Epidemiology and the Creation Health Model

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Abstract

The Creation Health Model is introduced as an incremental probability model of developing disease. The basis of the model is established from the Biblical events of Creation, Fall, and Flood. The model is predicated upon the concept of purposeful design. It is checked against emerging information from the fields of cancer epidemiology, cardiovascular epidemiology, and general medical epidemiology. It is concluded that a lifestyle consistent with the Creation Health Model reduces the probability of disease and will result in an improvement in overall individual and societal health. The model is scientifically sound and supports purposeful design and Special Creation. It helps to make health and disease understandable in a context that is problematic for molecules-to-man evolution. It may facilitate the development of predictive models of disease prevention and ultimately may assist in the development of therapeutics. Suggestions for several current-day health issues are given.

Introduction

Health is probably the most important aspect of a person's life and it is determined to a large extent by one's lifestyle choices. A healthy and correctly functioning human body is truly miraculous (Gillen et al., 2001). The complex interaction between the human body and the environment is remarkable and awe-inspiring, strongly suggesting design (Psalm 139:14). Unfortunately, as with any extremely complex system, many things can go wrong. Various degrees of dysfunction lead to disease, sickness, disability, and eventual death, which are now normal and everyday parts of life.

On a societal level, public health is crucially important. Each year there are over 700,000 cardiovascular deaths; 550,000 cancer deaths; 70,000 diabetes related deaths; and 122,000 deaths from chronic obstructive lung disease in the United States (Arias, 2003). Mortality and morbidity have enormous financial impact both in direct costs and in lack of productivity. Estimated healthcare expenditures for 2004 are $1.779 trillion and expected to rise to $3.1 trillion in 2012 (CMS, 2002). Public health is a significant economic concern in the United States.

Health and disease are vitally important from both individual and societal perspectives. Questions that arise are how does one maximize the probability of health and minimize the probability of disease and disability? Does a model of origins matter in understanding pathogenesis? Can a health model based on origins facilitate the understanding of health and disease and the development of predictive models for maximizing health? How do the Bible and modern medical science agree with respect to promoting health and minimizing the probability of disease and disability?

In this paper I define the Creation Health Model (CHM). I also investigate the correlation of the model with recent findings from modern medical epidemiology. Examples of common diseases are discussed. This paper is not intended to be a comprehensive review. Rather, I attempt in it to provide a basic framework to study health and disease from a Creationist perspective. This investigation suggests that a Creation model of origins and the CHM are consistent with modern epidemiology. The CHM offers a more comprehensive understanding of health and disease than standard molecules-to-man evolutionary theory. It can likewise assist in the development of predictive models of

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primary prevention of disease, and may ultimately assist in the development of therapeutics.

Definition of Epidemiology

Epidemiology can be defined as the study of the determinants of health and disease in a population (Gordis, 2000). Epidemiology has been used over the years to identify causes of disease, both acute and chronic. Epidemiology is a rich resource that has contributed vastly to medical science. John Snow's classic investigation of cholera and Sir Richard Doll and his colleagues' study of smoking and lung cancer are historical examples of the vitality of epidemiology (Lilienfeld, 1999). Epidemiology is a vibrant field and continues to identify causes of disease and factors that promote health (Oliveria et al., 1997).

Disease prevention is an important part of epidemiology and can be divided into primary and secondary prevention (Gordis, 2000). Primary prevention is concerned with preventing the development of a disease. The most obvious example is abstaining from cigarette smoking to prevent lung cancer. Secondary prevention attempts to detect pre-clinical conditions and intervene early in the natural history of the disease. Screening mammography for the early detection of breast cancer and screening Pap smears for the early detection of cervical cancer are examples. Primary and secondary prevention strategies are used to prevent disease or assist in the early detection of disease. Generally, these approaches are cost-effective and reduce morbidity and mortality.

The Creation Health Model

The CHM is an approach to understanding health and disease from the Scriptural perspective of Creation, Fall, and Flood. The CHM is predicated on the observation that the Earth was designed and created with purposeful intent; the "good" Creation was changed by the Fall of man; and the Flood dramatically modified the distribution of life on the Earth. The foundation for the CHM is found in Genesis 1:29–31: "And God said, 'See, I have given you every herb that yields seed which is on the face of all the earth, and every tree whose fruit yields seed; to you it shall be for food'…and it was very good" (NKJV). The tenets of CHM are:

- Life was created by the Creator with a specific design: a steady-state life where plants and animals exchanged waste products, painlessly meeting nutritional requirements. There was no pain, suffering, disease or death in the initial Creation. The initial diet was vegetarian consistent with painless existence, although painlessness was not specifically mentioned.
- The Fall of Man introduced complexities into the steady-state system including the tendency of breakdown and decay and the inevitability of disease and death. The Fall meant disease and death would become a part of life both from endogenous decay and exogenous factors such as pathogenic microorganisms. Avoidance of suffering became impossible in a fallen world.
- The Flood changed the availability and distribution of plant life that was designed to meet nutrition needs painlessly. The exact pre-Flood-post-Flood distribution of vegetation is not known. Presumably, many types of plants were lost. In addition, the distribution of vegetation was significantly changed (Wieland, 2001). Consequently, in the post-Fall world, complete vegetarian nutrition was not as simple as it had been. Meat eating was allowed and even encouraged for the priests and their families, although fat was prohibited (Leviticus 3:17). The reasons for the prohibition of fat were not given; they may have been biological, theological, or both.
- The CHM suggests the tendency to breakdown and decay, disease and death inherent in our world as a result of the Fall is potentiated by a probability that is a function of a person's lifestyle deviation from the initial design plan of Creation. The probability of health can be maximized and probability of disease, disability and suffering minimized by adhering to a lifestyle that is consistent with the purposeful design of Creation. The probabilities of health and disease are understood as variable functions increasing or decreasing in value based on deviations from that initial design. Maximizing adherence to the CHM minimizes sickness and suffering although it does not eliminate them. Certain aspects of the variable probability functions are controllable by individuals, hence, the importance of a comprehensive approach to creation, health, and disease (Table I).

Mathematical Representation of the CHM

The logic of the CHM can be delineated by the mathematical formula:

$$P(D(i)) = \alpha(i) + \beta(i) * (e_1 - e_2) = \alpha(i) + \beta(i) * E$$

where P(D(i)) is the probability of disease D(i). This equation is somewhat analogous to logistic regression equations used in epidemiologic research. Its uniqueness is in the assignment of $\alpha(i)$ and $\beta(i)$. i is an index that identifies

Table I: Tenets of The CHM and Their Significance

Event	Significance
Initial Creation	Designed to indefinitely exist in a steady-state, painless, disease-free, death-free earth. Vegetarian diet.
Fall of Man	Tendency to breakdown and decay introduced into the world. Inevitability of disease, suffering and death. Endogenous and exogenous factors involved in disease.
Flood	Availability and distribution of plant life presumably significantly changed. Dietary instructions changed. Meat eating became part of the world. Fat consumption was prohibited (Leviticus 3:17)
Health in a Post-Fall World	Probability of health and disease are functions of the deviation from the plan of the initial design of creation. Deviation is controllable to a large extent by person's lifestyle choices.

a disease. $\alpha(i)$ is a nonzero probability of disease(i) as a result of the Fall. $\alpha(i)$ represents the baseline probability of disease(i) that exists in the fallen world independent of lifestyle or personal characteristics. It corresponds to the tendency to decay in a post-Fall world.

$\beta(i)$ is a nonzero probability representing a person's unique susceptibility to disease(i). $\beta(i)$ represents an individual's unique susceptibility factors such as genetic makeup that add to the baseline risk $\alpha(i)$. Different persons have differing susceptibility to exposures and disease.

E is the total exposure defined as the amount of deviation from a lifestyle consistent with the initial design of Creation. It is composed of two other exposures: $E = (e_1 - e_2)$. e_1 is the amount of exposure to deleterious compounds such as carcinogens, tobacco smoke, infectious agents, etc. Large values of e_1 increase the chance of developing disease. e_2 represents exposure to salutary compounds such as certain phytochemicals, antioxidants, and essential nutrients. Large values of e_2 reduce the chance of developing disease. The CHM suggests a dual strategy, minimizing e_1 and maximizing e_2, is the best approach to maximize health. It is the contention of the CHM that a Creation model of origins and not an evolutionary model *determines* the essentials of e_1 and e_2. When the subscripts are omitted and E is treated as a single exposure variable E, it is understood that E is composed of two components, e_1 and e_2. The potential interactions and synergisms of e_1 and e_2 are complex but never result in an overall value of E that is zero or negative in a fallen world. E is the part of the CHM over which individuals have a large degree of control; it primarily depends upon lifestyle. For the diseases most prevalent in industrialized societies such as the United States, E may be the most important component of the equation given the inability to set $\alpha(i)$ and $\beta(i)$ equal to zero[1].

Since the Fall no person has a zero probability of disease. Even if a person adhered to a lifestyle that was absolutely consistent with initial design and had a low personal susceptibility, disease in all likelihood and death with certainty would still occur. The goal of the CHM is the minimization of E based on recognition of the good Creation and lifestyle recommendations consistent with it. As such, the CHM suggests that minimizing E will result in minimization of $P(D(i))$ for any given $\alpha(i)$ and $\beta(i)$.

CHM Recommendations

The CHM recommendations for minimizing E and maximizing health are six in number: 1) The diet should consist of natural organic foods including a wide variety of fruits, vegetables, nuts, herbs, and whole grains. Optimally, the diet should consist only of plant-based foods as in the initial Creation. The occasional consumption of fish, however, is allowable. Meat eating should be minimized or eliminated and fats avoided. All processed foods should be avoided. 2) Avoidance of tobacco. 3) Alcohol in only very moderate amounts, if at all. 4) Sexual relations within marriage only. 5) Avoidance of unnecessary risk-seeking behaviors. 6) Regular, moderate exercise. Goals 1 and 6 are strategies to maximize e_2 while goals 2 through 5 are strategies to minimize e_1.

Nutrition for creation health fitness was previously described (Anderson, 1982). These recommendations for optimal health, based on Scripture, are a reasonable approach to maximize health in our society. The CHM takes this a little further in that it recognizes what was delineated in creation health fitness but still recommends, based on probability considerations, that the diet should strive to be as consistent with the initial creation diet as much as possible.

Meat eating was introduced into the world after the Flood. The CHM in its purest sense suggests optimum health is obtained with a vegetarian diet since this is the presumed diet of the initial Creation and before the Flood. However, the CHM does not proscribe meat eating in its entirety. Scripture indicates dietary patterns changed after

[1] $\alpha(i)$ and $\beta(i)$ for sex-specific diseases such as ovarian cancer or prostate cancer are zero for the opposite sex and $\alpha(i)$ and $\beta(i)$ are zero for diseases for which there is a specific one-to-one correlation with an exposure such as alcoholic liver disease in lifelong teetotalers.

the Flood and there are many examples of meat eating in the Bible. The CHM does suggest the E in the mathematical formula of the CHM increases as more meat is consumed. Therefore, minimizing E requires minimizing or eliminating meat consumption. Even lean meat is not totally fat free and animal fat should be avoided as much as possible. For very small amounts of very lean meat, white meat is preferable to red meats and the risk benefit ratio may be favorable enough not to prohibit it. A large amount of meat consumption, however, is expected to increase E substantially and should be avoided. Non-processed meats should be the ones consumed, avoiding chemicals, hormones, and antibiotics as much as possible.

It is important to emphasize that the CHM is an incremental probability model and not all-or-none. As such, it is not inconsistent with Scripture where God declared acceptable animals for food (Leviticus 11) or Paul's admonition not to judge the diet of others (Romans 14:1–3). The initial creation was vegetarian (Stambaugh, 1991). The Fall and Flood dramatically changed the creation which now currently groans (Romans 8:22) and meat eating was allowed. Scripture does not give recommendations regarding the amount of meat consumption; however, it seems reasonable that a model respecting the initial creation and striving for consistency with it should at the very least minimize meat consumption.

Pain is another area of interest and extremely complex philosophically and theologically. Scripture does not give instructions to minimize pain with eating. It is assumed that the pre-Fall world was pain-free or if pain existed it was minor and served as a caution, preventing harm. Attaining adequate nutrition while minimizing pain is part of the CHM as it relates to consistency with the initial creation. Meat eating generally causes pain to the slaughtered animal, which has the "breath of life" in it. This is somewhat problematic, as the initial creation was pain-free. Consequently, the CHM recommends a pain-free, plant-based diet.

Avoidance of the harmful substances delineated above follows directly as the body is the temple of the Holy Spirit (1 Corinthians 6:19). Polluting the body with tobacco smoke and its carcinogens, poisoning it with large amounts of alcohol, and exposing it to sexually transmitted diseases should be avoided. Consistent with the primary prevention of disease, improved health is a direct consequence of the avoidance of harmful substances.

Problems Since the Fall and Flood

The Fall and Flood introduced disease, suffering, and a limited lifespan into the world. Genesis 6:3 indicates the maximum lifespan in this age is 120 years. The primary goal is to attain a lifespan approaching that limit with optimal health. The CHM does not suggest that adherence to the model guarantees health and longevity. Optimal health is universally problematic since the Fall and Flood. Disease and death did not exist prior to the Fall. Now they are an inevitable part of everyday life. Despite the certainty of an eventual death, a lifespan of 120 years with reasonably good health is possible because lifestyle, in industrialized society, is the primary determinant of the CHM probability function and lifestyle, to a large extent, is controllable.[2]

The tendency toward decay and dysfunction means that, even if it were totally possible to completely avoid all known harmful substances and adhere to the CHM, a baseline risk of disease would remain in a fallen world. This corresponds to non-zero $\alpha(i)$ and $\beta(i)$ in the CHM equation. Normal cellular functioning is not without error, and random mistakes occur, some of which may lead to cellular dysregulation. These malfunctions may be the pathogenic mechanism leading to atherosclerosis, cancer, and other diseases.

A plant-based diet is not without prospective difficulties. Pesticides and microorganisms are potential contaminants of fruits, vegetables, and whole grains. Cumulative pesticide exposure with agrichemicals may be problematic over the long term. Pathogenic microorganisms may cause acute infectious diseases or potentially contribute to chronic diseases. The Fall created the difficulties with the plan of plant-to-animal nutrition. Toil and labor is necessary to address these problems (Genesis 3:17–19). Proper food preparation, however, should prevent most of these problems.

An additional problem since the Flood is the possibility of nutritional deficiency with a totally plant-based diet. With the existence and availability of plants significantly changed post-Flood, attaining healthful nutrition became more difficult. For example, vitamin B12 deficiency can cause neurologic and hematologic problems and is a potential concern with a plant-based diet. Supplementation is available to correct deficiencies.

It is unknown what varieties of plants were lost after the Flood. With diligence, complete nutrition is possible with a largely plant-based diet (American Dietetic Association, 2003; McDougall 2002). Potential difficulties with nutrition may not have existed prior to the Flood and it is possible

[2] This applies to apparently healthy persons who do not have significant genetic or congenital problems. Other persons may have genetic or inherited diseases or susceptibility to disease that may be more important than lifestyle in health; i.e., the magnitude of $\beta(i)$ is large. Then $\beta(i)$ may be more important than E in the CHM probability function. This is also the result of the Fall.

many more species of plants existed. Some of these plants may have facilitated complete nutrition.

Evidence from Epidemiology

The critical question is whether modern epidemiology supports the Scripture-based CHM. If it does, the expectation for optimal health, although not perfect health in a fallen world, would be attained with a lifestyle respecting the Creator and a diet high in plant food. Consistent with this expectation, large amounts of accumulating epidemiologic research data support the conclusion that diet and lifestyle are vitally important (and probably the most important) determinants of health and disease in industrialized society. Table II briefly summarizes aspects of the two most common causes of death in the United States. They are cardiovascular disease and cancer (NCIPC, 2004). If diet is of importance in these diseases, and if it is the garden-type, plant-based diet, then the CHM and epidemiology support Creation. This is a direct expectation if Scripture is correct.

Cardiovascular disease is the nation's leading killer with over 700,000 deaths per year. Diet and smoking have been identified as critically important risk factors. Cholesterol and saturated fat intake are directly related to the risk of coronary heart disease (CHD). Other critical risk factors are blood pressure, diabetes, family history, and central adiposity.

With the exception of family history and personal genetic makeup, the other significant risk factors are directly modifiable. Dietary recommendations for a healthy heart include reducing the intake of saturated fat and increasing consumption of fruits, vegetables, and whole grains. The dietary interventions act directly by reducing the exposure to harmful compounds; i.e., saturated fat, and indirectly by reducing the risk of diabetes and assisting in weight control. The importance of diet in the prevention of coronary artery disease is clear as written by Hu and Willett (2002):

> Substantial evidence indicates that diets using nonhydrogenated unsaturated fats as the predominant form of dietary fat, whole grains as the main form of carbohydrates, an abundance of fruits and vegetables, and adequate omega-3 fatty acids can offer significant protection against CHD. Such diets, together with regular physical activity, avoidance of smoking, and maintenance of a healthy body weight may prevent the majority of cardiovascular disease in Western populations.

In the prior observation they are not merely suggesting that some coronary heart disease will be prevented, but that the majority of it is preventable. Their work is not unique in its conclusion or recommendations. Ornish et al. (1990) offer additional insight into the diet being a key component of coronary pathogenesis. The message is crystal clear: proper diet and abstinence from smoking can significantly reduce the incidence of coronary disease. It is compelling that the only diet, as part of a comprehensive lifestyle strategy, scientifically proven to reverse coronary artery disease is a vegetarian diet, which also minimizes E (Ornish et al., 1998). The evidence from cardiovascular epidemiology is consistent with the CHM.

Cancer is second only to coronary artery disease as a leading cause of death in the United States. It is estimated that there will be over 500,000 cancer deaths in the United States in 2003 (Jemal et al., 2003). Lung cancer will claim approximately 157,200 lives in 2003. There will be an estimated 57,100 colorectal cancer deaths; 40,200 breast cancer deaths; 30,000 pancreatic cancer deaths; and 28,900 prostate cancer deaths in 2003. These are the five leading causes of cancer death in the United States. Other cancers of note include non-Hodgkin's lymphoma with 23,400 deaths and the leukemias with approximately 21,900 deaths. Other organ sites contribute decreasing, yet still significant, numbers of cancer deaths. Obviously, cancer causes a significant morbidity and mortality burden for society.

There are several well-known causes of cancer. Tobacco, the most notorious, is involved in over one-third of all cancer deaths. The attributable risk of cigarette smoking for lung cancer alone approaches 90%. Smoking causes cancers of the tongue, larynx, esophagus, urinary bladder, pancreas, uterus, and leukemia. Other causes of cancer include: ultraviolet radiation, a cause of skin cancer;

Table II: The two leading causes of death in the U.S. in 2001 and E.

Disease	Estimated deaths in 2001	Major elements of E	Major dietary component
Cardiovascular disease	700,142	Family history, smoking, blood lipids, blood pressure, obesity and diabetes	Yes, the majority of cardiovascular disease can be prevented with diet and tobacco avoidance.
Cancer	553,768	Smoking, carcinogen exposure, protective effects of diet	Yes, together with tobacco avoidance, up to 80% of cancer deaths may be preventable.

ionizing radiation, a cause of leukemia and certain solid tumors; chemicals such as benzene which cause leukemia; and a variety of infectious agents that cause various cancers (Adami, 2002).

Primary prevention is the most logical and cost-effective method to reduce the risk of cancer. Primary prevention of cancer is twofold: 1) avoidance of carcinogens, and 2) dietary. For some carcinogens such as tobacco use, overexposure to the sun, and certain sexually transmitted viruses, avoidance is straightforward. For other carcinogens such as ionizing radiation and other environmental exposures including certain infectious agents, avoidance may be more difficult.

Interest in the primary prevention of cancer by diet is substantial. An increasing body of data indicates a diet high in fruits and vegetables lowers the probability of developing a wide spectrum of cancers (El-Bayoumy et al., 1997). Many studies evaluating diet and cancer have shown the risk of cancer to decrease with increasing amounts of fruits and vegetables in the diet (WCRF, 2002). Current research is identifying complex molecules in fruits and vegetables that may have a protective effect such as isothiocyanates (Thornalley, 2002). Although not every epidemiologic study conclusively supports fruits and vegetables in the reduction of cancer incidence, the majority of the data strongly suggests increasing consumption of fruits and vegetables will reduce the risk of developing cancer. Interestingly, this is true for both lifestyle related cancers, such as smoking associated lung cancer (Pillow et al., 1997), non-smoking associated lung cancer (Nyberg et al., 1998), and non-lifestyle associated cancers such as leukemia (Ross et al., 2002). This suggests that, even with carcinogen exposure, a diet rich in fruits and vegetables may offer some protection. The body appears to function more robustly with a high intake of fruits and vegetables as initially designed.

In the aggregate, the majority of cancer deaths may be avoidable. Diet alone may be responsible for up to 30% of cancers (Nasca, 2001; Mathers 1999). It is conceivable that diet (30% or more of deaths) and tobacco use (greater than 30% of deaths) combined may be responsible for at least two-thirds of all cancer deaths. A CHM, if followed, can be expected to reduce the impact of cancer mortality and morbidity substantially. The evidence from cancer epidemiology is consistent with the CHM.

Obesity is now an epidemic in the United States. It is estimated that 30.5% of Americans are obese (defined as a Body Mass Index (BMI) of 30 or greater) and 64.5% are overweight (defined as a BMI above 25) (Flegal et al., 2002). The increasing incidence and prevalence of type II diabetes mellitus is a direct result of the obesity epidemic. Complications of diabetes include nephropathy, retinopathy, neuropathy, an increase in coronary disease (Tierney, 2001), and higher incidence of cancer (Calle et al., 2003). Dietary interventions are first-line treatments for obesity. In addition to reduction in caloric intake, they involve a diet high in fruits, vegetables, and whole grains.

Most major health organizations recommend increasing fruits and vegetables in the diet. The American Heart Association, the American Cancer Society, the National Cancer Institute, the American Diabetes Association, etc., recommend increasing the intake of fruits and vegetables as primary disease prevention. A monograph produced by the American Institute of Cancer Research, which evaluated the dietary evidence for cancer prevention, generally recommends increasing fruit and vegetable consumption to reduce the incidence of many forms of cancer (WCRF, 1997). It follows directly that coronary artery disease, cancer, and obesity and its complications are to a large degree related to diet and, consequently, largely preventable. The preferred diet maximizes fruits, vegetables and whole grains that are natural, unprocessed, organic, and free of man-made pollutants.

This is not to suggest that every epidemiologic study concurs with the findings that a diet high in fruits, vegetables, and whole grains reduces the incidence of disease and mortality. Some studies show little relationship between the consumption of specific foods and the incidence of disease (Terry et al., 2001). Inconsistencies may be explained by confounding factors or methodological problems (Young-In, 2001). It is difficult to perform large-scale epidemiologic studies of diet and disease with accurate measurements of intake being potentially problematic (Van Assema et al., 2002). Nevertheless, the overwhelming preponderance of the data strongly supports a diet rich in plant products as the most healthful. The overall benefits of a plant-based diet are becoming clearer (Rajaram and Sabeté, 2000).

In the aggregate, the CHM and modern epidemiology are in agreement with respect to the primary prevention of disease: diet and lifestyle are the primary determinants of health and disease in industrialized societies. This is supported by the major health organizations. The benefits of a healthy diet are in all likelihood not limited to the common conditions discussed above (Weisburger, 2000). It is compelling that different organ systems have the *same diet* for optimal health. This is an expected observation if people were designed to live in a garden and consume plant foods (Emerson, 1996).

Some CHM Suggestions

There is a great amount of current interest in dietary approaches to health and weight control. Scientific findings

and recommendations, sometimes conflicting, seemingly change routinely. The CHM offers some dietary recommendations that appear applicable to a wide variety of health issues.

Yancy et al. (2003) have described some confusion about the optimum cardiac diet. Questions have arisen concerning the percentage of fat, protein, and carbohydrate in the preferred diet. Ornish has demonstrated that a vegetarian diet can be a vital component of a strategy to reverse coronary artery disease. The only proven diet to reverse coronary disease is a diet minimizing E, consistent with the initial creation. The CHM, as an incremental probability model, offers some guidance with respect to the best dietary approaches for optimal cardiac health: strive for a diet as consistent with the initially created diet as possible. As vegetarianism may be difficult to achieve in our society, a sensible strategy to minimize E is to maximize consumption of fruits, vegetables, and whole grains, minimize meat consumption, and avoid animal fat as much as possible.

The applicability and desirability of dietary strategies for cancer prevention are becoming more apparent. The preferred diet for cancer prevention is essentially the same diet that is recommended for cardiovascular disease prevention. As delineated above, a plant-based diet offers the greatest protection against developing cancer.

Other strategies such as chemoprevention may offer some protection against specific cancers in high-risk persons (You and Bergman, 1998). However, a diet high in fruits, vegetables, and whole grains is suggested by the CHM to be the preferred strategy for comprehensive cancer prevention in the majority of people. When diet is shown to reduce the incidence of cancer, the individual breakdown of the specific nutrients is generally not given and analysis may be difficult (Vainio, 1999). The CHM suggests that there is a balance of vital molecules in fruits and vegetables as designed by the Creator. The best approach to cancer chemoprevention may be a complete diet that includes a wide variety of complex molecules in the correct concentration available in fruits and vegetables. The correct balance of nutrients is defined by the design of fruits and vegetables and allows balance, interaction, or synergism of compounds required for maximum cancer chemoprevention. Any imbalance may preclude optimal cancer preventing molecular activities from occurring within cells. Consequently, the CHM suggests that a dietary approach which includes a wide variety of plant-based foods is the preferred method of cancer "chemoprevention."

This is not to suggest that a specific molecule may not be responsible for reduction in the incidence of a specific cancer such as selenium (Cohen 2002) or lycopene (Giovannucci and Clinton, 1998) for prostate cancer or tamoxifen for high-risk breast cancer (Fisher et al., 1998). Chemoprevention may be appropriate strategy in a highly selected person. On the other hand, studies have shown that beta-carotene supplementation in heavy smokers *increases* the incidence of lung cancer (Lippman, 2001). Chemoprevention strategies that rely totally on supplementation with a specific molecule may fall short of what is necessary to reduce overall cancer risk.

Obesity is either the number one or number two public health problem in the United States. The formula is straightforward: calories in minus calories out determines weight. The consumption of junk food and high-fat foods tips the balance in favor of calories in. Vegetables are the most nutrient dense foods. Intake of fruits instead of high-calorie snacks can be valuable in weight control. A plant-based diet can be expected to assist with weight control by increasing the intake of salutary compounds. This is not to say it is not possible to be an obese vegetarian. Fruits and whole grains have a large amount of calories. However, it does suggest that obesity is largely diet related and the public health problem will be helped by dietary interventions. Obesity is directly related to type II diabetes mellitus and the mortality from cancer is increased in the obese (Calle et al., 2003).

There is currently great interest in diets such as the Atkins diet. The CHM suggests this diet is probably not viable for the long term since it deviates from the initially-designed, plant-based diet to a large degree. There are too much fat and meat and too few fruits and vegetables. There are numerous other diets, each purporting to yield favorable results. Short-term effects may be acceptable and even desirable if weight loss is attained. The long-term effects may be problematic. In the current era of dietary confusion and sometimes conflicting recommendations, the CHM gives the most sensible answer: eat a wide variety of natural, plant-based, unprocessed foods (Tucker, 2001) as designed by the Creator. The CHM offers a viable dietary approach for the long-term, and maximizes the probability of health.

The true value of the CHM model will be determined by its ability to form a framework on which to make recommendations for maximizing the probability of health. Several suggestions are delineated above. The CHM predicts that the more one adheres to a diet rich in fruits, vegetables, nuts, seeds, and whole grains, the greater probability of health. Modern epidemiology is drawing the same conclusion. The primary difference, however, is that the CHM answers the question "why" this way: *the dependence of good health on plant life is because it was designed that way*. This is a critically important concept for understanding health and disease. It is intriguing to contemplate the CHM as a therapeutic model as well as a preventive model. Obvi-

ously, all elements of e_1 and e_2 are not known. The potential permutations, combinations, interactions, and synergisms of e_1 and e_2 are enormous. The elucidation of additional components of e_1 and e_2 requires more research, especially with respect to elements of e_2 and plant life.

Expectation for a Society Following the CHM

Significant improvement in public health can be expected for a society that adheres to the CHM. Understandably, it is not a trivial matter to adhere to the CHM. Our society consumes too much meat with fat and processed foods are ubiquitous. Tobacco and alcohol use is very common and exercise is insufficient. Dietary adherence to the CHM and avoidance of tobacco, however, can be expected to play a significant role in eliminating up to eighty percent of all cancer mortality and the majority of coronary artery disease. The vast majority of obesity and type II diabetes as well as its complications could be prevented. It is likely that other diseases are related to diet and will be positively influenced by adherence to the CHM. Reduction in alcohol use will result in less cancer, liver disease, and accidents.

The role of alcohol in coronary prevention is somewhat controversial and is not well enough substantiated to support drinking wine. The same beneficial effects can be secured from non-fermented grape products. Sexual relations within marriage eliminate the epidemic of venereal diseases. When consideration is given to all the evidences of design found throughout nature, it is not surprising to see that a health model which considers the Creator will have a significant effect on health and disease. Striving for a lifestyle consistent with the CHM appears to offer the highest probability for attaining health and preventing disease.

The CHM does not eschew medical care. Clearly, modern medicine has a lot to offer for the prevention and treatment of disease. The knowledge base and technological achievements are marvelous. Therapeutics and secondary prevention strategies have improved health substantially. The responsibility of health and the primary prevention of disease, however, rest with the individual and not the institution of medicine. Lifestyle is the most important determinant. Adherence to the CHM minimizes health problems and maximizes good health. Yet, no amount of primary prevention will prevent all sickness and disease. Adoption of the CHM by the majority of the population would significantly reduce demands on our already overburdened healthcare system.

It can be argued that elimination of current day diseases will just delay the inevitability of death and disease, essentially trading one for another. This is true to a certain extent. With the goal to maximize health, minimize morbidity, and enhance longevity, however, trading a cancer death or cardiovascular death at age 60 or 70 for a natural death at age 110 or 115 after a productive life seems prudent especially if one maintains vitality until the end. With the squaring of the morbidity curve; i.e., death is not preceded by a long period of morbidity and disability (Fries, 2003), this is not an unobtainable goal.

Plants are the Source of Important Compounds

Plants are chemical warehouses containing literally hundreds of different compounds important in homeostasis. Homeostatic compounds are necessary for cellular regulation and differentiation. Sulforaphane in broccoli, beta-carotene in carrots, and lycopene in tomatoes are some examples of compounds that have been shown to be important in cancer prevention. Plants also produce phenols, flavinoids, isothiocyanates, and indoles. In general, fruits, vegetables, and whole grains are free of cholesterol, saturated fatty acids, and trans fatty acids, which are each implicated in the pathogenesis of coronary disease. With all likelihood, there are many more compounds yet to be discovered, whose role in health is yet to be elucidated (Balentine et al., 1999). If humans developed out of a primordial slime under selective reproductive pressures, a critical reliance on plant life for optimal health makes no sense. The dependence of good health on so many of these compounds defies a cogent and sensible evolutionary explanation (Bergman, 1997).

Difficulty with an Evolutionary View

The overall evolutionary model may suggest that animals and plants coevolved and the dependency of good human health on plants is a result of such coevolution. If that is the case, then it is not clear how evolution of plants would have been directed to favor humans. Plant factors that would have been selected are those that abet plant reproduction, not factors critical for human health. In the struggle for survival, why would plants develop compounds vital for human health? The critical dependency of humans on phytochemicals is not explained by natural selection. The intellectual bankruptcy of evolution is again apparent. The only way evolution can be made to fit the observed data is by referring to the transparent and stale argument: that there were selective advantages over vast eons of evolutionary time leading to the current state. However, this really explains nothing and evolutionary theory offers no specific suggestions to improve health and reduce disease.

The data fit perfectly well with Genesis and a Creation

model, implying the CHM is a better explanation of the critical importance of plants in human health. The increasingly apparent dependence of optimum health on plant life does not prove creation and a purposeful design. The CHM does suggest the Creation model, however, rather than overall evolution. Modern epidemiology is increasingly pointing to a plant-based diet as a vital component to health, thus supporting the Bible. The CHM fits the observed data and adds further support to the many evidences of Creation. It helps refute Darwinian evolution as well.

Summary

Modern epidemiology strongly suggests that optimal health depends on a plant-based diet high in fruits, vegetables, nuts, herbs, whole grains, and avoidance of known disease causing activities. The probability of developing a variety of diseases such as coronary artery disease, cancer, and diabetes mellitus can be substantially attenuated by lifestyle choices, especially diet. These observations are not explained adequately within an evolutionary framework.

The CHM is an incremental probability model that suggests the likelihood of developing disease is a function of the lifestyle deviation from the initial plan of Creation. The CHM provides a foundation for understanding the apparent high dependence of humans on plant life for optimal health; i.e., *it was designed that way*. The CHM strongly suggests the dependency of optimal health on plant life is a direct consequence of the initial design of Creation and offers specific suggestions for maximizing primary prevention of disease and attaining a long, healthy life. Epidemiologic analysis of health and disease under a Creationist framework is supported by the data.

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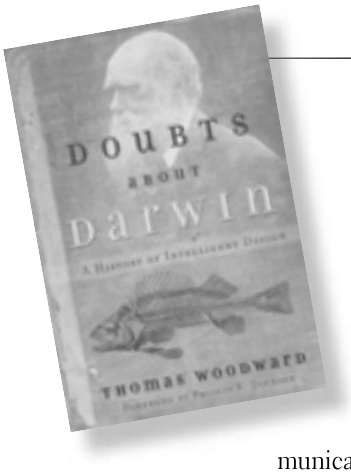

Book Review

Doubts About Darwin: A History of the Intelligent Design Movement
by Thomas Woodward
Baker Books, Grand Rapids, 2003, 303 pages, $17.00.

Thomas Woodward, a professor at Trinity College of Florida, teaches history of science, communication and systematic theology. He has produced a fascinating and comprehensive history of the Intelligent Design (ID) movement. Woodward approaches the historical analysis of the ID movement from the locus of modern communication theory. He relies heavily on Thomas Kuhn's enormously influential book, *The Structure of Scientific Revolutions* (1962) to interpret the successes of the ID movement.

Woodward begins his book with a brief introduction to the Intellectual Design movement. In the first chapter he establishes the major players in the movement and such notions as "paradigm shift." Then he presents a brief survey of the first glimmerings of dissent to the reigning Darwinian orthodoxy. Non-theist dissenters include the 1966 Wistar Institute meeting where mathematicians confronted Darwinian biologists with the improbability of evolution happening by natural selection and random mutations. Also included are the skepticism of French biologist Pierre Grasse, and Stephen Jay Gould and Nile Eldredge's introduction of punctuated equilibrium as a mechanism to shore up the inadequencies of neo-Darwinian theory. A prominent doubter was astronomer Fred Hoyle who argued vigorously concerning the bankruptcy of origin of life scenarios.

Woodward devotes a paragraph to scientific creationism (p. 35), and makes two mistakes (the dates for publication of the Genesis Flood and the founding of the Institute for Creation Research). From the outset the creation science movement is marginalized