Staying Healthy in Our Society

Francisca R. Sorensen
Stevens Elementary School

INTRODUCTION

When watching television, a person could easily get the idea that, in order to be well rested, happy, dynamic, and healthy, one need only to purchase some pharmaceutical product over the counter or by prescription. This type of health care marketing implies that the individual knows the nature of his or her affliction and has the medical knowledge to self-prescribe or request the appropriate medication. Furthermore, the advertisements instruct the person to inform the doctor of all ailments before taking the medicine. The implication here is that your doctor does not know you and has never treated you. This may sound bizarre until you realize that HMOs and insurance companies send you to clinics where the doctors are rotated so frequently that a patient is not likely to see the same doctor two visits in a row. If the clinic is a branch of a larger health care system, the patient's records are likely to be stored at another branch. In summary, the patient today is unlikely to receive the attention, much less the care, expected in the past.

Although the mass media reminds us daily of how wonderful our medical systems are, there are really very few people in the everyday life world who look or act healthy. Most of us suffer from a variety of digestive diseases, upper respiratory ailments, headaches, and innumerable allergies. It seems like most people take an alarming number of medicines to control symptoms, but these medicines do not guarantee that the patients get well and stay well.

Why do people prefer a medicated state of life over getting well and being healthy? Do people understand that they have choices when it comes to health and illness management?

There is an increasing feeling in our society that blind adherence to organized medicine is not the answer. The complementary and holistic health care movement is perhaps the best example of this (Garcia 5). The movement is towards seeking advice from alternative healers who offer to remove the *dis*ease by training the individual to live healthily by changing eating, sleeping, resting, exercising, and drinking habits.

These holistic healers have learned, through years of strenuous study, the wisdom of their medical sages whose knowledge is based on centuries, and in some cases millennia, of observations. Among the courses that these doctors learn is appreciation of the medicinal value of a healthy diet and the nutritional value of different foods, both plant and animal. They also know the worthiness of rest and serenity in order for an individual to live healthily as long as possible. In other words, they help improve the individual's quality of life without the need for so many medications.

The benefit of this form of healing has not been lost on our doctors. There are an increasing number of allopathic practitioners and alternative healers sharing information and healing practices in an effort to serve the general population more satisfactorily, both physically as well as economically.

As a teacher, I have a responsibility to help my students achieve a healthful and productive lifestyle. The school where I work and for which I am preparing this curriculum unit is a Title I elementary institution that serves a lower income population of Hispanic children. The principal

forms of diseases that affect these students' well being and their efficient learning are allergies, stomach ailments and upper respiratory infections. Every week at least one or two students go to the school nurse for one of these problems. The typical response is to send the ailing child home for the rest of the day. Sometimes the discomfort is overcome with parental tender loving care; more often the illness requires an expensive and time consuming visit to the doctor and the purchase of medicine that will make the little one feel better – at least temporarily.

When there is a stay-at-home parent, the child's temporary discomfort may present a bit less of an economic burden. In a school like mine, however, most of the parents are lower income workers and day laborers, so that leaving work to pick up a sick child often means loss of hourly wages. If the child is frequently sick, his or her parents risk losing employment altogether with the added problems that situation would cause.

Teaching students and their parents about the value of nutritional choices over quick and easy food options seems to be morally necessary. A perfect time to incorporate this information is immediately after my second grade students have learned about food chains and food webs and how the sun's energy moves through them. I will make it a purpose to reinforce the concept that the first organisms to receive that energy are plants which use it to produce their own food. This food is so rich in energy that, in normal conditions, the herbivores that consume it are healthy and strong. They in turn pass that energy to their predators and the top predators. Because we humans are omnivores, it stands to reason that we need to eat a substantial amount of vegetables and fruits complemented with some meat in order to strike and maintain an adequate balance so as to be physically and mentally strong.

I hope to convince my young students and their parents to develop healthy eating habits in order to build up and maintain their immune systems, to avoid medications as much as possible, to allow their bodies to perform in the way they were designed to do, and to discard the idea that we should tolerate ill health as an inevitable state of being.

Most of my students are either first or second generation immigrants. Their parents are hard workers with an upwardly mobile attitude even though they are, for the most part, illiterate, having had little or no access to education as children. They were farmers in their native lands who left their homes in remote villages in Mexico, Guatemala, El Salvador, or Honduras because of financial reasons. The foremost among these reasons were the difficulties in regenerating their agricultural soils at accessible costs. Some of their lands are in mountainous regions that have suffered severe erosion or are lacking sufficient water to maintain crops and sustain families.

In conversations with parents, I learned that young men and women from those rural areas are frequently encouraged to leave their towns and come north to find work. With work, they are able to send home the money to buy seeds, help install deep wells, purchase fertilizer, or anything else that can improve the land and the lives of their loved ones. My students' parents work very hard to meet their familial obligations and to not forget the land they left, but still love.

As they enjoy their newfound prosperity these parents are, understandably, proud of their accomplishments and ready to acquire the status symbols that they can afford. Among the first of these is to eat in restaurants and fast food places, a luxury that they could never afford in their countries. Now, they want to provide their children with "the best kind of food that there is" and not obligate them to eat "peasant food" like they had eaten. The quantity of food to be consumed is also a mark of their improved condition, so they serve enormous amounts of whatever the child desires.

In their pursuit of better foods these parents have not realized that the nutritional value of their food is very unbalanced and is causing their children to be considerably less healthy than they themselves were back home. In other words, they are making poor nutritional choices.

They are consuming snacks and sweet beverages that have little, if any, nutritional value, and putting aside those foods that do, such as fruit and vegetables. Most processed foods contain a lot of fat and sugars, as well as preservatives, artificial sweeteners, and/or other additives. The school provides the kids with fairly nutritional lunches, but the children discard the vegetables and fruits and in their stead eat the snacks that either their parents sent with them or gave them money to buy. In this way, and totally oblivious to the future, the parents are compromising the long term health of their children.

Their children will be unlikely to develop classic vitamin deficiency related to such diseases like scurvy or pellagra. But, their low vitamin and mineral intake levels could possibly have long term health and learning consequences. Fatigue, shortened attention span, decreased work capacity, reduced resistance to infection, and impaired intellectual performance have been associated with mild iron deficiency (Bhatlacharya *et al. Heat or Eat* ? 4).

There have been relatively few studies on vitamin deficiency in American children because there have never been any widespread episodes of hunger or famine here. Still, there is medical evidence that anemia, and advanced stages of iron deficiency, is on the rise among American adolescents; a clear indication that the intake of vitamins during childhood is well below the necessary levels. Other indications of poor nutrition during childhood by these adolescents are evinced by high blood cholesterol and serum vitamin deficiencies (Bhatlacharya *et al*. *Heat or Eat?* 4).

For the most part my students are alert and bright; however, some of my eight and nine year olds already exhibit signs of shortened attention spans, impaired intellectual performance, and reduced capacity for work. Oddly enough, these are the children who always bring snacks and sealed beverages with artificially flavored sugar water and who seldom eat their fruit and never their vegetables. These students are also frequently absent due to some illness.

OBJECTIVES

The purpose of this unit is to take a page from ancient medicine that has kept people healthy and productive through the centuries and apply this knowledge in a safe way to help other teachers, students and parents to strive for optimal nutrition habits. I hope to create awareness among them about the critical health issues that can be assuaged or even avoided if we learn more about good nutritional habits and make the necessary changes.

My students are, however, second graders, and their curriculum includes a cursory discussion of human health. I can introduce the students to the concept that our bodies are a collection of systems that interact to help us move, breathe, and live healthily (TEKS. Sci.2.5); that we have developed – as have other living beings – some adaptive characteristics that enable us to improve our ability to survive and reproduce (TEKS Sci. 2.9A); and that, as living organisms we need food, water, light, air, a way to dispose of waste, and an environment in which to live (TEKS Sci.2.8B).

RATIONALE

Because my students are very young and unlikely to eat anything other than what is served to them, I have taken it upon myself to create parental awareness by sending them a weekly report on what we do in the classroom and the reasons for the lesson. The following is a copy of one of these letters:

> La semana pasada los estudiantes del Segundo grado estuvieron aprendiendo acerca de diferentes partes de su cuerpo: el cerebro, corazón, estómago, pulmones y huesos. Descubrieron que aparte de las funciones que cada una tiene también depende una de otra. Por ejemplo: el corazón depende de la sangre que fluye hacia y fuera de él de los

pulmones. Estos a su vez dependen de la salud de su traquea y seno para introducir cantidades suficientes de oxígeno y para expulsar el dióxido de carbono que no necesitamos.

Comenzamos a platicar de la salud que cada una de estas partes debe tener y de cómo lograrla. Todos los días debemos hacer ejercicio, comer saludablemente y descansar adecuadamente.

Todos los días debemos caminar aproximadamente 20 minutos sin parar. Agregado a ésto los niños deben correr y brincar en el aire fresco. Esto les permite agilizar y fortalecer sus pulmones lo más que puedan. Si nosotros los llevamos a caminar a un parque el aire fresco y el ejercicio nos ayuda a nosotros también. Decimos, "¡Pero yo no paro durante el día, con eso ya hice bastante ejercicio!". Si, pero no fue constante y no se ejercitaron los músculos (corazón, pulmones, piernas ni brazos) de manera efectiva.

Todos los días debemos comer saludablemente. Eso es, comer mucha fruta fresca, verduras frescas, preparados con legumbres como frijoles, lentejas, chícharo seco, garbanzos o habas. La dieta debe incluir algunos carbohidratos como papas, arroz, o pastas. Una dieta saludable incluye un poco de carne, pescado o pollo.

Platicando con los niños les expliqué que durante cada alimento no deben comer más de lo que quepa en sus dos manos juntas. O sea, una porción de alimento no debe ser mayor a esto. La porción va creciendo conforme crece la persona. Si la comida consiste de nutrientes como los mencionados arriba, entonces la persona no tendrá hambre sino hasta la siguiente comida. Pero, en caso de que si tenga algo de hambre su tente en pie debe ser una fruta, unas pasitas o un puñado de nueces o pepitas sin sal.

Deben evitar refrescos gaseosos por la enorme cantidad de azúcar que contienen. Se ha descubierto que los sustitutos de azúcar que contienen los refrescos dietéticos son sumamente peligrosos a la larga. Entre los problemas que se conectan a ellos son la depresión y el alzhéimer.

Mejor es darles agua simple o aguas frescas endulzadas con algo de miel o panela. Una persona debe ingerir entre cinco a ocho vasos de agua diaria para que las toxinas que entran al cuerpo salgan rápida y eficientemente.

El cuerpo necesita reponer sus energías durante el sueño. Por eso todos debemos descansar bien siete u ocho horas continuas durante la noche. Hay que apagar todas las luces y los ruidos para que el cerebro no se distraiga y nos despierte frecuentemente. Para no tener que levantarse para usar el baño durante la noche es mejor no beber ningún líquido después de las 7 de la tarde.

Espero que estas recomendaciones les sean útiles.

Some parents have indicated pleasure at being included in their children's lessons, and the students have increasingly reported making some changes in their nutritional habits.

UNIT BACKGROUND

Nutrition is the process of nourishing or being nourished by which a living organism assimilates food and uses it for growth and for replacement of tissues (*Nutrition and Vitamins*). The body needs six categories of nutrients acquired from food: fibers, carbohydrates, proteins, fat, vitamins, minerals, and water. So, providing it with good nutrition on a regular basis will help prevent diseases and promote health. In spite of the obvious simplicity required, most of us are not healthy. We prefer to purchase readymade food products that have been precooked, frozen or packaged for our convenience rather than to prepare our food from fresh produce and fruits. These processed products claim to contain all the nutrients required by a person. But, that is only

a partially true statement. In the process of cooking all food loses some of its original energy and nutritional value. I do not doubt that at the time of preparing these goods the ingredients had all, or most of the claimed nutrients, but by the very nature of their industrialized production and conservation processes, the precooked products have lost most of their nutritional value. It has been noted that highly processed foods are lacking in significant amounts of essential trace minerals (*Nutrition and Vitamins*). The result is that the persons who are consuming processed foods are simply filling up and not deriving any nutritional value.

Although it would seem a simple task to meet the body's daily nutritional needs, hardly any one of us does. That is because many people make wrong food choices: consume too many calories or too few vitamins or minerals. For the body to maintain health it needs more than 45 nutrients, which can be obtained from a variety of foods. Many of the wrong food choices promote, rather than prevent, the development of degenerative diseases.

Nutrients

Nutrients are divided into six categories: proteins, carbohydrates, fats, vitamins, minerals, and water. Of those six, three are energy nutrients because they provide the energy to fuel the multitude of chemical reactions that sustain life each day, build structures such as bones, move the muscles, heat the body and maintain body temperature, or store as fat for later use. These three nutrients are proteins, carbohydrates, and fats. The other three nutrients – vitamins, minerals, and water – are referred to as "essential." That is, they must be consumed and absorbed to prevent deficiency symptoms.

Proteins

All of us have heard of proteins, but most of us are unsure of what they are and how they function. They are the fundamental components of all living cells and include many substances such as hormones, enzymes, and antibodies essential for the proper functioning of an organism. Proteins can be obtained from such foods as legumes, eggs, milk, meat and fish. Some minerals, such as calcium and magnesium, combine with the proteins to act as structural components in bone tissues.

Carbohydrates

There are two types of carbohydrates: simple and complex. All carbohydrates provide the main source of energy for the body as they are sugars manufactured by plants during photosynthesis. Simple carbohydrates found in milk and fruit are not only sugars; they also contain vitamins, fiber, and minerals. Complex carbohydrates are known as starches and can be found in whole grain products such as pastas and breads as well as in rice, oatmeal, and potatoes. All of these carbohydrates contain vitamins, fiber, and minerals, especially if they are not refined.

The way that carbohydrates function for the body is to break down into simple sugars which are absorbed into the blood stream. As sugar levels rise in the blood stream, the pancreas releases a hormone called insulin to move the sugar from the blood to cells where sugar is used for energy (*Nutrition and Vitamins*).

Fats

Through the media we have learned to fear fats and to avoid them at all costs. While in excess fats certainly are not healthy, in moderation they are not only good for you but also very necessary because they help transport nutrients and supply energy to the body. Two families of fatty acids are essential for the body in the right amounts. One is Omega 6 and the other is Omega 3.

Omega 3 fatty acids are polyunsaturated fatty acids whose carbon chain has its first double valance bond three carbons from the beginning. The human body needs this type of fat to

function normally, but it is not produced in the body. Instead, these Omega 3 fatty acids must be obtained from food such as walnuts, pumpkin seeds, sesame seeds, avocados, and dark leafy green vegetables, such as spinach and collard greens. Oils derived from some of these seeds are recommended so long as they have not been over refined. Other sources come from fish, such as salmon, mackerel, sardines, anchovies, albacore, and tuna.

Extensive studies indicate that Omega 3 fatty acids help reduce inflammation and help prevent risk factors associated with chronic illnesses, such as heart disease, arthritis, and even cancer. "These fatty acids are highly concentrated in the brain and appear to be particularly important for cognitive and behavioral function" ("Omega 6 Fatty Acids").

Through a complicated process, Omega 3 in combination with Omega 6 fatty acids will convert into hormone-like compounds known as eicosanoids in a healthy body. These eicosanoids aid in many bodily functions including vital organ function and intracellular activity. The body uses Omega-3s to make cell walls supple and flexible as well as improve circulation and oxygen uptake with the required red blood cell flexibility and function ("Omega-6" *Science Daily*). Both Omega 3 and 6 are required for stimulating hair and skin growth, regulating metabolism and reproductive capability as well as bone health.

Foods that contain Omega 6 fatty food are easy to find. Most common among the foods are pumpkin seeds, pistachio nuts, sunflower seeds, olive oil, olives, chicken, and corn, as well as corn oil. All of these foods are incorporated into the food that my students' parents are familiar with. For many of them the foodstuffs such as flaxseed oil, flaxseeds, flaxseed meal, hempseed oil, hempseeds, and grape seed oil might be more complicated, but it would be worthwhile offering them these options.

A healthy human with good nutrition will easily convert Omega 6 (linoleic acid) into gamma linolenic acid (GLA), which will later be synthesized into the eicosanoids mentioned above. These help improve diabetic neuropathy, rheumatoid arthritis, and skin disorders, such as psoriasis and eczema. But the benefits are lost on most Americans; although they obtain an excess of Omega 6 fatty acids, they cannot be not converted into GLA because of metabolic problems caused by diets rich in sugar, alcohol, or trans-fats in processed foods. Other factors that keep the process from functioning well are smoking, pollution, viral infections, stress, and aging ("Omega 6 Fatty Acids").

Studies done at the University of Maryland agree that deficiencies in these two essential fatty oils can lead to reduced growth, a scaly rash called dermatitis, infertility, and lack of ability to fight infection and heal wounds. American diets tend to have too much Omega 6 in relation to Omega 3 fatty acids. The imbalance contributes to long term diseases, such as heart disease, asthma, arthritis, and depression. A healthy diet should consist of roughly 3 times as much Omega 6 as Omega 3; however, a typical American diet contains 14 – 26 times more Omega 6 fatty acids than Omega 3 fatty acids. Researchers and other scientists believe that this data helps to explain the rising rate of disorders such as arthritis, asthma, and depression ("Omega 6 Fatty Acids").

Vitamins

Vitamins are a group of organic compounds required by the body in very small amounts in order to regulate metabolism and maintain normal growth and function. At present the thirteen known vitamins are classified into two groups according to their solubility: water soluble and fat soluble vitamins. Vitamins A, D, and K are fat soluble, and Vitamins C and the B groups are water soluble.

Vitamin A is most frequently associated with vision, especially night vision, but it has other functions, such as keeping healthy skin and hair. In adults the effects of vitamin A deficiency are

usually seen only in people whose diet has been deficient for a long time in both vegetables and dairy products. An early sign of Vitamin A deficiency is night blindness. In more advanced stages the cells of the skin and mucous membranes that line the respiratory, gastrointestinal, and urino-genital tracts cease to differentiate and lose their secretory functions, promoting dry skin and loss of hair sheen. The lack of protective mucus in these areas leads to susceptibility to infections (Ball 178, 179).

In order for vitamin A to metabolize adequately, it depends on other nutrients, foremost among them fats and proteins. Both of these provide a lipid vehicle for vitamin A absorption and transport to those parts of the body that require it, especially the bloodstream. Vitamin E is also a fat soluble vitamin that enhances the functions of vitamin A. When a diet contains sufficient Vitamin E, Vitamin A will be stored in the liver for future use (Ball 150).

Vitamin D, unlike the other vitamins, is not absorbed by the body through food, but from solar radiation and some fish liver oils such as cod and halibut. Much of the Vitamin D required by the body is synthesized in the skin in response to sunlight, but nutritional levels can be maintained by a diet containing fatty fish such as herring, sardines, pilchards, and tuna, and in smaller amounts, eggs and dairy products (Ball 191).

The use of sunscreens and cover ups have inhibited Vitamin D absorption through the skin, and that can account for the depleted vitamin D intake observed by doctors in the growing number of sicknesses being linked to low levels of Vitamin D. Some of these are reduced muscle strength, increased risk of cancer (breast, rectum, ovary, prostate, stomach, bladder, esophagus kidney, *etc*.), and bone malformation and frailty (rickets). Other diseases connected to lowered Vitamin D intake that are on the rise are autoimmune diseases like Type I diabetes and multiple sclerosis (Brody 60).

The daily recommended dosage of 400 IUs that was established decades ago seems to be proving insufficient, so some scientists have been experimenting with higher dosages. They feel that the daily dosage should be increased to at least 700 IUs because their studies show that these levels substantially decrease fracture risk with and without calcium supplements. Other doctors believe the daily dose could be safe between 800 and 2000 IUs, but only if calcium were to be avoided, because the combination of those levels of Vitamin D and Calcium can cause kidney stones (Brody 60)

It is ironic that a vitamin derived from sunlight should be in short supply in the human bodies. Especially when as little as five minutes a day in the sunlight during summer will replenish the body's supply and the excess, if any, will be stored in the body fat for later use during the year.

This is not the case with Vitamin K, the third lipophilic vitamin which relocates certain proteins (C and Z) required for blood coagulation, the factors of which are synthesized in the liver. This control of coagulation is very sensitive. Blood clots could block the flow of blood in arteries of the heart, brain or lungs, resulting in heart attack, stoke, or pulmonary embolism respectively. The reverse is equally life threatening. Blood that does not coagulate adequately can lead to internal hemorrhages resulting in the death of the individual.

In spite of the fact that this vitamin does not store well and can be rapidly depleted without regular dietary intake, deficiencies in Vitamin K among adults are extremely rare. When there is a deficiency, it is usually because intestines have been damaged due to heavy antibiotic use resulting in the inhibition of intestinal floral growth (Combs 251 -391).

Among the foods that contain and replenish the stores of Vitamin K are olive oil, mayonnaise, cooked broccoli, raw spinach, leaf lettuce, parsley, watercress, and other dark green leafy vegetables.

Undoubtedly the most familiar of the water soluble vitamins is Vitamin C, perhaps because of commercials for orange juice. It is highly available to us through fresh fruits and green vegetables. Potatoes also contain some amounts of Vitamin C, and since they are highly consumed, they tend to be one of the main sources of the vitamin. Liver, heart, and kidneys are also a good source of Vitamin C, which indicates that there is ample evidence that vitamin C plays an important role in the biochemistry of the human immune system (Ball 409).

Studies indicate that Vitamin C has antihistaminic properties because ascorbic acid degrades histamines without enzymes. These studies suggest that an elevated consumption of Vitamin C rich foods may be particularly valuable in helping allergy prone individuals. Other benefits to be derived from Vitamin C are in metabolizing cholesterol and inhibiting some of the steps involved in atherosclerosis and thrombosis (Ball 408 – 412).

Severe Vitamin C deficiencies as reported in Northern countries of Europe and Asia before the eighteenth century are rare today. But it still occurs. Vitamin C deficiency causes failure of wounds to heal adequately and a diminished production of organic matrix in bones leading to osteoporosis. Joint pain and inflammation derived from the deficiency often affects the psychological outlook in individuals whose motor skills have been curtailed. These effects have been associated with personality changes, such as hypochondria, depression, and hysteria (Ball 414).

Finally we have the vitamin B complex, which consists of at least eight types: among them are thiamin, riboflavin, niacin, vitamin B6, Biotin, pantothenic acid, folate, and Vitamin B12. These extremely important water soluble compounds have the function of metabolizing with other compounds to ensure the proper performance of the neuromuscular system in our bodies and to control dermal as well as gastro- intestinal disorders. Some, like pantothenic acid, are necessary for the well being of the liver along with the skin and nervous systems, and the folates and the B12 complexes are crucial for maintaining a rich blood system.

Deficiencies in any of these complexes can result in various degrees of anemia and dermatologic lesions causing, in extreme cases, death (Combs 251 – 391). Furthermore, many forms of neuromuscular, gastrointestinal, and hemorrhagic diseases can be avoided by consuming daily amounts of products that contain vitamin B compounds. Sources for these vitamins are abundant and can be gotten in fresh meats, fish, legumes, vegetables, nuts, and grains, such as corn, wheat, oats, barley, and rye.

Minerals

As plants absorb water through their root systems they also take in minerals that have leached into it from the soil. The minerals are passed on to the herbivores and their predators, performing as "structural components of living tissue and as regulators of important processes that occur in the body" (Davis 154). Although they are vital, the body does not require equal amounts of each mineral. Some found in amounts greater than 5 grams in the body are referred to as *macro-minerals* (major); those found in trace amounts (just a few milligrams) are *micro-minerals.*

The major minerals found in the body are potassium, sulfur, sodium, chlorine, magnesium, phosphorus and calcium. This last is among the best known minerals required by the body. Calcium's main function is to build strong bones and teeth. At least 99% of all calcium in the body is found within them, and the remaining percent circulates in the blood or in the soft tissues. This one percent helps blood to clot, transmit nerve impulses, activate enzymes and secrete hormones (Somer 90; Davis 159). Sources of calcium are dairy products and green vegetables. However, some vegetables and chocolates contain oxalic acid, which combines with calcium and prevents its absorption into the body. This is important to know, when we realize that children are often enticed to drink their milk because it has chocolate (Davis 162).

The next three major minerals – sodium, chloride, and potassium – are referred to as electrolytes because they are all important in maintaining the balance of gastric juices and water levels in the body.

Undoubtedly sodium is the best known of all the micro-minerals. It has the function of balancing the water in our bodies. (Note how salty our sweat and tears are.) But it also balances the acid base, transmits nerve impulses, and regulates the cell membrane functions as well as muscle activity. Very importantly, it plays a major role in the absorption and transportation of certain nutrients. Most foods either have sodium naturally or have acquired it through preparation. So the body has a large reserve of sodium. Since under normal circumstances people are continuously eating sodium containing foods, a deficiency is not likely. Still, strenuous and prolonged activity in warm weather can cause profuse sweating, in which case the source within the body can be temporarily depleted.

Some people try to replenish sodium rapidly through salt pills. It is worthwhile to remember that misuse (heavy intake) of sodium causes health problems, such as high blood pressure and kidney malfunctions.

Chlorine also plays a role in the balance of water and acid base. It is part of the much needed hydrochloric acid of the stomach, which uses it to maintain normal digestive functions. These ensure proper absorption of food and help to control the development of harmful bacteria.

Another mineral that helps to maintain water and acid base balance in the body is potassium. Normally our bodies contain about 9 grams of potassium in the cells. It, too, functions in the transmission of nerve impulses and in the transfer of messages from nerves to muscles. Furthermore, it functions as a catalyst in the metabolism of carbohydrates and proteins. Some studies suggest that a high intake of potassium rich foods may reduce blood pressure and the risk of stroke (Davis 177).

Low levels of potassium are uncommon because there is such a large array of vegetables, fruits, meats, and dairy products that contain the mineral. However, diuretics to bring down high blood pressure can cause potassium to be lost from the body even though that person may be consuming those foods.

The adjective “major” attributed to the minerals above certainly gives the impression that they are somewhat more important than those referred to as trace minerals. Nothing could be less true, as will be discovered in this simple study of some. Among the most important trace minerals in the body are iron, iodine, and copper.

Iron

An adult human’s body contains a teaspoon or less of iron. More than sixty-five percent of it is used in hemoglobin, enzymes and other functions (Somer 115; Hendler 149; Davis 178). Hemoglobin is the protein that transports oxygen and carbon dioxide to and from the cells of the body in the process called respiration: the burning of food to produce biologic energy to insure life. Iron is heavily involved in the entire process of breathing. It does so in the following manner. Four iron atoms are bound to each protein molecule in each red blood cell. When the blood passes through blood vessels in the lungs, iron binds to oxygen and is carried to all the tissues of the body. After the tissues receive the oxygen, iron binds to carbon dioxide, the cellular waste product, and carries it to the lungs for exhalation (Hendler 149). In this and other complex ways iron functions as the principal determinant of how much oxygen reaches and is used by all body tissues including the muscles, heart, brain, and liver.

Another major role for iron is the production of collagen and elastin, “two major components necessary to keep the connective tissues integral in the maintenance of the immune system, in the

production and regulation of several brain neurotransmitters and in the protection against oxidant damage" (Hendler 149).

Iodine

This trace mineral is found in sea foods and plants such as kelp as well as iodized salt. It is an important component of the thyroid hormones, which control energy metabolism in the body. The only known function of iodine is as a component of the thyroid hormones. These hormones regulate the rate of metabolism: growth, nerve and muscle function, growth of skin and hair, reproduction, the use of oxygen by cells and the synthesis of proteins (Hendler 144; Somer 114; Davis 184). The body contains about 25 mg of iodine, and almost half of it is in the thyroid gland.

Despite the production of iodized salt, since 1924 deficiency of iodine continues to be the major cause of hypothyroidism throughout the world. Some symptoms include chronic fatigue, dry skin, apathy, weight gain, intolerance to cold, and enlargement of the thyroid called goiter (Hendler 144).

Copper

The human body contains about 75 to 100 mg of copper. This trace element, along with iron, plays a unique role in respiration, as it is part of several enzymes that help form hemoglobin. Hemoglobin carries most of the oxygen in the blood and relies heavily upon iron. Now we see that copper helps absorb and use iron. Together they are used by the hemoglobin for its synthesis and function.

Copper is available in liver, dried peas and beans, cocoa, fruits, vegetables, and shellfish. Deficiency in this mineral is rare; however, studies done on pigs indicate that one can produce emphysema, resulting in diminished oxygen transfer from the air into the blood (Hendler 128). Still, "severely malnourished children whose growth and metabolism were disturbed" (Davis 193), evince a copper deficiency.

Water

About 70% of lean body tissue is actually water. Metabolic reactions involving vitamins and minerals take place in this substance, therefore it is essential for the maintenance of normal body functions. Among them are to transport nutrients to cells and to help rid the body of waste materials and to act as a solvent for compounds, such as glucose, amino acids, vitamins, and minerals. Another important function is to aid the body in maintaining its temperature, and, finally, water is a lubricant of joints acting as a shock absorber inside the spinal cord and the eye.

Water is lost from the body each day through urine, stools, and sweat, as well as from the air we exhale. A healthy person usually excretes at least one quart of urine a day, so it is important to replace it often. This can be partially controlled by satisfying thirst and drinking sufficient water. To keep the body well hydrated, we need to drink a substantial amount of water each day. The amount of intake varies with the individual but, 2 1/2 to 3 quarts a day is reasonable, and the amount can be complemented with soups, teas, milk, eggs, vegetables and fruits. There is little danger of drinking too much water since it will be excreted through urine.

Though water always contains minerals – except for distilled water – the amount of minerals is never the same. That amount greatly depends on the water source. If the water has a high concentration of calcium and magnesium, it is referred to "hard water," whereas "soft water" is one that has only a small amount of minerals. The human body usually adapts to the type of water to which it is exposed and regulates its intake of other substances to maintain its balance.

Most foods provide a combination of the six categories of nutrients necessary for growth and for the maintenance of life and health of the body tissues. Chicken, for example, is a protein rich

food that contains a generous supply of iron and niacin and trace amounts of other minerals as well as vitamin B. Milk is another source of essential nutrients that is best known for its calcium; however, it contains substantial amounts of vitamin B2, carbohydrates, proteins, vitamin D, water, and magnesium (Somer 9). A third example of food that is rich in all six categories of nutrients is whole wheat bread, mostly known for its carbohydrate rich substances, but which also supplies the body with vitamins, protein, small amounts of fat, minerals, and water.

Eating a wide variety of naturally grown food clearly poses a healthier advantage to the consumer over the frozen or prepackaged industrially processed foods. The latter offer convenience and time savings, but in the end the price to be paid by the consumer is deteriorated and compromised health. The most affected of the consumers are the very young whose structural components are being developed.

As though nature herself were having a last laugh at human arrogance, the people in the developed world have an added serious obstacle to deriving proper nutritional value from fresh fruits, vegetables, and meats. That is because the industrialized countries have so much polluted air, agricultural lands, water ways, and oceans that it is almost impossible to find any of these products free of minute (parts per trillion) residues of dichlorodiphenyltrichloroethane (DDT), Bisphenol A (BPA) or Diethylhexylphthalate (DEHP) (Colburn 4 – 10). These toxins bio-accumulate – that is, once they get in the body, they stay there. These tough stable compounds accumulate over time and, at high enough doses, are known to cause immune deficiencies, reproductive problems, liver damage, skin disease, and adult cancers.

In an effort to protect consumers from the above-mentioned compounds, agriculturalists and farmers have begun growing products without the aid of synthetic fertilizers, pesticides or irrigated waters channeled from industrialized zones. These products have the FDA's stamp of "100% Organic" and are considered safe to ingest (Garcia 47 – 51). Unfortunately, the cost of most organic foods is well above the reach of people with modest to low incomes. They must buy what their budgets allow regarding available fresh produce and meats and risk the consequences, which lamentably will not be noticeable for years. In other words, nutritional deficiencies or anomalies begin to express themselves a few years after the body has been systematically exposed to nutritionally altered foods and synthetic compounds such as the ones mentioned above.

In the meantime, we have to consider ways to deal with a rise in ailments associated with malnutrition in this country, which span across all levels of society, even the wealthy: fatigue, anemia, gastrointestinal disorders, obesity, allergies, respiratory conditions, high or low blood pressure, colds, arthritis, stress, depression, insomnia, and headaches (Somer 16 – 20; Bhatlacharya *et al*. *Heat or Eat?* 5 – 8).

Conclusion

Despite advertisements by pharmaceutical companies that claim cures for the vast array of diseases affecting most people in the United States, and the much touted excellent medical care, Americans are still unwell. In places like Houston, known for its advanced medical services, the petrochemical plants still pollute the water, soil, and air. The waste sites still contain large amounts of solids with toxic components, and the food processing companies still encourage buyers to consume their readymade products.

This unit does not claim to cure anyone, or to offer a panacea to health. It does, however, hope to encourage the reader and his or her students to learn more about their bodies and the nutritional contents that their food should have and to make the necessary changes in their eating habits. My wish is that they take the opportunity to improve their health and general well being in order to be happy, productive citizens of the future.

LESSON PLANS

Although I have developed the following four lessons to teach the principles of health to my second graders, I am confident that they can be used and applied by all school levels.

Lesson I

It is when second grade students are learning about the food chains and food webs that they discover the important role that plants play in the lives of all the animals. I usually draw pictures to help my young students understand some of the more abstract concepts that I am sharing with them. I allow them time to copy as I go along. First, I draw a large triangle beneath a large sun. Then, at the base of the triangle I draw a wide fringe with plants of all kinds and point to the sun, showing how its rays are reaching all of the plants. I remind them that plants need sunlight to produce their own food and so are called producers.

Above this fringe of plants I draw crickets, cows, rabbits, and other herbivores. While I do this I explain that these animals eat only plants and that they get all of their energy from them. They do not produce their own food. They consume it from the plants.

The next fringe is smaller than the second one, and so it has space for fewer animals. The animals in this fringe are carnivores. Children love carnivores; they conjure ideas of power and strength in them, an elation I allow them to dwell upon until I draw the third fringe above the producers. But first I draw an arrow going from the herbivores to the carnivores explaining how the solar energy is flowing toward them. In the very small fringe left at the top we draw an eagle and perhaps a lion. There is no more space for more of these top predators (as is the case in reality).

When the picture is complete, I ask students to consider why a pyramid is a better model for the natural world than a cube.

At this point I begin to draw a cube with the fringes. It doesn't take long before someone protests that there is far more plant life than herbivores and that they hardly ever see a top predator. A discussion will then begin whereby the teacher will be able to detect comprehension of the importance of energy flowing through the food chains.

Lesson II

Having established the relative proportions of food availability in the natural world, the students are prepared to discuss our species within the energy pyramid. We can begin the discussion by asking the students how many plants they eat each day. Normally children the age of second graders have not realized that bread, cereals, *etc.*, are derived from plants, so I begin to make an "idea storm chart" with the food stuff they call out. When sufficient information has been charted, I will begin to ask where they think bread came from, then tortillas, rice, sugar, etc. While I do this, I hand out some blank sheets of paper where they will begin to draw a table with the food consumed during a meal, preferably lunch. We will first write down the menu. Then we will break it down into the most obvious ingredients; for example pasta, tomato sauce, cheese. These ingredients will each be placed at the top of each column.

When the titles have been placed in the columns the students will be asked to explain the origin of each ingredient. Pasta, for example, is made of flour, and that in turn is made from wheat, which is a seed, and the seed is the fruit of a grass. The tomato paste will bring surprises when the students learn that it is not just tomatoes that go into it, but onions, garlic, and spices.

Normally, there will not be enough time to finish the chart at school, so I will ask them to take it home and bring it back completed. I assure them that it will be all right to have help from some member of the family. (Remember that my purpose in these lessons is to also instruct the parents about the importance of healthy nutrition). With the charts completed the students will realize

that a large amount of the food they ingest is plant based and that the animal products consumed are relatively small in quantity.

At this point I will break up the students into groups of four. Then I will hand out a set of cards containing the sources of vitamins and minerals to each of the groups. In addition the group will receive a large poster paper where the members will make a table with the vitamins and minerals heading each column. In the first column labeled "Food" the students will list the products in their charts. Then they will look at the cards and find out what vitamin or mineral it contains. They will discover that some products contain a variety of both.

While the students are working on the assignment, I will put up a chart with the human figure on the board. When they have finished their work, we will discuss their findings. Then I will call them to me for an explanation of the functions that each type of vitamins and minerals has and how it affects different parts of the human body. This will be a good introduction to the reasons we recommend a healthy nutrition.

Lesson III

Before I begin most of these lessons, I always have my students read a series of books on the human body. The topics of these books are The Lungs, The Heart, The Stomach, etc. After all the students have read them and shared the information with their fellow students, I focus on the lungs and heart as part of the circulatory system.

To begin this lesson I will ask my students to put the fingers of one hand on the veins in their wrists. Then I have them count the heartbeats during one minute and record them in their journal. Once they have done that, I will suggest we go for a walk around the school grounds for a minute. At the end of that time, they will take and record their pulses. Then I will ask them how many heartbeats they think they might be able to count if they ran around the school yard for a minute, and then I will let them find out. When they return, it will very likely take them a bit of time to catch their breath and to settle down to checking their pulse. The last exercise will be to jump up and down for a minute and do the same as before.

While they are recording their findings and chattering with their classmates, I will interrupt them to ask them why they are breathing through their mouths and not their noses. They will try, but fail, to close their mouths. Someone will finally gasp and say he felt he needed more oxygen. This is, of course, the answer we would be looking for, and which we will be able to tie in with the lungs, respiratory system, heart, and circulatory system.

I will now be able to explain to the students how the minerals, especially iron and copper, are involved in the entire process of breathing, adding that when the blood passes through blood vessels in the lungs, iron binds to oxygen and is carried to all the tissues of the body. After the tissues receive the oxygen, iron binds to carbon dioxide, the cellular waste product, and carries it to the lungs for exhalation. Then I will explain that running, jumping, and playing outdoors is a very good exercise because it stimulates and strengthens many of the body's organs, including the brain. That, of course, is because the hemoglobin in blood will get to all parts of the body, oxygenating them and forcing waste in the form of carbon dioxide out. Exercise in itself is an added way to stay both physically as well as mentally healthy.

Back in the classroom the students will be directed to look at the figure of the human body on the board and to draw a picture of the circulatory system explaining the connection between the lungs and the heart. The accuracy of the information included will be considered for an evaluation.

Lesson IV

Exercise and good nutritional habits will not be complete if we do not heed a warning from the animals in the wild that are either dying or mutating in alarming numbers due to contaminants in

the air and water. Students and their families must understand the dangers that components within plastic products have on their endocrine systems and that of their unborn children.

This lesson will be among the last lessons of the year when the students have learned about food chains and webs in different ecosystems. For my students' particular needs we will place this lesson in the salt marshes of the Gulf of Mexico coastal regions. Teachers in other biomes can change the scenario to suit their ecosystems.

Because students like to act, I have devised a play for them in which some children are crustaceans near the bottom of a marsh. Others are fish who eat them. One or two students will be herons who eat the fish, and a couple will be raccoons who visit the marsh and finally a hawk that will prey on the raccoons.

The crustaceans will have a fairly large number pinned on their shirts, which might say "10,000." Those children who are algae eating fish will have a larger number, "100,000," the predating fish will be given the number "1,000,000," and the second level predators such as raccoons "10,000,000." Top predators such as alligators or hawks will be marked with "100,000,000."

I will have to explain to the students that these numbers represent the synthetic chemical molecules accumulated in the consumers' bodies. As the children reenact a food chain in the marsh, the consumers will take the number from their prey. Then they will go to their seats and view the collection of numbers that they have. Even though the second graders do not understand the numbers, they can see that as they eat the consumers acquire and retain greater and greater quantities of deleterious matter, and that inevitably will affect their health.

When all the children are sitting, I will engage them in a discussion about the transferal of energy within the food web at the marshes. Then I will question them about their thoughts of the added transferal of synthetic molecules within that ecosystem and how it is affecting the populations there. Finally I will ask them to add humans into that ecosystem's populations and to think about how that transferal might affect humans.

Toward the end of the lesson I will ask students to write a letter to their representatives in Congress expressing their disapproval of pollutants in our marshlands and asking them to pressure industries and agriculturists to neutralize their waste.

There will be two evaluations for this lesson. One of them will be for the accurate knowledge of the energy transferal processes demonstrated in the play. The second will be the accuracy and completeness of the letters to their congressmen.

BIBLIOGRAPHY

Works Cited

Ball, G.F. M. *Vitamins: Their Role in the Human Body.* Oxford: Blackwell Publishing Ltd., 2004.

Bhatlacharya, Jayanta, Janet Currie, and Steven Haider. *Heat or Eat? Cold Weather Shocks and Nutrition in Poor American Families.* 2002. National Bureau of Economic Research, Inc. Working paper # 9004.

Brody, Jane E. "An Oldie Vies for Nutrient of the Decade." *Health 09/10: Thirtieth Edition.* New York: McGraw–Hill Companies, 2009.

Colburn, Theo, Dianne Dumanoski, and John Peterson Myers. *Our Stolen Future*. New York: Penguin Group, 1996.

Combs, Gerald F., Jr. *The Vitamins: Fundamental Aspects in Nutrition and Health.* London: Academic Press, Inc., 1992.

Daniel, Eileen L. Editor. *Health 09/10: Thirtieth Edition.* New York: McGraw–Hill Companies, 2009.

Davis, W. Marvin, Ph.D. *Consumer's Guide to Dietary Supplements and Alternative Medicines: Servings of Hope.* Oxford: Pharmaceutical Products Press, 2006.

Garcia, Alexandra. "Is Health Promotion Relevant Across Cultures and the Socioeconomic Spectrum?" *Health 09/10: Thirtieth Edition.* New York: McGraw – Hill Companies, 2009.

Hendler, Sheldon Saul, M.D., Ph.D. *The Doctor's Vitamin and Mineral Encyclopedia*. New York: Simon and Schuster, 1990.

Nutrition and Vitamins. Answers.com. February 19, 2009. < Answers.com/topic/nutrition and vitamins>.

"Omega-6 Fatty Acids." 1 May 2007. University of Maryland Medical Center. <www.umm.edu/altmed/articles/omega-6-000317.htm>.

"Omega-6 Fatty Acids: Make Them Part of Heart-healthy Eating, New Recommendation Say." 2 Feb 2009. *Science Daily*. 2 February 2009, 19 March 2009. <http://www.sciencedaily.com/releases/2009/01/090126173725.htm>.

Somer, Elizabeth and Health Media of America. *The Essential Guide to Vitamins and Minerals.* New York: Harper Perennial, 1995.

Supplemental Sources

For Teachers

Bhatlacharya, Jayanta, Janet Currie, and Steven Haider. *Food Insecurity or Poverty? Measuring Need Related Dietary Adequacy.* 2002. National Bureau of Economic Research, Inc. Working paper # 9003.

Couto, Richard A. *Poverty, Politics and Health Care: An Appalachian Experience*. London: Praeger Publishers, Inc., 1976.

Funk &Wagnalls. *New Comprehensive International Dictionary of the English Language.* New York: Publishers International Press, 1980.

Navarra, Tova, and Myron A. Lipkowittz. New York: *Encyclopedia of Vitamins, Minerals and Supplements,* 1996.

Stewart, Charles T. *Healthy, Wealthy, or Wise? Issues in American Health Care Policy*. London: M. E. Sharpe, Inc., 1995.

For Students

DeGezelle, Terri. *Your Bones.* Mankato, MN: Capstone Press, 2002.

--. *Your Heart.* Mankato, MN: Capstone Press, 2002.

Kurtz, Kevin, and Consie Powell. *A Day in the Salt Marsh.* Mt. Pleasant, SC: Sylvan Dell Publishing, 2007.

Ylvisaker, Anne. *Your Lungs*. Mankato, MN: Capstone Press, 2002.

--. *Your Muscles.* Mankato, MN: Capstone Press, 2002.

--. *Your Stomach.* Mankato, MN: Capstone Press, 2002.