 diabetes, hypertension, obesity, and memory loss since sleep deprivation affected insulin response and cortisol secretion.¹⁶⁵

Inadequate hours of sleep and sleepiness are factors in accidents. There is an especially clear association between sleepiness and car accidents. An individual who drives while sleepy can be just as impaired as one who drives while under the influence of alcohol.¹⁷⁵ A worker who did not have enough hours of sleep the night before, who works an eight hour day, and then goes out to a bar for a few drinks after work could be a double driving threat later that evening. But even without drinking, the tired worker without adequate sleep is more likely to be in an accident than is a well-rested worker.

For most of the 20th century, women averaged a longer life span than men, although the gap has been steadily closing in the last few

decades. It has been proposed that part of the reason for the better health of women is that they have stronger immune systems. Research examining the thymus and T-cell production, a component of the immune system, found that women have improved thymic function relative to men and that this better functioning extends longer into old age in women than in men.¹⁷⁶ It is only in the last few decades that women have been participating in the work force in large numbers and have been employed in shift work. These changes in the employment profile of women and the resulting disruption to sleep cycles that occurs with shift work may lead to a further narrowing of the gap between male and female life expectancies as women suffer more from a depleted immune system.

Importance of Sleep

- **Needed to maintain immune system effectiveness.**
- **Enhances brain development and learning.**
- **Allows for production of peptides protecting stomach lining.**
- **Reduces stress, irritability, and accidents.**

Optimal Hours of Sleep

Children:

- 10 to 12 hours

Young Adolescents:

- 10 to 12 hours

Older Adolescents:

- 8 to 10 hours

Adults:

- 8 to 10 hours

Summary

While a few individuals may function better at night than during the day, humans are not a nocturnal species. This means that the vast majority of us function best during the daylight hours after a full night's sleep. While it may be difficult in our 24/7 culture to find the time for an adequate night's sleep, if we want to maintain our immune systems at peak efficiency and to provide our children and ourselves with an optimal opportunity for learning, we must find the time to sleep...

Natural Parenting

Along with so many other aspects of our lives, parenting has been adversely affected by the many changes in our society, particularly over the past 100 years, that conflict with how infants, children, and their parents are adapted to interact. We can achieve a good understanding of the parenting style for which we adapted by comparing the parenting styles of our closest primate relatives, the chimpanzees, with that of foraging populations, those who hunt and gather foods in diverse environments. From this we will be able to determine the natural parenting style.

Comparison of Parenting Styles

Humans and chimpanzees diverged from a common ancestor around six million years ago. We are genetic, biological, and behavioral “cousins” sharing a many “greats” grandparent. Humans are not descended from chimpanzees any more than you are descended from one of your cousins. We just share a common ancestor. However, we also share about 99% of our DNA; and anyone who has watched chimpanzees at a zoo knows we share much of our behavior. We both love to be tickled and to laugh. We both feel shame, empathy, and fear.

Some of us are outgoing, some are shy; some are adventurous, some prefer more placid activities. And when we watch mothers interact with their infants and children, the similarities are striking.

Experienced chimpanzee mothers are extremely nurturing towards their infants. They carry the infant everywhere, they hold them while the infant nurses, they play gently with the infant, even doing stretching exercises and making play faces as human mothers do. If the infant should die from disease or accident, the mother experiences deep loss and sorrow.

Human mothers in foraging populations are in many ways more similar to chimpanzee mothers in their behavior towards their infants than they are to mothers in Western, industrialized nations. Infants in foraging populations are carried 100% of the time, primarily by their mothers, but also by other adults and older children. This is possible because infants are carried in a sling across the mother's chest or back. Infants nurse frequently, whenever they wish, because the breast is always available. As with chimpanzees, human infants in foraging populations sleep with their mothers so that they can easily nurse at night without waking mother.

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The first item of "clothing" invented by our ancient ancestors was probably a baby sling made from the skin of an antelope, minimally

modified. Unlike chimp babies who can cling to the fur of their mothers, human infants have no fur to cling to and must be carried. Since each adult and older child in foraging populations is expected to provide most of their own food each day, mothers need to have their arms free for gathering and carrying food items. Thus, a baby sling was a necessity. In addition, it was imperative that the infant be able to nurse whenever it wished because a crying infant acts like a beacon to a predator. Our ancestral mother and infant would be a poor match for a hungry leopard, so a quiet, well-fed, happy infant was one who had a good probability of surviving infancy. Chimpanzee mothers are several times stronger than human mothers, but they still attempt to avoid attracting the attention of leopards and other predators.

Mother and infant co-sleeping is beneficial in many ways. As mentioned before, an infant sleeping with her mother can easily nurse as needed throughout the night without disturbing her mother. Sleeping with mother also provides protection from night predators who are unlikely to attack a full-grown, healthy adult. Furthermore, there is evidence that co-sleeping aids in synchronizing the infant's breathing to that of the mother, thereby preventing the sleep apnea associated with Sudden Infant Death Syndrome (SIDS). SIDS is extremely rare in cultures where mothers and infants sleep together. The highest rates occur in western cultures where

infants sleep alone.¹⁷⁸ While placing the infant to sleep on the back has reduced the SIDS rate, it has also led to an increase in permanently flattened skulls and delayed motor abilities.¹⁷⁷ This is an unnecessary cost that co-sleeping mothers and infants do not pay since the infant sleeps more on the side than on the back. Infants who are carried in slings throughout the day and then sleep with their mothers at night have accelerated motor development compared to other infants, are alert and interested in their surroundings, cry very little, and are generally happy and placid. This is also true of chimpanzee infants.

Based on this comparison we can conclude that human infants are adapted to a parenting style in which they are carried 100% of the time, generally upright in a sling. Although any human can carry an infant, since infants are also adapted to nursing when and as frequently as they wish, mothers are the primary carriers of their infants. This also means that infants are adapted to sleep with their mothers so that they can easily nurse. Co-sleeping has the further benefit of essentially preventing SIDS. Infants are adapted to a parenting style where they are never put down, never left alone, and never allowed to cry for more than a few seconds. Any other parenting style conflicts with the infant's adaptations and, depending on how much the parenting style diverges from the natural parenting style, can lead to an infant who is unhappy, withdrawn, whiny,

fearful, aggressive, antisocial, clingy, or demonstrating one of many other maladaptive traits. Infants cannot be spoiled by natural parenting, but they can be “spoiled” and psychologically harmed by parenting styles that conflict with their adapted needs.

Nuclear Family?

One father, one mother, and a few children seems so right, so normal, so natural to those of us living in Western industrialized nations, that it is difficult to conceive that such an arrangement was not always common; that our most ancient ancestors did not also live in nuclear families. In fact, it is so difficult for some to conceive that they have even proposed the creation of the nuclear family as the reason for the development of bipedal locomotion.¹⁷⁹ Given what we know of our cousins, the chimpanzees, and what we know of foraging populations, the nuclear family as the natural family is quite improbable.

In the chapter, *Walk, Don't Run*, a probable scenario for the development of bipedality was presented. In this scenario, our ancient ancestors became bipedal gradually, over a long period of time, as a result of gathering foodstuffs from the watery margins of lakes, streams, rivers, and seas. Both males and females would have been affected by this behavior; and the selection pressure for this behavior would have

been strong since those eating these food sources would have been smarter, and therefore, more attractive to the opposite sex. See that chapter for more details.

On the other hand, the nuclear family, or more accurately, the pair bonding scenario, has numerous problems associated with it, only a few of which will be discussed here. The major problem relates to the concept of pair bonding. In pair bonding, a male and female mate for life. As modified in the pair bonding scenario, among a group of pre-hominids (that is, they still walked quadrupedally, on four legs, as chimps do), a male would be attracted to a particular female and would essentially choose her as his mate. In order to make sure the bond held, he would bring special foods, especially meat, to share with her and their offspring. Since it is easier to carry stuff if one walks on two legs instead of four, the gift-bringer would gradually adopt an upright posture and bipedal locomotion. This behavior would be selected for because the female would be better fed and able to have more and healthier offspring with that male's genes than females who did not have a male providing for them. So far, this may sound like a plausible scenario, but we need to examine it more closely.

Behaviorally, pre-hominids were probably extremely similar to chimpanzees. Chimpanzees have shown no signs of developing pair

bonding. For a few days a month, a male and female may go off together to mate while the female is in her fertile period, but then they will go their separate ways. The most frequent behavior during a female's fertile period is for her to mate with any male that shows interest. These matings are quite brief and generally do not involve the male giving the female food items. On occasion, a female will offer sex for food a male has, but the male does not deliberately gather food for the purpose of enticing a female to have sex with him and only him.

Another problem with the pair bonding scenario is that it implies that the "couple" has a home base and that the female and offspring stay there while the male goes off to gather the food. While foraging populations may have a temporary home base, it is the responsibility of the women to provide for most of their own food needs, along with that of their children. In some cases, women provide 70% of the food eaten by everyone, male and female, in the group. If we now move six million years into the past, we can see that it is improbable that males among pre-hominids would be the primary food providers when this is not even the case among most modern foraging populations. And it is certainly not the case among chimpanzees who share more in common with pre-hominids than does any other group.

The home base presents a further difficulty. A male who claims a female needs some way to ensure that only he mates with her so that he knows that her offspring are also his, otherwise there is no way to ensure that his genetic material is passed to future generations. If genes are not passed on, then the base for selection of the pair bonding scenario is destroyed. Among modern foraging populations, there is no way to ensure this. It is difficult to ensure it in modern industrialized populations. The method used to attempt to ensure it among chimpanzees is for males to have sex as frequently as possible with all fertile females in the hope that their sperm will win the competition with other sperm. While the pair bonded male is off hunting meat for his female, another male could visit her. If she is firmly attached to her male (and this is a big if), she may resist the intrusive male's efforts, but as males are larger than females, she would probably lose. The fully quadrupedal male would be passing on his genes while the male who was spending more time in bipedal locomotion would not pass on his genes. Pair bonding is neither a necessary nor sufficient behavior to lead to bipedality. And the fact is that modern humans are not pair bonded nor even particularly monogamous. The most important bond is that between a mother and her offspring. Any other bond is secondary to that.

Sisterhood is Powerful

The change from quadrupedal locomotion to bipedal locomotion caused changes in the pelvis, in addition to changes in the angle of the femur as discussed in Walk, Don't Run. So long as our hominid ancestors remained relatively small-bodied and small-brained, the pelvic changes were not much of a problem while giving birth. However, by about two million years ago our ancestors had reached our modern body size and about two-thirds of our brain size. This meant that women were giving birth to heavy, large-brained infants. As most women who have given birth will tell you, birthing such a large infant is not easy and is, in fact, quite painful. Most women do not wish to undergo labor alone, and this was probably the case two million years.

Chimpanzee females have a roomy pelvis and give birth to relatively small-brained infants. In addition, the infant is born face up which means it is easy for the mother to reach down and pull the infant to her breast. Chimpanzee females give birth alone. Human females, on the other hand, have a relatively compact pelvis with barely enough room for a full-term infant to squeeze through the birth canal. In addition, the infant must twist and turn its way through the canal, ending up being born face down. If the mother reaches down to pull the infant to her, she could easily break its back or otherwise injure it. While human females can give

birth alone, they are more successful if there is someone there to aid them in the process. 180

Women who have given birth themselves know what the woman in labor is enduring and can offer appropriate comfort and advice. Women who have aided at a number of births are especially valuable since they have not only their own experience to guide them but that of several other women. Until the 18th century, when men began to professionalize the field of medicine and to medicalize birth, women always aided women during the birth process. Mothers, older sisters, and midwives were the desired birth attendants. Based on what we know of birthing among forager populations, we can surmise that this was also the case with our ancient ancestors.

Among our ancestors, the mother/infant dyad was the primary relationship. The birthing process would have formed strong bonds with the women who aided the birth process, and with other women who were mothers. Each woman was the primary source of food for herself and her young offspring. Since toddlers and young children enjoy playing together, but must still be monitored by someone older, it is probable that women and their offspring would forage in pairs or small groups, both for companionship and safety. Over the course of an average day, a woman and her offspring would probably have little, if any, contact with any man,

but would have been in close contact with other women. The bonds among women were probably quite strong, even if the women were unrelated.

Among bonobos, a subgroup of chimpanzees living in the Congo, females in a particular group are unrelated, but strongly bonded; so much so that there is relative equality between the sexes since the females will work together to control an overly-assertive male. In fact, on occasion, the group will be led by a female. Bonobos tend to be much more peaceful than other chimpanzees, in part because they use sex to heal tensions. In addition to sex between adult males and females, sex occurs between males, between females, and between individuals of differing ages. Given the critical need of female support during childbirth, it is possible that the bonds formed among women led our ancestors to engage in a behavioral pattern similar to that of bonobos.

The roles of men among our ancestors would have been limited, but important. The primary role of men would have been as an intermittent sex partner. While a particular man might prefer to mate with a particular woman, it is more probable that each man and woman had multiple partners over the course of a year. Since no man could be assured of which children were his, he probably treated all children much the same, although he might be more favorably disposed towards those of

his current special woman, if he had one. Probably the next most important role for a man would have been as defender of the group against predators. Since men are much stronger than women and are not necessary for infant care, unlike women who must breastfeed their infants, men are more suited to the role of group defender than are women. These same attributes are also why men primarily take on the role of hunter. Among modern foraging populations, the meat provided from hunts is generally only a small portion of the daily food and calories consumed, but is, nevertheless, an important part of the diet. These three roles (sex partner, protector, hunter), while important, do not require or even support the concept of the nuclear family. It is more probable that the natural parenting family consisted of a woman, her children, and her extended family of women friends or kin, particularly older, experienced women, and their children. This group of women worked together to raise their children with little if any input from the men. This does not mean that men cannot be actively involved in childcare and childrearing, but it does mean that there is not an adaptive history of men taking on this role. A woman and man are not adapted to parent alone. If they do not live near either set of their own parents, then they need to create a network of relationships with older, experienced individuals to provide them with the guidance they need when confronted with various parenting issues.

Breastfeeding

Contented infants live in an environment where two primary conditions are present. First, the contented infant is in constant physical contact with another human while being held, carried in a sling, or sleeping. This other human can be an older sibling or cousin, or any willing adult. A father who wishes to be actively involved in his infant's life and who wants to make an impact on the infant's health and well-being will choose to carry his infant as much as possible. In addition, the father will want the infant to sleep with both parents. Bodily contact is necessary for the contented infant. Among neonatologists this is known as kangaroo mothering. Although valuable for all infants, it has been found to be particularly beneficial when used with premature infants because the body heat of the one holding the infant acts as an incubator, while that individual's heart beat and breathing help to regulate those of the infant's thereby improving the infant's chances to thrive.¹⁸¹ Second, the contented infant is able to nurse at will. Fathers should encourage mothers to breastfeed and provide the necessary support to make it as convenient as possible for the mother to do so. Breastfed infants cry much less than those who are bottle fed, or both bottle and breastfed, probably because they are able to control their food intake.¹⁸² While this

generally means the mother needs to maintain close contact with the infant, on occasion another nursing mother can substitute for the infant's own mother. This can only be a stopgap measure unless the substitute mother has lost her own infant since breastfeeding is a major drain on caloric resources. The necessity to nurse two infants can put both infants at risk. Multiple births will be discussed later in this chapter.

Breastfeeding is important to infant contentment not only because it provides the needed bodily contact, but because it does more to ensure that the infant remains healthy than do other forms of infant nourishment. Research has shown that infants who are exclusively breastfed have significantly fewer serious illnesses than do infants who are bottle fed or who receive supplemental foods during the first six months of life. ¹⁸³ This is in part due to the natural immune substances passed from the mother to the infant via breast milk which provide the infant with immunity to a variety of illnesses until the infant's own immune system begins functioning later in the first year of life. ^{184, 185} This natural immune system via breast milk can be disrupted by supplemental feedings. Increased incidence of illnesses is directly correlated with the introduction of supplemental foods prior to six months, even if breastfeeding continues. ¹⁸³ This may be because the infant is obtaining less breast milk than previously. Fewer illnesses among breastfed infants are also the result of

lessened contact with potential allergens in cow's milk and supplemental foods, and impurities in formulas, especially when the formula is made with impure water. ¹⁸⁵ Since death from serious illness is a major factor in infant mortality, breastfeeding may have as important a role to play as does birth weight in reducing the infant mortality gap between African-American infants and European-American infants. Breast feeding is much less frequent among African-American mothers compared to European-American mothers. As more mothers breast feed their infants, infant mortality rates should decline. ¹⁸⁶

Very-low-birth-weight (weighing less than 1500 g) and premature infants are subject to a number of health and developmental problems, one of which is a deficit in intelligence compared to normal weight, full-term infants. This deficit is reduced in infants who are breastfed compared to those who are not. The longer an infant is breastfed, the better the results when intelligence is measured by various tests at later ages. ¹⁸⁷, ¹⁸⁸ Therefore it is doubly important that low-birth-weight and/or preterm infants be breastfed since it not only reduces the risk of serious illness that could lead to death, but may also increase the probability that these infants will develop into children with normal intelligence levels. ¹⁸⁹

Breastfed infants also may be less prone to obesity than are bottle fed infants. While there are many factors related to the development of obesity including poor diet and lack of exercise, whether or not an infant was breastfed and the duration of breastfeeding may also play a role. After adjusting for a number of physical, lifestyle, and socio-economic factors, researchers found that among adolescents, those who had been breastfed longer than seven months were significantly less likely to be overweight than were those who had not been breastfed or were breastfed for less than three months. A possible reason given for this outcome is that breastfed infants regulate their food intake from breastfeeding while bottle fed infants are frequently fed until the bottle is empty, thereby disrupting the infant's natural control mechanisms and setting the stage for overeating throughout life. ¹⁹⁰

Breast cancer is associated with whether or not a woman has breastfed during her life. Women who have breastfed have a lower risk of breast cancer than those who have not. Further, the longer a woman breastfeeds, the lower her risk. ¹⁹¹ Therefore, not only is breastfeeding best for the infant, it can be shown that breastfeeding also benefits the mother's health. This is further supported by research which found that mothers who breastfed had higher bone mineral density once lactation ended than did mothers who did not breast feed. This was also true of

teen mothers who themselves were still growing.¹⁹² Breastfeeding does a body good.

It appears that a number of health issues among certain populations could be improved if more infants were breastfed. The infant mortality rate could be reduced if more low-birth-weight and preterm infants received their mother's immune substances via exclusive breastfeeding for at least six months. Deficits in intelligence among very-low-birth-weight and preterm infants could be limited if these infants were exclusively breastfed for six months. Obesity and its associated problems of type 2 diabetes and heart disease could be reduced if infants were exclusively breast fed for six months and then continued to be breast fed for some months beyond that while receiving nutritious supplemental foods. Breast cancer rates, particularly among women younger than age 40, could be lowered if the women breastfed any children they had. Breast feeding our infants is our natural adaptation and is an important component of good health, both for the infants and their mothers.

Since breastfeeding is so important, our society must make some changes to accommodate mothers, especially mothers who work outside the home and who wish to breastfeed. The optimal solution would be for mothers working outside the home to receive six months paid maternity leave and for employers to provide on-sight daycare for infants and

children six months and older. Since this optimal solution will probably occur in few businesses in the United States, although it is provided in other industrialized countries, ¹⁹³ the next-best solution would be to allow mothers to bring their infants younger than six months of age to work with them. The mother could carry the infant in a sling on her chest or back as women in other cultures do. As mentioned earlier, infants who are constantly carried and who can nurse at will are very contented and cry little, if at all. Therefore, although this solution would require some changes in work dress and a general acceptance of nursing in public, the behavior of the infant herself would not be a factor.

Benefits of Breastfeeding

- **Low Cost**
- **Human breast milk is best nutrition for human infants**
- **Breast milk includes maternal immune substances which provide protection to infant until his immune system begins functioning**
- **Minimal crying among infants who breastfeed at will**
- **Reduces intelligence deficits in preterm or LBW infants**
- **Breastfed infants are less prone to obesity in later life**
- **Breastfeeding results in higher maternal bone mineral density**
- **Women who breastfeed have a reduced breast cancer risk**

One on One

There is an odd excitement in this country when a woman gives birth to multiple offspring. The larger the number of offspring, the greater the excitement when the births are announced. Although multiple births are usually accidental and unplanned, new reproductive technologies are changing this by allowing the implantation of multiple embryos into a woman's uterus. This is of great concern because women are adapted to having only one offspring with each pregnancy.

When compared with our nearest relatives the chimpanzees, human infants born at full term are actually premature. This is because there are constraints on the female pelvis between the adaptations for successful bipedality and those for successful delivery of an infant. By about two million years ago, the human pelvis had reached the limits of the changes that could be made to enlarge the pelvis in order to deliver larger infants while also maintaining an adequate angle of the femur for efficient walking.

Chimpanzees have a brain size about one-third of ours. A chimp infant born at full-term (about eight months gestation) has a brain size 75% of its adult size, with growth of the brain continuing slowly after birth. The chimp infant is also advanced in motor skills compared to a human infant, able to hold its head up, sit up, and creep within the first month. A human infant is born with a brain size about 50% of what it will be as an adult, but brain growth remains on a fast trajectory after birth, slowing down at about two years of age. However, because of this limited brain growth at birth, the human infant also has limited motor abilities. It is not until approximately one year after birth that the human infant achieves the same motor abilities that the chimp infant achieves soon after birth. Therefore, humans are considered to have a nine month *in utero* gestation and a twelve month *ex utero* gestation. The reason for this extended *ex*

utero gestation is that the human female birth canal formed by the pelvic bones simply cannot accommodate a larger infant than that delivered after a nine month *in utero* gestation. In order for humans to develop their large brains, rapid infant brain growth had to continue after birth instead of being completed prior to birth as is the case with chimpanzees. The problem with this solution is that humans give birth to what are in essence premature infants, even when they are born after a full nine months' gestation. Premature infants require much more intensive care than do more developed infants. Therefore, an infant born to our ancient ancestral mother placed a much heavier burden on her resources than was the case of an infant born to a chimpanzee mother.

Chimpanzee mothers, as is true with all apes, generally have only one offspring with each pregnancy, but they do occasionally give birth to twins. Despite their greater physical development than is true of human infants, twins place a tremendous burden on the chimpanzee mother. Two infants are clinging to her; two infants must nurse; she must find even more food to make up for this caloric drain, but this is harder to do when she must carry two infants everywhere. Generally, one or both infants die soon after birth because the burden on the mother is just too great.

The burden of twins on our ancestors would have been much, much greater than that on the chimpanzee mothers, even if others in the

human group helped out. This is because, unlike the chimpanzee mother, the human mother would be coping with physically and neurologically premature infants. Since twins tend to be born prior to full term anyway, the prematurity would be greatly exacerbated. As with chimpanzee twins, it is probable that one or both of the human twin infants would die soon after birth simply because the drain on the mother's resources would be unbearably burdensome, even if she received help from others. Even now, in the 21st century, with all our technological advances and social support systems, multiple births place tremendous burdens not only on the mother, but on her family and society.

Between 1980 and 1997, when in vitro fertilization (IVF) became more common, the rate of multiple births increased dramatically, with twin births jumping 42% and triplet or higher births skyrocketing 370%.¹⁹⁴ Prior to the widespread development of perinatal intensive care facilities in the 1970s, many of the triplet and higher multiple births would have died because of their extreme prematurity due to being born well prior to 40 weeks gestation. While currently many, if not most, of these infants may survive, they suffer from much higher rates of neurological and developmental problems than is true of singleton, full term infants. Cerebral palsy is 20 times more probable among triplet than singleton births.¹⁹⁴

Low birth weight (weighing less than 2,500 g) is associated with higher rates of infant mortality and increased developmental problems. The average birth weight for twin births is about 2,300 g, while that for triplet births is about 1,600 g. With increasing number of fetuses, there is a decreasing birth weight. Number of fetuses per pregnancy is also associated with gestation length. Full term gestation averages about 40 weeks; twin gestation is about 36 weeks; while that for triplets is 33 weeks. Again, with increasing number of fetuses, there is decreasing gestation length. Among triplets, neonatal deaths occur at about three times the rate of twin deaths, even with our advances in neonatal intensive care.¹⁹⁵

Twin births, the most common of multiple births, are associated with several fetal and maternal problems, even leading to death for both mother and fetuses. Despite our improved technologies and treatments, such births are not without risks.¹⁹⁶ The older the mother, the more these risks worsen. The optimal age for a first pregnancy is between 18 and 24, while the optimal age for subsequent pregnancies is between 25 and 34. During these age spans, the risks to both the fetus and the mother are smallest and the outcomes are the best. However, due to a variety of factors, many women are now delaying reproducing into their 30s or even 40s. This is problematic since the risk of poor outcomes for

both fetus and mother rise rapidly after age 35. One of the sources of poor outcome is the higher rate of preeclampsia associated with a rise in maternal blood pressure and fluid retention. It frequently leads to preterm labor, but can also result in fetal and/or maternal death. Preeclampsia has increased 40% over the past decade, perhaps as a result of delaying reproduction and increasing use of IVF. Preeclampsia occurs most frequently in older women and those carrying multiple fetuses, along with those with pre-existing high blood pressure or diabetes. ¹⁹⁷

Fertility rapidly declines past age 35. Delaying reproduction into the mid-30s and beyond not only increases the chances of a poor outcome, it also increases the probability of being unable to achieve pregnancy without the intervention of IVF. As mentioned before, IVF is associated with the dramatic rise in multiple births due to implantation of multiple embryos. Even in the absence of IVF, twinning occurs at higher frequency among women aged 40 and older than among younger women. This is particularly true of women for whom this is their first pregnancy, or who have had four prior pregnancies. ¹⁹⁸

Women who become pregnant for the first time after age 35 are known as elderly primiparas, and for good reason. Although in today's society a woman at 35 or 40 is still relatively young and healthy in many ways, in terms of reproduction, she is a senior citizen. The number of

viable eggs in her ovaries is drastically reduced compared to a woman in her 20s, and on the downward plunge to menopause. Of those eggs that remain, there is an increased risk of problems occurring during cell division that could result in a variety of abnormalities, some of which are incompatible with life. The older woman is more likely to suffer preeclampsia and, past age 40, more likely to have a multiple birth with all its attendant problems, including an increased probability of an operative delivery. 195

Despite the odds, many women will have a successful outcome. However, the energy level of the average woman at 40 is much lower than that of a woman at 20. If we add a twin birth into the mix, we can see that it will be quite difficult, if not impossible, for the woman to fulfill each infant's adapted needs. The more infants resulting from a pregnancy, the more improbable it is that the infants' adapted needs will be fulfilled. Despite the best of intentions, infants in a multiple birth will be short-changed. Even if they are fortunate enough to avoid the health and developmental problems so common in multiple births, they will be unable to claim the full attention they are adapted to require if they are to achieve their full potential. Humans are not meant to have litters.

Summary

Much more could be said on the subject of natural parenting, particularly concerning older children and adolescents. Fathers can play especially important roles in the lives of their older children and adolescents by modeling appropriate behavior and teaching them various skills. If parents follow the advice laid out in this chapter concerning pregnancy and parenting during infancy, the foundation will be established for achieving the best possible outcome in parenting: raising offspring to become healthy, intelligent, independent, responsible adults. Following the advice in the previous chapters on diet, exercise, and sleep will ensure an optimal outcome.

Infants and children cannot be spoiled with appropriate, loving attention. Treat your children as you would treat your best friends, and as you would want your best friends to treat you. This does not mean treating children as adults, but it does mean listening to them seriously, responding to them promptly, and including them in age-appropriate decision-making situations. Infants and children are not bionic toys or superior sorts of pets. They are our future.

Diversity, not Divisiveness

The United States has created a socio-political culture which views individuals defined as Black or White as virtually polar opposites. This polarization, which has served to hamper our efforts to eradicate racism, is due to socialization and not to any underlying biological realities.

Phenotype: not culture-specific

An attitude toward polarization is exacerbated by the tendency to believe that biological phenotype (what one looks like) is welded to a specific culture. This inappropriate welding of phenotype and culture seems to be a particular problem when we look at how Americans with West/Central African ancestry are viewed. If a particular person's phenotype falls within the perceived "West/Central African" phenotype, broadly defined, or if that individual has a parent of West/Central African descent, that individual is slotted into the "cultural" grouping of African-American or Black, which culture is supposedly quite different from that of European-American or White.

And if that person thus slotted does not behave as expected, then he/she is reviled as turning his/her back on "their" culture... on buying into the dominant culture... as being untrue to themselves. The sad fact of the matter is that it appears that many individuals, including some Americans

with West/Central African ancestry appear to have bought into the slave owner's notion of the "one drop rule". No matter what the extent and diversity of an individual's heritage, if that person has "one drop" of West/Central African "blood", then that person is slotted into a group which is somehow supposed to be very different from the group to which those with European ancestry and no West/Central African ancestry belong.

Black American culture is essentially Southern American culture transferred to Northern urban centers.¹⁹⁹ It is not unique to those with heavy pigmentation. Nor should it be. Americans with West/Central African ancestry are no more African than are Americans with European ancestry Europeans. They are Americans, as any West African or European would be happy to inform them.

Although it seems that many people really do think that if someone looks different from someone else, then that person really is different and that those differences are the most important aspects of that person, this is not only inappropriate, it ignores individual realities and the transient nature of culture. Culture is constantly changing, flowing, adding, subtracting, living, breathing.^{200, 201} If it is not, it is Latin: an interesting curiosity, but dead. When someone says, "We need to be aware of cultural differences," there is an a priori assumption that any such

differences are static, permanent, immutable. Even a brief study of history will show the errors of this viewpoint.

At the moment individuals from two different cultures meet, their respective cultures begin to evolve as they interact with each other through mating, trading, education, and all other types of interaction. As the contacts continue, the individual cultures will add aspects of the other culture to their own. As further time passes, the individual cultures will contain more variety than they did originally, and, most importantly, will become more similar to each other. Eventually, the two cultures may merge to become one richer culture than either of the two were separately. This is certainly the case with American culture. ²⁰²

Welding phenotype to culture implies that there are “pure” phenotypes associated with “pure” cultures and that mixing “pure” groups is ultimately harmful. While such an attitude may be appropriate when dealing with minerals such as gold, it has no place in a discussion of biological organisms. Purity in a population signals its death knell. ²⁰³ In order for a human population to remain viable, it must contain both genetic and cultural variability. Purity leads to extinction; variability equals strength because it allows a population to adapt to changing circumstances.

Since humans dominate the world to the tune of six billion plus individuals, it can be assumed that we have managed to avoid the albatross of “purity”. What this also means is that no particular phenotype can be associated with a particular culture. While there may be a tendency for a particular stereotype of a phenotype and a culture to correlate, when we look at the level of the individual, the biological unit of selection, we do not find that correlation.

Not so diverse

Having emphasized the importance and reality of variability in human populations, we now come to an interesting paradox. Compared to our nearest relatives, the chimpanzees, humans are not particularly variable at all. ²⁰⁴ Humans and chimpanzees share almost 99% of their DNA (and are more genetically similar to each other than either is to gorillas), ²⁰⁵⁻²⁰⁸ which means that comparisons between chimpanzees and humans allow us more insight into our development than solely studying humans would allow. Research ²⁰⁴ on sequencing the nuclear DNA of chimpanzees found that there is more genetic diversity in just the Central African chimpanzee subgroup than in the entire human race. This striking conclusion flies in the face of conventional wisdom and polarizing

attitudes. Despite beliefs to the contrary, humans really are not very different from each other, at least in terms of genetics. In fact, each individual appears to differ from any other individual by only 0.0003% of his/her DNA.

This conclusion is particularly important in light of the numerous studies being done to find genetic differences in disease susceptibility among different populations; in particular, to find genetic differences between “Blacks” and “Whites”. [e.g. prostate cancer studies: 18, 51] Given that phenotypes are not culture-specific, and given that “races” are a socio-cultural-political construct of 18th century Europe and the United States, ²⁰³ scientific research is inhibited by the continued use of archaic “racial” categories. ²⁰⁹⁻²¹¹ The heterogeneity within any of the so-called “races” dramatically outweighs that which exists between them. ²¹²

Pigmentation

The biological variable that is most used in “racial” classification is degree of pigmentation. Individuals with a particular degree of pigmentation are assumed to be quite different, culturally, behaviorally, and biologically, from individuals with a visibly darker or lighter degree of pigmentation.

Although several studies determined that the number of genes associated with pigmentation was between three and six, ²¹³ more recent analysis has called this into question²¹⁴ and concluded that there are not yet enough solid data to make a specific number determination. However, there is no question that more than one gene and several alleles (forms of a gene) are involved; therefore, pigmentation is a polygenic trait: a complex quantitative trait represented as a continuous distribution. There is no point at which one degree of pigmentation can be distinctly separated from the next degree, except arbitrarily.

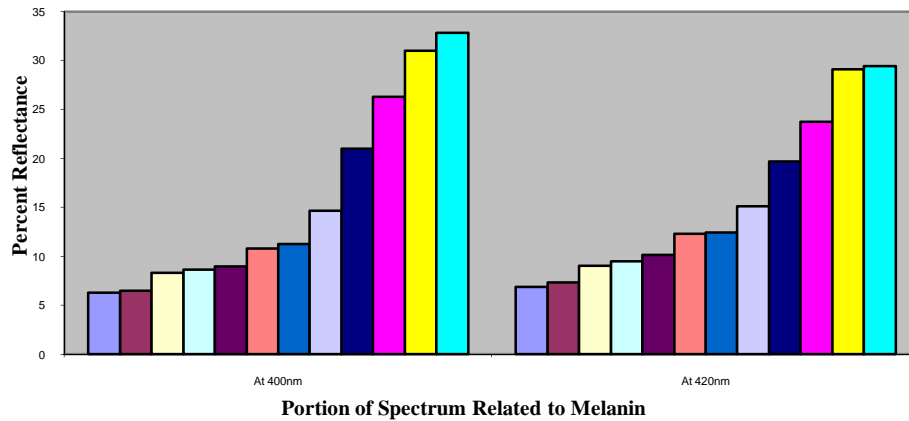
Pigmentation, a trait that is clearly adaptive, is strongly correlated with latitude, which explains about 80% of the variance in skin color. As discussed in an earlier chapter, the primary factor in skin pigmentation is the degree of ultraviolet B (UVB) radiation. ²¹⁵ Heavily-pigmented skin protects the individual from over-exposure to UVB radiation and skin cancer, particularly melanomas, in regions of constant, intense ambient UVB radiation; while lightly-pigmented skin allows UVB radiation to penetrate to the lower skin levels, activating the vitamin D cascade in regions of intermittent, low-to-moderate ambient UVB radiation.

There is a critical balance between latitude, degree of pigmentation, and UVB radiation exposure. If this balance tips too far in one direction, melanomas develop; too far in the opposite direction, other significant

health problems occur. This balance can be seen in the degree of pigmentation of the ancestral inhabitants of Africa and Eurasia: as one travels from the equator to the poles, degree of pigmentation gradually lightens. At no point is there an abrupt transition: variability is continuous and adaptive to changing environments.

Furthermore, although we have been culturally trained to view a heavily-pigmented individual as having a skin color which is extremely different from that of a lightly-pigmented individual, it is, in fact, not so different. In a pilot study, ²¹⁶ spectrophotometer measurements were taken on the upper, inner arm of 12 women ranging in skin tone from very heavily-pigmented to very lightly-pigmented. The spectrophotometer is an instrument designed to measure the percentage of reflectance from objects, with reflectance of absolute black being calibrated at zero and absolute white calibrated at 100. ²¹⁷ The measurements were taken at 400nm and 420nm of the infra-red spectrum which best define melanin levels in skin. ²¹⁸ The percentages of reflectance of the 12 women were found to cluster rather tightly, ranging from about 6% to about 33%. For comparison, a sheet of white computer paper has a reflectance of 80%. As shown in Figure 4, the distribution of measurements at each wavelength is continuous and rather narrow. We are all, in effect, shades of cocoa with varying amounts of cream added.

Figure 6: Spectrophotometer Measurements of the Inner Arm



Summary

A population of variable individuals is required for successful adaptation to changing environmental circumstances. Humans, due to both variable genetics and variable cultures, have successfully adapted to wide-ranging environmental changes. However, while human variability is evident, the degree to which any two humans differ from each other is far less than is commonly believed to be the case.

The entire range of human genetic variability is less than that of one sub-group of chimpanzees. Based on skin reflectance analysis, “black” skin does not differ that much from “white” skin. “White” skin might be more properly viewed as “white chocolate”.

What this means is that we should spend less time looking for genetic differences between groups to explain health differences and more time analyzing the phenotypic interactions of an individual's biology with their particular environment. Such research may be less “clean” than looking for amino acid alterations in a piece of DNA, but will ultimately be more useful. If we are truly interested in eliminating the health differences among various populations, we need to quit trying to find genetic differences among groups that are by definition tremendously heterogeneous and which are also continuously in flux. Instead, we must focus more broadly on individual/environmental interactions. Human variability is a paradox: variable enough for species viability and yet far less variable than our nearest relatives. No matter what we look like, we are not so different after all.

After Word

If we wish to increase our opportunities for health, happiness, and well-being, we need to live a lifestyle that most closely approximates the lifestyle for which humans became adapted long ago. While, with the help of technology, humans can live in almost any environment, under a wide range of conditions, this does not mean that we will necessarily be living an optimal life. We have been living under maladaptive conditions for so long that these conditions are considered normal; and as “normal”, they are accepted as being “right”.

Humans are not bionic constructions, more mechanical than biological, although that is frequently how we perceive ourselves and others. We drive ourselves to the point of exhaustion and illness, then visit a doctor for a checkup/tune-up to fix our breakdown so that we can get back on the road again. There is tremendous uneasiness with accepting that we are an animal and, like other animals, are adapted to particular environments, diets, and lifestyles. We think that somehow we are immune to what applies to elephants, chimpanzees, and jackals; that we are above or beyond the laws of nature. We are not. The more we learn about other species, the more similarities we find between those species and ourselves. Yes, we are extremely bright and have used

technology to radically alter the natural environment, but we are still a primate, a mammal, an animal.

In the preceding chapters, I laid out a plan of action to bring our current diets and behaviors more in line with those for which we are adapted. I am not suggesting that we throw out modern technology and retreat to a foraging lifestyle. That would be impossible with over six billion individuals on this planet. Nor is it necessary or appropriate. If anything, it is technology and worldwide contacts and trading networks that allow those of us living in more prosperous circumstances the opportunity to eat and live more as our ancient ancestors did. We can live in a temperate zone, but eat a wide variety of fruits and vegetables on a year-round basis. We can dine on fresh ocean fish and shellfish even if we live 1000 miles from an ocean. Those of us with appropriate education credentials can choose to live and work in environments best suited to our adapted needs. We are fortunate. The majority of the world's six billion individuals does not have these options and is forced to live a maladapted life. If we truly wish to demonstrate our superiority to the other animals on this planet, we should use our abilities to bring all human lives into alignment with our adaptations. You can begin today to improve at least one life: your own.

Plan of Action

➤ **Vitamin D:**

- Obtain adequate exposure to UVB radiation based on your degree of pigmentation and latitude of residence.
- If obtaining vitamin D through UVB exposure is not possible, get at least 1000 IU/day by eating certain fatty fish and/or by supplementation.
- Adequate vitamin D is necessary for good health and well-being.

➤ **Exercise:**

- Do a set of flexibilities each morning to keep limber.
- Walk about 2 miles each day.
- Swimming can be alternated with walking.
- Adequate exercise is necessary for good health and well-being.

➤ **Premier Nutrition Pyramid:**

- Eliminate grains and dairy products from your diet.
- Eat around 10 servings/day of fruits and vegetables.
- Eat tree nuts, fish, shellfish, eggs
- An appropriate diet is necessary for good health and well-being.

➤ **Sleep:**

- Children and teens need 10 – 12 hours of sleep each night.
- Adults need 8 – 10 hours of sleep each night.
- Work during the day, sleep at night.
- Adequate sleep is necessary for good health and well-being.

➤ **Parenting:**

- Infants should be in constant physical contact with another human.
- Infants should be breastfed and able to breastfeed at will, day and night.
- Infants should sleep with their mothers.
- Singleton births are optimal for the infant and her mother.

➤ **Diversity:**

- Phenotypes and cultures are not welded together.
- Cultures are constantly changing.
- The entire human race is less genetically diverse than one subspecies of chimpanzee.
- Each human differs from any other human by only about 0.0003% of his DNA.
- Human similarities outweigh our differences.

APPENDIX

Worksheet 1:

UVB Radiation Exposure and Vitamin D Supplementation

Current City of Residence		# of Years There?	
Current Zip Code			
Birth Date			
Birth Place City		# of Years There?	
Other Cities of Residence		# of Years There?	
		# of Years There?	
		# of Years There?	
		# of Years There?	
		# of Years There?	
		# of Years There?	
		# of Years There?	

Skin Color: Put an X on the appropriate spot along this continuum. Very Light _____ Very Dark	
Natural Hair Color:	Eye Color:

Sun (UVB) Exposure Approximate number of hours spent outside daily between <u>10 am and 3 pm</u> during the summer <u>as a child.</u>	10 – 20 min
	20 – 40 min
	40 – 60 min
	1 – 1.5 hrs
	1.5 – 2 hrs
	2 – 3 hrs
	3 – 4 hrs
	4 – 5 hrs
Sun (UVB) Exposure Estimate Monday – Friday exposure between <u>10 am and 3 pm</u> during the summer <u>as an adult.</u>	10 – 20 min
	20 – 40 min
	40 – 60 min
	1 – 1.5 hrs
	1.5 – 2 hrs
	2 – 3 hrs
	3 – 4 hrs
	4 – 5 hrs

Type of Employment:	
Indoors	
Outdoors	

Severe Sunburns:		
As a child	Yes	No
As an adult	Yes	No

Exercise Outdoors:	
Often	
Occasionally	
Not at all	

Do you suffer from SAD?	
[Seasonal Affective Disorder]	

Level of Weekly Activity:	
Sedentary	
Mild	
Moderate	
Active	
Extremely Active	

Daily Supplements:		
	Amount of Vitamin D per Pill	
Multivitamin		
Calcium/Vitamin D		
Vitamin D		
Other		

Worksheet 2: Vitamin D Intake

This form is about the foods that you usually eat which contain vitamin D.

Please check the box which indicates the number of times that you typically eat these foods.

The usual serving size for the food is indicated in parentheses ().

Eaten

FOOD ITEMS WITH VITAMIN D	Never	1-2month	1/week	≥2/week	1/Day	>once/day
CEREALS						
Regular Ready-to-Eat Cereal (1 serv)						
Special Cereals, 1 serving						
Fruit & Fibre (1 cup)						
Healthy Choice Golden Multi-Grains (3/4 cup)						
Post Great Grains Raisins, Dates, & Pecans (2/3cup)						
Kellogg's Muselix apple & almond crunch (3/4 cup)						
Post Raisin Bran (1 cup)						
EGGS						
Real Eggs (1 egg)						
Morningstar Farms Egg Substitutes (1/4 cup)						
MILK PRODUCTS						
Carnation Evaporated Milk (2 T)						
Carnation Nonfat Dry Milk (1/3 cup)						
Carnation Breakfast Bars (1 bar)						
Carnation Instant Breakfast (8 oz)						
Resource Instant Breakfast (8 oz)						
Fresh Whole Milk (8 oz)						
Low-fat Milk (8 oz)						
Skim Milk (8 oz)						
Cream (1 oz)						
Butter (2 pats)						
Cheese (1 oz)						
FISH/SEAFOOD						
Sardines (1 medium sardine)						
Salmon, canned (3 oz)						
Salmon, raw (3 oz)						

Mackerel (3 oz)						
Herring, raw or canned (3 oz)						
Halibut (3 oz)						
Swordfish (3 oz)						
Shrimp (3 oz = 11 large)						
Oysters (3 oz or 6 medium)						
LIVER						
Beef (3.5 oz or 100g)						
Calf (3.5 oz or 100g)						
Chicken (3.5 oz or 100g)						

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Table 1: Amounts of Vitamin D in Various Foods*

Food Items with Vitamin D	Vitamin D/Portion in IU/portion	Vitamin D/Portion in µg/portion
Ready-to-Eat Cereal (serving)	40	1
Egg Substitutes (1)	22	0.55
Real Egg (1)	24	0.6
Evaporated Milk (cup)	24	0.6
Nonfat, Dry Milk (cup)	100	2.5
Whole, Fresh, Fortified Milk (cup)	100	2.5
Coffee Cream (1 oz)	16	0.4
Butter (2 pats)	4	0.1
Cheese (100g)	12-16	0.3-0.4
Liver:		
Beef (100g)	8	0.2
Calf (100g)	0-12	0.0-0.3
Chicken (100g)	48-68	1.2-1.7
Fish/Seafood:		
Swordfish (100g)	1800	45
Sardines (100g can)	1160-1560	29-39
Mackerel (100g raw)	1120	28
Salmon (100g can/serving)	240-480	6-12
Salmon (100g raw)	160-560	4-14
Herring (100g raw or canned)	320	8
Halibut (100g)	40	1
Shrimp (100g)	160	4
Oysters (3-4 medium-sized)	4	0.1

Flexibilities

- Sit on the floor. Stretch your legs wide apart in the biggest V you can make. Reach for your feet. Eventually, you will be able to grab the soles of your feet. Hold this position without bouncing, and without undue pain, for a slow count of 20. Release.
- In the same position, angle your entire body towards your right leg, attempting to grasp your right foot with both hands. Hold for a slow count of 20. Release.
- Do the same for the left leg.
- With legs still in V shape, cross arms in front of chest and lean torso over as far as possible towards the floor. Hold for a slow count of 20. Return to upright position.
- Bend legs and bring them towards the torso. Bring the feet together and try to bring them as close to the crotch as possible. Hold for a slow count of 20. Release.
- Still sitting, let legs loosely cross. Bend left arm behind back, reaching towards neck. Raise right arm, bend elbow, reach behind neck. Attempt to clasp hands. Hold for a slow count of 20. Release. Reverse position of arms, attempt to clasp hands, etc.
- Still sitting, push legs forward with feet together and knees bent. Legs should form a diamond shape. Bend torso towards feet, attempting to touch forward to toes. Hold for a slow count of 20. Release.
- Still sitting, bring legs together straight in front of you. Bend forward at waist. Attempt to grasp feet. Hold for a slow count of 20. Release.
- Lay back. Bend right leg, bringing foot towards shoulder. Stretch arms above head. Hold for a slow count of 20. Release. Stretch out right leg and bring up left leg. Hold for a slow count of 20. Release.
- Lay flat on back with legs stretched out in front and arms stretched above head. Hold for a slow count of 20. Release.
- Laying flat on back, raise left leg. Grasp around thigh and pull gently towards shoulder. Hold for a slow count of 20. Release. Do the same with right leg.
- Still on back, raise both legs. Grasp and gently pull towards

shoulders. Hold for a slow count of 20. Release.

- Drop legs. Bend left leg and pull towards chest, pointing toes. Keep right leg straight, about 6 inches above the floor, toes pointed. Hold for count of 5, then flex feet, while maintaining position and hold for count of 5. Return to toe point and count of 5, then foot flex and count of five. Release. Reverse legs and repeat.
- Stand up with hands on hips. Move left leg forward and slightly bend knees. Hold for slow count of 10. Reverse legs, etc. Repeat for both legs.
- Raise arms to sides at shoulder height. Bend left leg and lean towards left. Hold for a count of 10. Stand straight, then bend right leg and lean towards right. Hold for a count of 10. Repeat for both legs.
- Stand up with legs spread wide. Bend at waist, grasp feet. Hold for a slow count of 20. Release.
- While still bent over, use both arms to grasp right leg. Hold for a slow count of 20. Release. Twist to left leg, grasp. Hold for a slow count of 20. Release.
- Stand in front of a stair. Raise right leg and rest heel on stair. Hold for count of 10. Change to left leg. Hold. Repeat for both legs.

Once you are comfortable with the moves, the entire series of flexibilities can be completed in 10-15 minutes. You will feel more alert, relaxed, and limber.

Sample Menu for One Day (servings for 1)

Breakfast: This is perhaps the most important meal of the day since it occurs after a long fast and primes you for the rest of the day. Therefore, it should include a good dose of protein along with a number of fruits and vegetables.

2 egg omelet: Use a non-stick omelet pan and heat to medium high.

Test that it is hot enough by seeing if water drops sizzle on the pan.

Crack in **2 eggs**, whisk together. When eggs begin to set, **add 1/3 cup thawed frozen spinach* and 1/3 cup tomato salsa**. Fold omelet in half.

Let cook about 1 minute; turn off heat and flip omelet over. Let cook another minute or so.

1 cup raspberries, fresh or frozen

grapefruit half

tea

Midmorning Snack:

banana

water

Lunch:

1 can (100g) of sardines in mustard or tomato sauce

(not soybean oil: the oil adds too much fat to the sardines).

1/2 red bell pepper

1/3 cp dried fruit mix

Water

Mid-afternoon Snack:

1/3 cp plain shelled almonds

Water

Dinner:

tuna and spinach* salad: Shred **2 cps fresh spinach leaves**. Add **½ red bell pepper, chopped; ½ cp chopped carrots; 1 small tomato, chopped; 1, 6oz can water-packed tuna**. Toss with olive oil and vinegar dressing.

Water

Post Dinner Snack:

1/3 cp plain shelled almonds

fruit juice

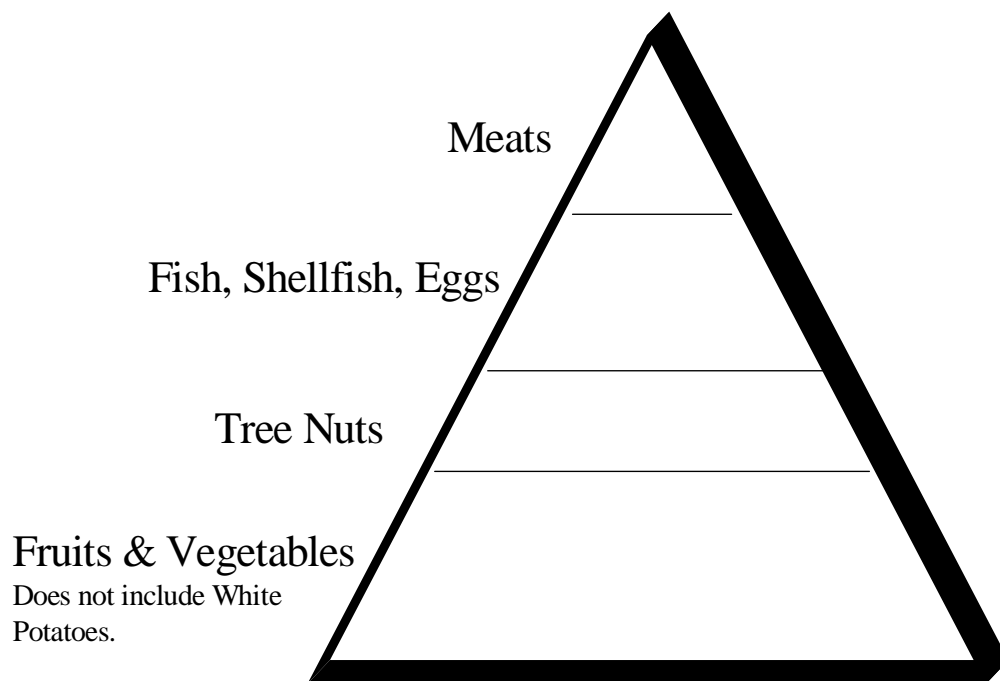
* In order to release the calcium from spinach, the spinach needs to be eaten with acidic foods such as lemon juice, vinegar, or tomato salsa.

Worksheet 3: Premier Nutrition Pyramid

To determine how well your diet stacks up to the Premier Nutrition plan, make copies for each day of one week of the following chart. Fill in the Pyramid with the food items eaten on a typical day. Do not put down food items not shown on the pyramid such as dairy or grain products. The quantity of each type of food eaten should relate to the size of the space allocated for that particular food type. For instance, the largest quantity of food items eaten should be in the Fruits & Vegetables category. If this is not the case, adjustments need to be made in your daily diet.

Example: Yesterday Don ate 2 scrambled eggs, a piece of toast with butter, a glass of orange juice, an apple, a hot ham sandwich with cheese, a cola, a bag of chips, a steak, a baked potato with sour cream, broccoli, a glass of wine, and a slice of angel food cake. Don would write in the pyramid in the appropriate slots: 2 eggs, orange juice, apple, ham, steak, and broccoli. His diet is top heavy on meats and very lacking in fruits and vegetables. A large portion of his diet is made up of high glycemic foods such as bread, chips, cake, and white potatoes; and with dairy products such as butter, sour cream, and cheese. He needs to replace these items

with more fruits and vegetables. He should also get more of his protein from tree nuts, fish, and shellfish and less from meats.




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**Diverse Responses to UV-B Radiation and Repair Mechanisms of Bacteria
Isolated from High-Altitude Aquatic Environments** 

V. Fernández Zenoff, F. Siñeriz, and M. E. Farías*

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Author Information

Dr. Kathleen E Fuller holds a MA in Paleoanthropology and a PhD in Biological Anthropology from the University of Kansas. She has taught and lectured extensively on topics related to human health and how best to live a lifestyle for which humans are adapted. Dr. Fuller has lived in 9 states and 15 cities in all sections of the United States. Both her research and her life have shown her the importance of living a well-adapted life. For further information on her research or to schedule lifestyle coaching sessions, contact Dr. Fuller at: www.AnthroHealth.net.