

The China Project

T. Colin Campbell, PhD; Hans Diehl, DrHSc, MPH

Dr. T. Colin Campbell, professor of Nutritional Biochemistry at Cornell University and the U.S. Mastermind of the China Project, recently addressed some 600 graduates and their friends who had completed my Coronary Health Improvement Project (CHIP) in Kalamazoo, Michigan. These graduates had attended my intensive 40-hour educational curriculum designed to prevent and reverse Western killer diseases by adopting a dietary lifestyle similar, in principle, to the one advocated by Dr. Campbell and his researchers from the China Project. The convincing data from the China Project, as published and presented by Dr. Campbell as part of the graduation exercises under the auspices of the Borgess Medical Center, is reflected in this article.

Stable Population and Regional Diets

To status conscious people in China, animal products spell prestige. Someone dressed in a fur hat, wool coat, and leather shoes, is more impressive than a comrade clothed from head to toe in lowly cotton. But the one area where most Chinese have not yet been able to indulge their fondness for animal products is their diet. Aside from occasional pieces of pork and chicken, for most rural Chinese, meat—until more recently—has been largely scarce in their predominantly agrarian society.

“Disease-specific death rates in China could vary several hundredfold from region to region.”

With a fairly stable population—most people spend their entire lives in the same geographic area eating the same locally grown foods throughout their lives—and a diet that varies considerably from one region to another—villagers on the North Bank of the Yangtze River may rely on steamed breads and sweet potato, while on the rich farm lands to the south, villagers may fill their plates with rice—China offered a unique opportunity to researchers and epidemiologists to research and study first-hand the possible connection between diet and other lifestyle factors as they relate to disease and mortality.

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ties, had shown that disease-specific death rates could vary several *hundredfold* from region to region.

At the same time, international comparisons had demonstrated that in the United States *17 times* as many men under the age of 65 die from coronary heart disease than in China, and that the death rate for breast cancer for American women is *five times* higher than among the Chinese.

Ideal Human Laboratory

The availability of such reliable morbidity and mortality data with sufficiently different disease and death patterns and the presence of a stable population with sufficiently different dietary patterns—from the largely rural areas to the industrialized regions of Nanjing, Beijing and Shanghai—made China the ideal living laboratory for studying the impact of different dietary patterns on disease and death.

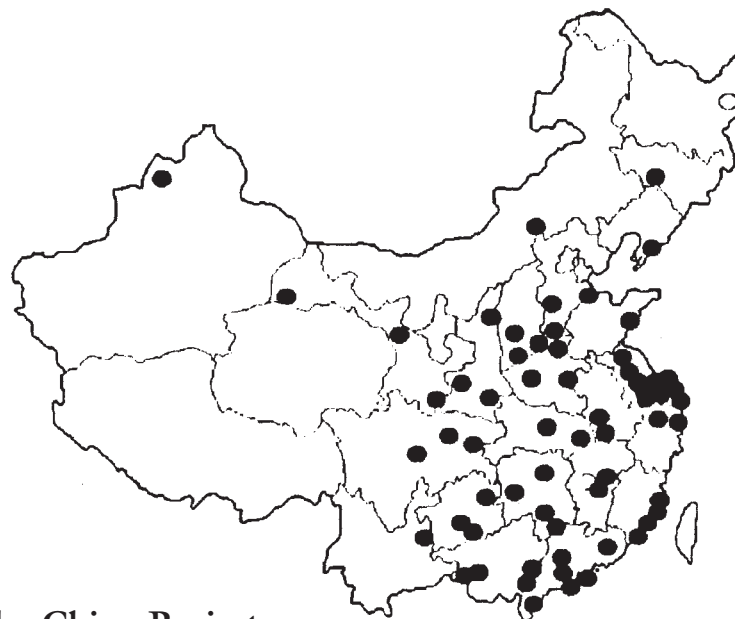
Data Collection

In 1983 an international collaborative effort between Cornell University, the Chinese Academy of Preventive Medicine, the Chinese Academy of Medical Sciences, and Oxford University in England, began gathering information on how people live and die.

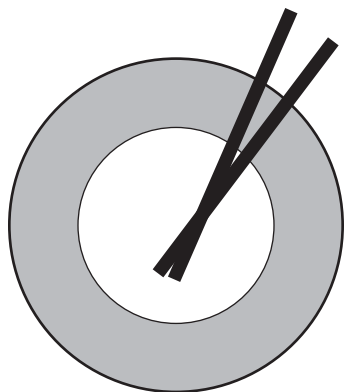
Some 367 items of information were systematically collected from 6,500 adults living in 138 villages in 65 counties. Researchers sometimes had to travel for days across rough terrain in order to reach nomads on the Russian border or villagers in an oasis near the Gobi Desert. This monumental survey of food, environment, social practices, and disease, is the most comprehensive study ever made on Chinese people. Known as the *China Project*, it represents the “grand prix” of epidemiology. It has given researchers a rare close-up view of the complex links between dietary prac-

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—*New York Times*



**The China Project:
Massive Human Living Laboratory
Counties Surveyed**



“In the big cities, eating meat has become a status symbol and a sign of prestige.”

tices, different types of disease and deaths. The data from this first survey, alone, published by Cornell University Press, fills a 920-page volume.

In 1989, a second survey was undertaken. This time, more than 1,000 items of information were collected in 170 villages in rural China and in Taiwan involving 10,200 adults and their families. These study subjects were observed, interviewed, measured, and poked for several days. Every piece of food they ate was recorded. In addition, urine and blood samples were collected.

These new data, including a large number of socio-economic characteristics, will be combined with a new survey on the causes of death for the population of 100 million. The databank is so colossal that it will yield enough work for analysis and interpretation for the next 20 years. Dr. T. Colin Campbell, a nutritional biochemist at Cornell University and the chief investigator and U.S.

Mastermind of the *China Project*, suggested in a speech in Kalamazoo, Michigan, “The opportunities for exploring the causes of disease are incalculable. We believe that these data have the potential to establish a new paradigm for thinking about nutrition and health.”

Income-related Disease Clusters

One of the first things to emerge from the *China Project* data concerned the fact that certain clusters of diseases tended to occur in areas that shared similarity of geography and economic status. Although researchers had long observed that underdeveloped nations tended to experience different diseases than those in richer countries, the Chinese data offered, for the first time, clusters of “rich” and “poor” diseases *within the same country*.

Diseases of Poverty

The researchers grouped pneumonia, tuberculosis, infectious diseases, parasitic diseases, eclampsia, and cancer of the stomach and liver under the heading of *Diseases of Poverty*. These diseases are predominantly intertwined with poor sanitation, nutritional deficiencies and poor food quality due to lack of refrigeration.

Diseases of Affluence

On the other hand, the researchers grouped coronary heart disease, stroke and hypertension, cancer of the breasts, prostate, and lungs, as well as diabetes and osteoporosis under the heading of *Diseases of Affluence*. These diseases account for over 75% of premature U.S. deaths. While rare in China, these killer diseases correlate strongly with high intakes of animal products, especially fats and protein. These dietary patterns, in turn, correlate closely with the level of economic development.

Not surprisingly, populations surveyed near the large Chinese cities showed the highest rates of these *diseases of affluence*. As people become more affluent, they begin to eat diets richer in animal products. In Nanjing, Beijing, and Shanghai, eating meat has become a status symbol and a sign of prestige. Biochemical data, however, has shown that this Epicurean form of social climbing has its down side. It was accompanied by higher *blood urea nitrogen* levels, which—aside from elevated blood cholesterol levels—emerged as a main biochemical marker for the *diseases of affluence*. Urea nitrogen is the remnant of protein metabolism; it's what's left over from the metabolism of protein in the body. The higher the protein consumption—the more meat, milk, and eggs eaten—the higher the urea nitrogen levels in the blood.

The researchers thought of the findings on blood cholesterol and blood urea nitrogen as even more remarkable in that even small intakes of animal products were associated with significant increases of heart disease, cancers and diabetes. On the other hand, they found that the greater the percentage of plantfood in the diet, the lower the risk of getting these diseases.

“I can hardly emphasize enough the importance of nutritional and dietary practices as the major cause of American diseases,” said Dr. Campbell. “Chinese counties with a more affluent lifestyle showed a clear shift from *diseases of poverty* to *diseases of affluence*. But, *diseases of affluence* are not inevitable. A society that can afford sanitation, refrigeration, and abundant food, may yet conquer these *diseases of affluence* by simplifying its diet and by eating more *foods-as-grown*.”

“This epicurean form of social climbing has its down side.”

Disease Groups

Diseases of Affluence

- Coronary heart disease, Stroke, Hypertension
- Cancer of the breasts, colon, prostate, lung, blood, brain (children)
- Diabetes
- Osteoporosis

Diseases of Poverty

- Pneumonia, Pulmonary tuberculosis
- Digestive diseases, Intestinal obstruction, Peptic ulcer
- Cancer of the stomach and liver
- Infectious diseases
- Parasitic diseases
- Nephritis
- Eclampsia, Diseases of pregnancy
- Rheumatic heart disease

Here are some of the specific findings of the most comprehensive project on diet and disease ever undertaken anywhere in the world.

Obesity

The *China Project* discovered that in China obesity relates more to what kinds of food people eat than to the number of calories it contains. In China, the calorie intake per pound of body weight is 30% higher than in the United States. The Chinese actually eat 270 more calories a day than the Americans. But while obesity is rampant in America, it is difficult to find it in China. While exercise may play a role, it does not fully explain why those extra calories don't end up as extra flab in unwanted places on Chinese bodies.

Since the Chinese plant-based diet contains *three times* the amount of starch and only 30% of the amount of fat that the Americans eat, some scientists suspect that fat may be stored more readily and directly by the body, whereas a larger proportion of starch calories may need to be burned off first as energy and heat before they can be stored as fat. Others suspect that when fat is burned as energy and heat instead of being incorporated as body fat, that it may contain not 9 but 11 calories per gram.

Blood Cholesterol

Cholesterol levels in China were found to be substantially lower than in North America. Blood cholesterol levels among the Chinese averaged 127 mg% (90-170 mg%) compared to 212 mg% (157-274 mg%) among people in North America. "Their 'higher than normal' cholesterol is our low cholesterol," noted Dr. Campbell.

"The differences in blood cholesterol levels reflect largely the markedly different consumption patterns of red and white meat, eggs, and dairy. These are the markers for the intake of cholesterol, animal protein, and saturated fat," explained Dr. Campbell to the graduating class. "Increasingly, high blood cholesterol values are emerging as the most important predictor of heart disease, cancer and diabetes—the diseases of affluence. Low cholesterol values, on the other hand, not only protect against heart disease—for every heart attack in

China there are 17(!) in the U.S.—but they also protect against colon cancer, one of the most common life-threatening cancers among Westerners. In China, mortality rates from colon cancer are clearly lowest where cholesterol

“Blood cholesterol and urea nitrogen levels emerged as main biochemical markers for the *diseases of affluence*.”

levels are lowest. This is a finding that contrasts with previous studies in Western society where very low cholesterol levels were associated with a possibly greater incidence of colon cancer.”

How can American blood cholesterol levels be lowered? A varied diet of plantfoods only—vegetables, grains, fruits and legumes—will do it. The higher the intake of soluble fiber as found in legumes (like peas and beans), the lower the blood cholesterol levels. The lower the blood cholesterol level, the lower the risk of cancer, diabetes, and heart disease. For every 1% drop in blood cholesterol, the heart disease risk drops by 3%.

“Our findings are going to upset a lot of the nutritional mythology of the West.”

—T. Colin Campbell, PhD

Heart Disease

With the powerful blood cholesterol-heart disease linkage etiologically established, the *China Project* found that—aside from dietary cholesterol and saturated fats—animal protein may play a much larger role in raising blood cholesterol levels than previously thought.

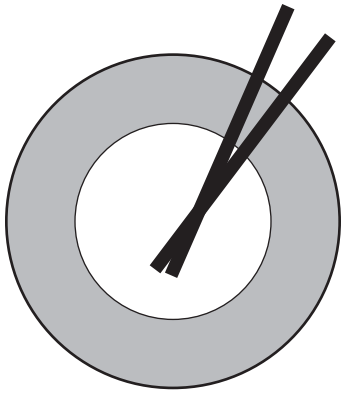
These findings are increasingly supported by human metabolic ward studies. They show that animal protein may raise serum cholesterol levels even more than the saturated fats, which come largely from meat and dairy products. This means that a piece of lean meat may be just as damaging to blood cholesterol levels as a piece of fatty bacon. “The Chinese experience shows that most Western coronary heart disease is unnecessary,” according to Dr. Richard Peto of Oxford University, the *China Project’s* chief epidemiologist.

Cancer

BREAST CANCER

Many epidemiological studies have shown a strong association between the amount of meat and fat consumed in populations and their breast cancer rates. The greater the meat and fat intake, the greater the cancer risk (see graphs on next page). Migrant studies have confirmed this relationship. As people from low-risk countries move to high-risk countries and exchange their traditional lifestyle for the new one, they gradually take on the disease risk rates of their host country.

After analyzing their data and comparing it with data from other countries, the *China Project* researchers found that deaths from breast cancer were associated with:



- High intake of dietary fat and high blood cholesterol levels
- Estrogen and elevated blood testosterone levels
- Early age at first menstruation and late menopause

Fat and Cholesterol

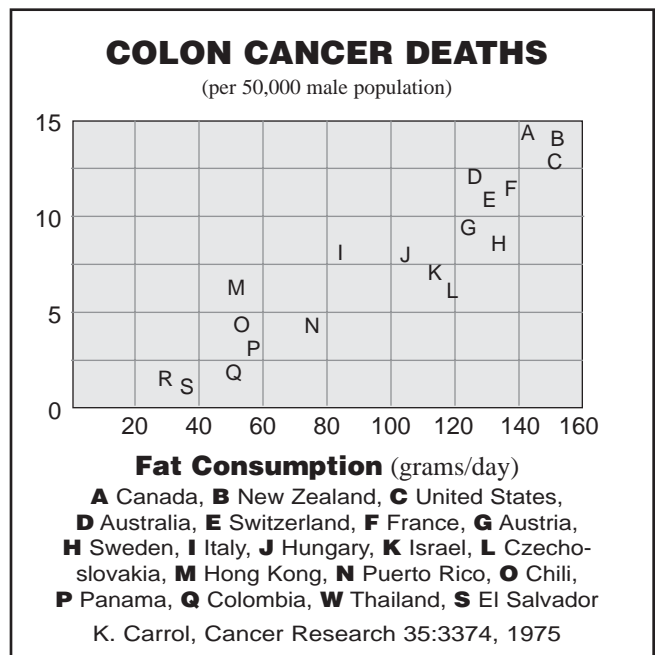
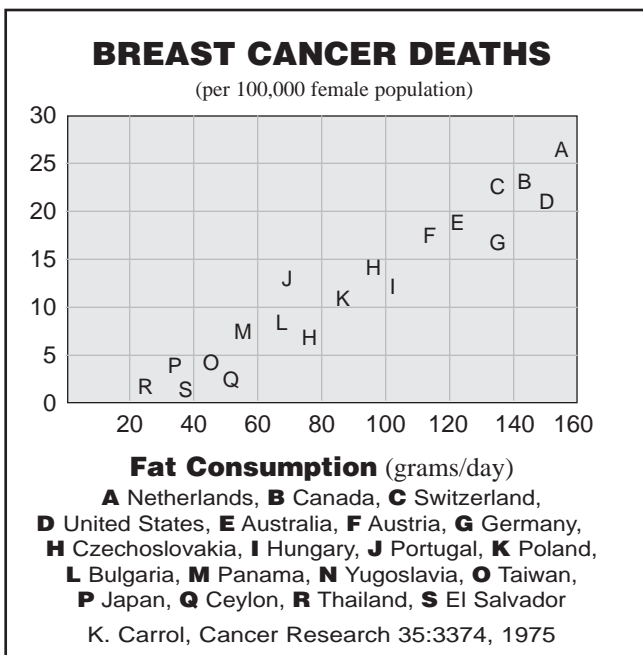
While dietary fat and blood cholesterol are known to be related to high meat-dairy-egg consumption patterns, could dietary factors also play a role in the levels of estrogen and testosterone and in the onset of menstruation (menarche) and menopause?

Estrogen and Testosterone Levels

Scientists have known for some time that high levels of estrogen, a hormone that regulates a women’s monthly cycle, can stimulate certain forms of breast cancer. Some scientists have even suggested that estrogen levels may be markedly influenced by dietary factors. The *China Project* found that even relatively small additions of milk, meat and fat to the traditional plant-food-centered Chinese diet can increase the level of estrogen and other reproductive hormones.

In addition, the researchers found that Chinese women between 35-60 years of age had much lower blood levels of estrogen than British women of the same age. Moreover, Chinese women had much higher levels of a helpful protein that “binds” estrogen in their blood thus making it much less able to stimulate breast cancer.

Testosterone, like estrogen, is a hormone predominantly found in men. But women also have small amounts in their bodies, where it affects the sex-



ual drive. The *China Project* found that those women who ate more fat and animal-based foods had not only higher blood testosterone levels, but they also had higher breast cancer rates.

Age of Menarche and Menopause

Even more impressive were the findings that the age of menarche and the age of menopause were strongly associated with greater breast cancer risk. The researchers found that the menstrual cycle of Chinese women usually begins at the age of 17 and ends at around 44. In America, however, the menstrual cycle normally begins below the age of 12 and ends at around 48. This means that Chinese women have about 8-10 *fewer years* of their hormonal surges that are associated with higher risks of breast cancer than their American counterparts. International population studies had suggested that diets high in fat, calories and animal protein may hasten the onset of menstruation by accelerating growth. These suggestions have now been strengthened and confirmed by the results from the *China Project*.

“These new findings challenge our traditional beliefs about protein, calcium, weight control, ideal cholesterol, and vitamin requirements.”

—T. Colin Campbell, PhD

COLON CANCER

Epidemiological studies have linked colon cancer with high fat and low fiber intake. High fat diets promote bile production, which can undergo chemical changes and become co-carcinogenic and cancer-promotive. Low fiber diets, on the other hand, slow down the passage of food through the alimentary tract so that it may often take some 100 hours to process food from the time of ingestion until elimination.

The *China Project* confirmed these concepts: the higher the intake of a wide variety of fibers, the lower the rate of bowel cancer. With the Chinese eating three times more fiber than Westerners, the fibers from whole grains, beans, and vegetables bulk up waste and speed it through the digestive tract in about 24 hours. This drastically reduces the time that the intestinal lining may be exposed to dietary carcinogens. In addition, the much larger and moist stools dilute the potentially cancer-promoting bile acids. The low rates of colon cancer in China strongly support the idea that dietary fiber plays a protective role in this disease.

PROSTATE CANCER

One in five men in North America will eventually be diagnosed with prostate cancer. While the majority of these cancers grows very slowly and in most cases does not represent a threat to life, growth can be markedly

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accelerated by high testosterone levels which, in turn, are largely under the control of diet. Testosterone production is accelerated by a high animal-protein diet, while a diet low in animal protein and fat, yet high in fiber, slows its production and speeds its elimination.

Moreover, in addition to certain antioxidants and vitamins, vegetables contain plant estrogens that can help normalize the testosterone/estrogen ratio. Men eating diets high in phytoestrogen-containing foods (like soy beans and peas) have been shown to be less likely to develop prostate cancer.

Two major studies tracking some 68,000 American men found that those men who ate the highest meat-and-butter diet had almost 80% more advanced prostate cancer than men who skipped those greasy foods.

A comparative study looking at prostate cancer rates found that men in China had the lowest prostate cancer rates in the world, while Chinese-American men living in San Francisco had a rate 19 times as high!

Animal Protein: Red Alert!

In general, one of the most dramatic findings of the *China Project* was the strong association between foods of animal origin and cancer. Villages high in carnivorous foods had much more cancer than villages low in them. Dr. Chen Junshi, the chief Chinese researcher of the *China Project*, was not surprised at these findings. “After all, looking at and learning from dietary experiments with animals, we expected this.”

“Chinese living in America have prostate cancer rates 15-20 times higher than those living in China.”

—T. Colin Campbell, PhD

He referred to a series of experiments where a diet high in animal protein was fed to animals who had been exposed to a carcinogen. On this diet, the tumors in their livers grew rapidly. When the animal protein, however, was decreased and replaced by

plant protein, the tumors stopped growing.

Carcinogenesis is apparently turned on by a diet high in animal protein (and fat) and turned off by a diet high in plant protein (and low in fat). This holds true even if the cancer has already been initiated. *The China Project* found that the diet of most rural people contains only 4 grams of animal protein, while Western diets contain 71 grams.

LIVER CANCER

For more than 60 years, scientists believed and taught that aflatoxins found in moldy grains and beans were the major cause of high rates of liver cancer in developing countries.

The China Project, however, found no correlation between these carcinogens and liver cancer. Instead, they found that people infected with chronic viral hepatitis B (60 times more prevalent in China than in North America) were predisposed to getting liver cancer, and those with a higher cholesterol level were more likely to be stricken by this cancer. This primary liver cancer, therefore, may not be a viral/chemical carcinogen disease as previously thought but it may be a viral/nutritional disease. If so, it should be treated with a very low fat, plantfood-based diet.

STOMACH CANCER

China, along with some other developing countries, has high rates of stomach cancer, a disease that is not commonly found in North America.

Often linked up with stomach ulcers as a potential precursor to stomach cancer, this condition was believed to be largely related to chronic stress. It was only recently that the bacterium *Helicobacter pylori* was discovered as a prime suspect in some of the disease etiology.

The China Project confirmed that stomachs chronically infected with *Helicobacter pylori* are indeed at increased risk for turning cancerous. With refrigerators being rare in China, most people preserve their food by fermenting or salting it. Unfortunately, the fermentation process, not always done under controlled conditions, often facilitates the contamination with harmful bacteria, such as *Helicobacter*, which then can help trigger the sequence that leads to stomach cancer. The relationship is now clear: the more fermented or highly salted foods the Chinese eat, the more likely they are to suffer from chronic stomach conditions.

The China Project, however, also suggests that even in people predisposed to liver and stomach cancer, a high intake of plant-based foods leads to fewer cases of these diseases.

Daily Food in Two Worlds

Some key differences between Chinese and Western diets and blood levels.

Variable	Chinese Average	Western Average
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NUTRIENT CONSUMPTION (in grams/day)

Total Protein	64	100
Plant Protein	60	29
Animal Protein	4	71
Starch	371	120
Fat (as % of calories)	14%	40%
Calories	2636	2360
Dietary Fiber	33	10
Calcium (mg/day)	544	1,143
Iron (mg/day)	34	18
Vitamin C (mg/day)	140	73

BLOOD LEVELS (in mg%)

Total Cholesterol	127	212
HDL Cholesterol	40	45
LDL Cholesterol	85	155

CHINA PROJECT

LUNG CANCER

The active and aggressive promotion of tobacco use in China, both by American and Chinese companies—together with China's Ministries of Agriculture and Economics, has made China the country with the most smokers in the world. As a result, the death toll from lung cancer is rising precipitously. Dr. Richard Peto has estimated that of the Chinese now alive, some 50 million will die prematurely of this disease.

Antioxidants

Considerable interest has been generated in the use of antioxidants since it was discovered that oxygen can change into an oxidant, or free radical, closely associated with the aging of organs and the functional diminishment of the immune system. Turning oxygen into a free radical can be brought about by a variety of environmental conditions, such as infections or large intakes of unsaturated fats. Since free radicals are unavoidable, it is important to minimize their damage as much as possible by being able to obtain plenty of antioxidant-rich foods, such as vegetables, fruits, and grains, which contain the

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antioxidants vitamin C and E, and beta carotene, among many others. Many of the better-known antioxidants, such as vitamin C and beta carotene, are virtually unavailable in meat or milk.

The China Project research observed that the lower the vitamin C and beta carotene intake, the higher the rate of esophageal and stomach cancer. Numerous studies have shown that these antioxidants may be protective in a variety of other cancers as well.

Recent research has consistently shown that these antioxidants are only protective when eaten in whole foods; they may not be helpful at all when taken in a supplement form. It is believed that this relates to the fact that, besides vitamins and antioxidants, plantfoods have a plethora of phytochemicals, such as *indoles*, *phenols*, and *flavonoids* that supplements do not have. “All these components probably work together as sort of a biochemical cocktail,” said Dr. Campbell. “Even if only one of its components is missing, then the desired effect may not take place.”

Osteoporosis

While calcium is vigorously pushed by the dairy industry and promoted by the medical/pharmaceutical complex to prevent brittle bones, shortened stature, and life-threatening osteoporotic fractures, the data from the *China Project* does not support this view.

Most Chinese consume very little, if any, dairy products. They ingest relatively low amounts of calcium obtained largely from eating green leafy vegetables, legumes, and grains. Even so, osteoporosis is quite uncommon in China. Hip fracture rates, for instance, are at 19% of the U.S. prevalence rate.

“Ironically,” Dr. Campbell noted, “countries with the highest rates of osteoporosis consume the most calcium and most of it comes from protein-rich dairy products. The Chinese data helps us to understand that people need less calcium than we thought, and we can get adequate amounts from vegetables. What we need to do is lower our high animal protein intake, which actually forces calcium from the bones where it is stored. Osteoporosis is probably not so much a disease of a dietary calcium deficiency as it is a disease of calcium losses due to dietary excesses.”

“The *China Project* suggests that excess intake of iron may be harmful to health!”

—T. Colin Campbell, PhD

Iron-Deficient Anemia

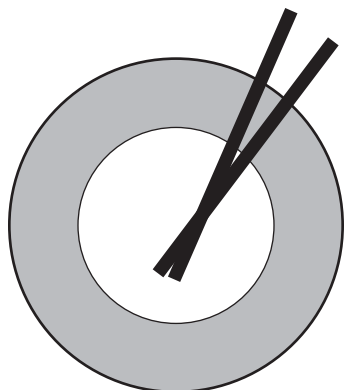
For years, the traditional Western nutritional wisdom has been to eat plenty of meat so as to have good iron levels and to prevent anemia. The results of the *China Project* do not support this idea either. While Chinese live on a plant-based diet with very little meat, they nevertheless have totally normal iron levels. Although meat is seldom eaten, iron-deficient anemia is very rare. “The average Chinese adult consumes twice the iron Americans do,” commented Dr. Campbell. “But almost all of this iron comes from plant foods. Because vitamin C is quite high in the Chinese diet, it greatly increases the bioavailability of non-heme iron. Our studies show that Americans don’t have to eat meat to prevent iron-deficient anemia.”

As a matter of fact, after careful review of the data, the *China Project* suggests that excess intake of iron, especially from meat, may be *deleterious* to health! Excess iron intake from meat apparently encourages free radical damage, which increases the risk of heart disease. Increased iron intake from vegetables, however, poses no coronary risk at all, according to a recent Harvard study.

PMS and Hot Flashes

The *China Project* found that Chinese women report far fewer symptoms of PMS and considerably fewer menopausal symptoms, such as hot flashes, than Western women. Dr. Campbell suggested the following observations, which may help to piece the puzzle together some day:

- American women tend to have higher estrogen levels than Chinese women.



- Many researchers suspect that difficulties with menopause are caused by the degree that estrogen levels *fall*. If estrogen levels are not so high to begin with, the extent of their fall will be much less, probably leading to fewer symptoms.
- Meat, chicken, and dairy products contain foreign estrogens that are fed to animals to increase weight and production, once ingested with the meats. These estrogens flow down the bloodstream to breast tissue where they may slip, like keys into keyholes, into estrogen receptors. But these little keys may be keys to trouble: they have been implicated by some scientists to promote fibrocystic breast disease as well as breast cancer.
- Diets rich in vegetables, particularly whole grains and legumes, provide magnesium and vitamin B₆. Both vitamins apparently reduce PMS symptoms.
- Many plantfoods (like soy products) contain *phytoestrogens*. One of these plant estrogens is *genistein*, which binds to estrogen receptors in the breast or endometrium “locking out” the “bad” estrogens associated with disease. In addition, these phytoestrogens provide natural and gentle source of estrogen as women’s levels drop during menopause.

CONCLUSION

Based on the emerging evidence from this study and from a massive database already in place from other research reports, very little doubt exists that the traditional rural Chinese diet is right on track, and that most diets in the Western world need a major overhaul.

Dr. Campbell, one of the co-authors of the National Academy of Sciences’ 1983 landmark report “*Diet, Nutrition and Cancer*,” which recommended eating more fruits, vegetables and whole grains, believes that the Chinese diet holds the key to unraveling many of the contradictory and confusing—if not downright incorrect notions—held today about the effect of diet on nutrition and health.

“What we’re finding out is going to upset a lot of the nutritional mythology of the West,” Dr. Campbell commented reflecting on the *China Project*. “These new findings challenge our traditional beliefs about protein, calcium, weight control, ideal cholesterol levels, dietary fiber, and vitamin requirements.”

The *China Study* also provides insight into the way Western dietary influences may affect future Chinese disease patterns. Because of this, Dr. Campbell and his Chinese colleagues have already advised Chinese policy planners and officials at the World Bank not to encourage the growth of a livestock industry. “Our data show that this is not a smart move. Hopefully, the Chinese are listening. They need to realize that animal-based agriculture is not the way to go. The *China Project* offers them the opportunity to learn from our mistakes in the West.”