Are Your Genes Hazardous to Your Health?

Dear Reader,

This year I again visited China—my tenth trip since 1981! Each time, I am reminded more of how much smaller and interconnected our world is becoming. Fax machines, e-mail, and convenience phones of all kinds constantly remind us, wherever we are, to communicate and to get to know our shared humanity.

I was also reminded in China of another fact: no matter how small our world is becoming, Westerners and Easterners still have very contrasting thoughts and experiences on health. Chinese ideas arise from centuries of practice; ours from the tools of modern science and medicine. They aim to control disease through prevention; we aim to control disease through cure. The Chinese—at least in rural China—rely mostly on foods of plant origin; we rely mostly on foods of animal origin. For good health, they emphasize whole body experiences and whole food consumption; we emphasize “magic bullet” pharmaceuticals and targeted surgical procedures.

Nowhere are our contrasting philosophies more striking than in the recent news reports on the connections between genes and disease. According to these reports, there are one or more genes or hereditary units responsible for breast cancer, colon cancer, liver cancer, Alzheimer’s disease, and so on. Two recent front-page stories in the New York Times by Gina Kolata note that scientists have now discovered about 900 genes that are directly associated with some kind of disease or other condition. What these articles do not mention is the role that diet can play in altering these genetic forecasts.

My editorial hypothesis for healthy living — More important than knowing which genes cause which disease is knowing how to control gene expression by dietary and lifestyle practices.

I am speaking of genes in the larger sense of the word. I consider genes to be both the natural genes given to us by our parents and the mutated ones arising after we are born. In each case, the implications are the same. Every biological response, disease or otherwise, originates directly or indirectly from the genes within our cells. These genes are, in essence, the blueprints of our biological existence. They are the “seeds” from which responses arise.

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I admit, these new gene discoveries are marvelously fascinating. In some sense we are beginning to understand the very basis for disease. Commercial tests are already becoming available for determining exactly which genes are linked to precisely which diseases. But regrettably, something really important is missing. It is this: we are ignoring the dietary and lifestyle conditions that determine how and when these genes are expressed. Almost always, having a particular gene is not the only nor the final word. Before a gene can manifest in a disease or other condition its "hidden" message must be expressed.

**Diet Can Help Change Genetic Projections**

An increasing number of researchers have recently become interested in those factors responsible for gene expression. One of my post-doctoral graduates has convincingly shown, for example, that expression of the gene responsible for liver cancer can be dramatically repressed and liver cancer can be delayed or prevented if less animal protein is consumed. This type of discovery is not new. Many years ago, researchers found that the production of enzymes, which are the main products of gene expression, also could be markedly controlled by what we eat. Unfortunately, this information is not being adequately publicized, and with disastrous results.

The articles I referred to earlier raise some important ethical questions. For example, what does someone do when they learn that because of their genes they are destined for cancer, or a neurological disorder? What will employers and medical insurance companies do with such information? Should parents tell children who test positive? The list goes on and on.

What a difference it would make if we could just remember that genes only establish the potential for disease; they do not alone cause disease. We must understand, appreciate, and therefore act upon those factors responsible for expressing or exposing the hidden genetic messages.

**Fatalistic Medical Reports Only Tell You Half the Story**

What concerns me most about these stories is the fatalism conveyed by scientists to the doctors, and by doctors to their patients. People who learn they have such disease-producing genes often behave in very tragic and unproductive ways. According to Ms. Kolata’s New York Times report, an otherwise healthy nine-year-old boy who tested positive for the gene for a neurological disorder was put into a foster home. In other cases, some healthy young women, when told that they had a genetic susceptibility for breast cancer, underwent early mastectomies. Even suicide has been attempted.

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Diabetes: Taking Control with Diet

By Neal D. Barnard, MD

Diabetes is not rare. About seven million Americans have it and the results can be deadly. Because diabetics frequently need medical treatment, the costs of medical care and lost productivity are enormous—over $20 billion annually.

Diabetes is, in essence, starvation. The cells of the body are starving for their normal food, which is a simple sugar called glucose. Normally, the cells use this sugar to run their microscopic machinery. The problem in diabetics is that sugar has trouble passing from the bloodstream into the cells where it can be used. It must be escorted into the muscle, liver, and fat cells by a hormone called insulin, which can be thought of as a key that opens a door in the cell membrane for glucose to enter. When insulin is absent or not working properly, glucose simply waits in the bloodstream, unable to enter the cells.

From this disarmingly simple beginning, diabetes leads to many problems. Sugar builds up in the blood and ends up being excreted in the urine. Excessive urination leads to thirst and dehydration, along with weight loss and weakness. Diabetics can develop aggressive atherosclerosis, leading to heart attacks and strokes. Poor circulation to the legs, combined with trouble combating infections, may mean that a simple foot sore will progress to gangrene.

The Two Types of Diabetes

The technical name for the disease is diabetes mellitus. (Mellitus is a Latin word meaning “honey-sweet,” referring to the sugar content of the urine.) There are two different types of the disease. In childhood, if the pancreas is somehow damaged so that insulin cannot be produced, the result is insulin-dependent diabetes, which means that the affected individual will need insulin injections for the rest of his or her life. This form of diabetes is sometimes called childhood-onset diabetes or Type I diabetes. It usually starts before the age of 40.

In the second, and much more common form of diabetes, the problem is not a lack of insulin, but simply that the insulin does not work effectively. This form of the disease is called non-insulin-dependent diabetes (or adult-onset or Type II). It typically occurs in overweight adults over the age of 40, and is usually treated with dietary changes and oral medications, although insulin injections are sometimes used.

Immediate Steps You Can Take

By eating a diet of fruits, grains, legumes, and vegetables, and exercising regularly, you can have a powerful effect on diabetes. Although non-insulin-dependent diabetics often find that the disease disappears with diet and exercise, people with insulin-dependent diabetes will need insulin injections regardless of the diet they follow. However, dietary changes are usually helpful in managing the disease and in minimizing complications. Diabetic treatments should always be individualized.

The cornerstone of the diet is to keep fats and oils to a minimum, because they interfere with insulin. When I was a medical student, we did not appreciate the importance of this. We thought sugar was all there was to it. But all the while, the high-fat foods were a much bigger problem because fats interfere with the action of insulin. Although doctors used to believe that diabetics should steer clear of carbohydrates, we now know that just the opposite is true. Complex carbohydrates and fiber should be increased to allow a more gradual release of sugars into the blood. The specific type of carbohydrate may make a difference. For example, beans seem to cause a small rise in blood sugar levels, while the soluble fiber in fruits and vegetables helps reduce blood sugar.

Physical activity is very important. When muscles are exercised, they have a voracious appetite for sugar. They pull it out of the blood, even with very little insulin present. For this reason diabetics do well to maintain a regular program of aerobic physical activity. Caution is advised, however; a sudden increase in exercise can lower blood sugar too rapidly, and insulin doses will need to be adjusted by your doctor.

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The Protein Puzzle: Picking up the Pieces
by Dr. T. Colin Campbell

There’s a common myth among both scientists and non-scientists that people of underdeveloped countries are small simply because they don’t eat enough meat. If they ate more meat, they would be big and strong like us. But this is not what we found from our China Project research. On the contrary, these people can become bigger not by adopting Western dietary habits but by increasing the quantity, variety, and quality of their traditionally consumed plant foods.

In our study in rural China, we found that between 1953 and 1982, males increased their height an average 3.2 centimeters per decade. What astounded us about these figures was that during the same time, male height in Japan increased by about the same amount, allegedly because Japanese eating habits were rapidly becoming more like those of the U.S. But in rural China, where people are quite isolated from Westernization, we could find no such correlation.

The answer is not for Third World countries to “Westernize” their diets by adding more animal foods—at the risk of inheriting our high cancer and heart disease rates—but rather to retain their traditional plant-based diets while simultaneously improving their hygiene. In certain areas of China less than 3% of the population under 65 years of age will die from cancer, but the so-called “diseases of poverty”—pneumonia, tuberculosis, and other infectious diseases—take many lives. When diets are plant-based, yet lack sufficient variety or quantity, the diseases of poverty remain prevalent. While developed countries have mostly conquered these diseases, unfortunately, the “diseases of affluence” (degenerative diseases such as colon, lung, and breast cancers, diabetes, and coronary heart disease) have become the new killers. And in this case, too much rich food, especially of the animal kind, is the culprit.

The Unreliability of “Proven” Research

In the Western world, we would like to think that our principles of protein nutrition reflect the accumulated insights of intellectual scrutiny and the latest scientific research. But in fact, many of our cherished assumptions are firmly rooted in outdated research that bears only the slightest resemblance to some of the newer information on protein.

To understand how this has happened, we must understand the conflicting interests within government. In the United States, the Department of Agriculture (USDA) is primarily responsible for promoting agriculture and secondarily responsible for promoting good nutrition. Considering the obvious conflicts of interest in this peculiar marriage, we should hardly be surprised to find that the USDA has long recommended meat and dairy-based diets, including the Basic Four Food Groups. It has only been due to the persistent efforts of concerned citizens’ groups that we have seen the recent version of the Food Pyramid, which now gives more emphasis to grains, fruits, and vegetables, rather than meat and dairy products.

The Cornell-Oxford-China Nutrition project, conducted in mainland China and Taiwan, is a massive survey of over 10,000 families designed to study diet, lifestyle, and disease across the far reaches of China. By investigating simultaneously more diseases and more dietary characteristics than any other study to date, the project has generated the most comprehensive database in the world on the multiple causes of disease. Upon completion of the initial results, all local health authorities in the China Project survey were advised on how to change their diets to lower their disease rates.

SOME COMMON SOURCES OF PROTEIN

<table>
<thead>
<tr>
<th>Food</th>
<th>Serving Size</th>
<th>Protein (g)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almonds</td>
<td>2 oz (24 nuts)</td>
<td>6.5</td>
</tr>
<tr>
<td>Avocado</td>
<td>1 medium</td>
<td>5.6</td>
</tr>
<tr>
<td>Beans, kidney</td>
<td>1/2 cup cooked</td>
<td>7.2</td>
</tr>
<tr>
<td>Broccoli</td>
<td>1/2 cup cooked</td>
<td>2.4</td>
</tr>
<tr>
<td>Lentils</td>
<td>1/2 cup cooked</td>
<td>7.8</td>
</tr>
<tr>
<td>Oatmeal</td>
<td>1 cup cooked in water</td>
<td>4.8</td>
</tr>
<tr>
<td>Rice, brown</td>
<td>1 cup cooked</td>
<td>4.9</td>
</tr>
<tr>
<td>Soybeans</td>
<td>1/2 cup cooked</td>
<td>9.9</td>
</tr>
<tr>
<td>Tempeh</td>
<td>2 oz</td>
<td>11.2</td>
</tr>
<tr>
<td>Tofu</td>
<td>4 oz</td>
<td>10.0</td>
</tr>
<tr>
<td>Wheat, shredded</td>
<td>2 biscuits</td>
<td>5.0</td>
</tr>
</tbody>
</table>

*Source: USDA
Two Problems: One Solution

Unfortunately, even the revised Food Pyramid does not go far enough. Our China Project data surprisingly indicates that relatively small amounts of foods that are based on animal protein may be hazardous to your health. But this is only half the story. The other half concerns the health of our planet.

The consumption of large amounts of animal protein clearly is leading to devastating shifts in world agriculture from food grains to feed grains. Today, over one billion people—about one in every five on earth—do not get enough food of any kind to lead fully productive lives. This is largely due to the tremendous amount (40%!) of the world’s total grain production that is fed to livestock. We must take this seriously and shift our thinking and actions towards a plant-based diet.

Do You Need to Combine Grains, Greens, and Beans?

When you start the switch to a plant-based diet it’s natural to wonder whether you need to combine proteins to get a full assortment of amino acids. That is, do you need to eat grains, beans, and greens with every meal?

Because protein is found in fairly generous amounts in many plant foods, it’s virtually impossible not to get enough. It’s true that virtually all plant proteins are relatively low in at least one of the nine essential amino acids, but this does not mean you need to get all nine amino acids in a single meal. If you can pick up your amino acids over the course of a day, that will be sufficient. And you will certainly get all your amino acids as long as you remember that variety is life’s elixir.

The RDA for protein assumes that adults need on average little more than 0.5 grams of protein daily per kilogram of body weight, but because individuals vary in their ability to utilize proteins, the RDA adds 0.3 gram per kilogram as a safety factor. If you are curious as to how you stack up with the RDA protein guidelines, you can divide your weight in pounds by 2.2 to get your weight in kilograms. Then simply multiply your kilogram weight by 0.8 to calculate the RDA standard protein requirement for adults. For example, if you weigh 155 pounds and divide it by 2.2, you’ll find you weigh 70.45 kilograms. Multiplied by 0.8, you’ll come up with 56.36 grams for your daily protein requirement.

The concern for many who eat only a plant-based diet is whether they can indeed get enough protein. We’ve all been asked the question many times: “If I don’t eat meat, how can I get enough protein?” The table shown above represents a typical daily menu following a plant-based diet. If desired, any number of grains, fruits, and vegetables might be added for more calories.
Chopsticks

A Chinese Recipe from the Province of the Month
by Banoo Parpia, Ph.D.

Zhejiang

A beautiful and richly endowed province, Zhejiang boasts a 2,200 kilometer coastline with numerous harbors and islets. Long, undulating mountain ranges spread across the southwest, while the northeast is abundant in lakes and rivers. Moreover, Zhejiang is endowed with the immensely fertile area of the Yangtze river basin.

It’s no small wonder that with all its water resources, Zhejiang is perhaps best known for its fishing industries, including freshwater and saltwater fisheries, as well as the harvesting of seaweed and algae. The capital city of Hangzhou inspired Marco Polo to hail it as the world’s “most prosperous metropolis.” Seven centuries later, the Chinese government continues to bill Hangzhou as a cosmopolitan destination for international travel.

Health/Lifestyle Profile

The two rural counties in Zhejiang that were studied for the China Project showed a low incidence of most types of cancer. However, Zhejiang like the rest of China has two major exceptions to this rule—stomach and liver cancer. For example, looking at China as a whole, and using a population base of 100,000, the incidence of stomach cancer in the U.S. is just 6.5 versus 90.9 for China; for liver cancer, the U.S. rate is just 2.55 versus 77.75 in China. More alarming for the people living in Zhejiang is that their death rates are even higher than other areas of China. Why such high figures for stomach and liver cancer in a country that’s otherwise known for a low cancer incidence? This is at least partly due to the high consumption of moldy and spoiled foods, as well as the consumption of salted fish and pickled foods, and a general lack of refrigeration. Moreover, unlike the residents of many of China’s other provinces, the people of Zhejiang compound their risk by eating relatively few deeply colored vegetables.

Featured Recipes

We have selected two typical Zhejiang ts’ai dishes that can easily be made without salt or pickled ingredients. However, to make sure that you are getting a truly healthy meal, be sure to include some dark, leafy greens in the other ts’ai dishes. A ts’ai dish of dark leafy greens for this meal might consist of blanched soybean greens. To reduce fat, you can substitute vegetable broth or water for the oil. Also, we recommend using fruit juice instead of the small amount of sugar commonly used in China.

Zhejiang Celery with Peanuts

4 large stalks of celery
1/4 cup raw peanuts, shelled
1 tsp. sesame oil
1 tsp. vinegar
2 T fruit juice
salt to taste

Cut celery into 1/2 inch dice and blanch in boiling water for about 3 minutes. Rinse immediately in cold water and set aside. Place peanuts in a small sauce pan and cover with cold water. Bring to a boil and simmer for 15–20 minutes until soft. Combine peanuts and celery and add sesame oil, vinegar, juice, and salt to the mixture and toss until all the ingredients are well blended.

Mung Bean Sprout Salad

1/2 lb mung bean sprouts (substitute any bean sprouts)
2 T very finely chopped fresh ginger root
1 tsp. sesame oil
1 tsp. vinegar
1/2 tsp. salt
2 T fruit juice
2–3 sprigs of fresh cilantro leaves for garnish

Blanch bean sprouts in boiling water and rinse immediately with cold water. Add the ginger, sesame oil, vinegar, salt, and juice, and mix thoroughly until sprouts are well coated. Garnish with chopped cilantro leaves.

The Fan Ts’ai Principle

The fan ts’ai principle constitutes the heart of Chinese cooking. A typical Chinese meal combines a grain (the staple known as fan) and a mixed dish (usually a vegetable, referred to as ts’ai). Generally, fan is consumed in large amounts while ts’ai is eaten sparingly, simply to flavor the fan.

Nutrition Advocate
Without protein, life would be impossible. Practically every cell in your body spends considerable time and energy manufacturing various kinds of proteins. Every imaginable part and function of your body has protein involved in some way, from the enzymes that are critical to the digestion of foods to the fibers that plug leaky blood vessels. But before you get carried away with putting protein on a nutritional pedestal, it can also be said that life would be impossible without sugars (carbohydrates) and fats (lipids). So just what exactly is protein?

**Understanding Protein . . . It’s Kids’ Stuff!**

Protein is simply a name for a nutritional family. We could just as easily have said this is a photo of the Jones or Smith family. To pick out their distinctive family characteristics we need to look closer. Do they all have large noses, blue eyes, and freckles? Just as human families have one trait in common with all others—they are all members of the human species—so do proteins. The principal trait for all proteins, large or small, is that they are composed of amino acids. For the sake of our discussion, I would prefer to call these common linking blocks LEGOS®.

Despite the mix of Lincoln Logs®, Erector Set® pieces, and rubber farm animals spread over the living room floor, my son can always spot the colorful plastic LEGOS® that interlock with each other to construct various structures from cars to space ships. Depending on the need, some LEGOS® may function best as doors, others as headlights, and others as antennas. Nevertheless, the pieces can be readily recognized and used individually or in highly complex constructions to meet the demands of the most persnickety designer.

This is exactly the way amino acids work. With about 20 different kinds available, every cell of your body can choose from the pool of amino acids to construct specific proteins to meet very diverse needs of human physiology. For example, there are boats to shuttle oxygen around (hemoglobin), taxis for small fats (LDL), and ballistic missiles to destroy invaders (immunoglobulins). Put two amino acids together and you get a dipeptide (di = “two”); put three amino acids together and the result is a tripeptide (tri = “three”); finally, a complex construction of many amino acids makes a polypeptide (poly = “many”). Human insulin, for instance, which is responsible for getting glucose into the muscles, is composed of 51 amino acids in two short polypeptide chains.

As the digestive process kicks into high gear, “intelligent” receptors on the large intestinal surfaces have to decide which amino acid, dipeptide, or tripeptide to absorb, and which will have to wait. This competition among the amino acids for absorption is not a big deal, since the body’s receptors “know” which amino acids are needed most of the time. However, if your intestinal tract is flooded with amino acid supplements, the absorptive cells cannot deal with these refined and readily available amino acids all at once. Inevitably, the “pushier” amino acids, or the ones in greatest concentration, leave the receptors no choice but to take them in first.

**What Is so Essential about Essential Amino Acids?**

The constant construction of new proteins, along with the destruction and elimination of old proteins, means that a continual supply of amino acids must be made available via nutrition to maintain a healthy balance. Different foods provide essential amino acids in varying proportions.

We now have clear evidence that even if a diet is derived exclusively from the vegetable kingdom, it can provide all the necessary amino acids for optimal health. It is generally sufficient simply to have a consistent supply of a variety of vegetables, legumes, and grains throughout the week.

**Your Nine Essential Amino Acids – All From Plants—**

- Histidine: Seaweed, wheat germ, almonds, sunflower, peanuts
- Isoleucine: Soybeans, asparagus, almonds, peanuts, sesame seeds
- Leucine: Soy sprouts, green peas, lentil sprouts, green beans, asparagus
- Lysine: Toasted wheat germ, almonds, brazil nuts, cashews, lima beans, soybeans
- Methionine: Wheat germ, pistachio nuts, almonds, walnuts, sunflower seeds
- Phenylalanine: Wheat germ, corn, soy sprouts, sweet potato
- Threonine: Dried figs, almonds, peanuts, sesame seeds
- Tryptophan: Pumpkin seeds, almonds, collards
- Valine: Toasted wheat germ, dried peach, dried fig, peas, potato

You are welcome to send questions to “Back to Basics,” c/o Dr. Jeff Gates, at Nutrition Advocate, P.O. Box 4716, Ithaca, NY 14852.
do know that routine consumption of plant-based foods offers the best chance of providing overall control for most of these diseases, and therefore expression of their underlying genes.

My colleagues who focus their work on these genes—some of us call them “gene jockeys”—will disagree with me on this point because they want to know the exact mechanism and the exact agents in foods responsible for this effect. Unfortunately, this view implies that we have little knowledge of, or hope for, the idea that by eating whole foods of the right kind we can control the development of these so-called genetic diseases. Generally, molecular biologists are banking on the notion that someday, not too far off, science will be able to replace our disease-causing faulty genes with new ones. It’s called gene therapy. Supposedly when we are able to identify all the genes responsible for all our diseases, we will be able to dig them out and replace them with new ones.

Thank You, I’ll Keep My Genes

This story about genes and gene jockeys is only the latest chapter illustrating the East/West debate on nature versus nurture. In this case, the genes provide the nature; nutrition and lifestyle factors provide the nurture.

I’ll accept whatever genes I have; anyway, I must. Rather than become a modern Frankenstein, I’ll stick with my own genetic package. I prefer to use the kind of diet that, based on some very strong evidence, works best to keep under control those genes that ought to remain asleep.

Wishing you and yours the best of health!

\[Signature\]

T. Colin Campbell

REFERENCES

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