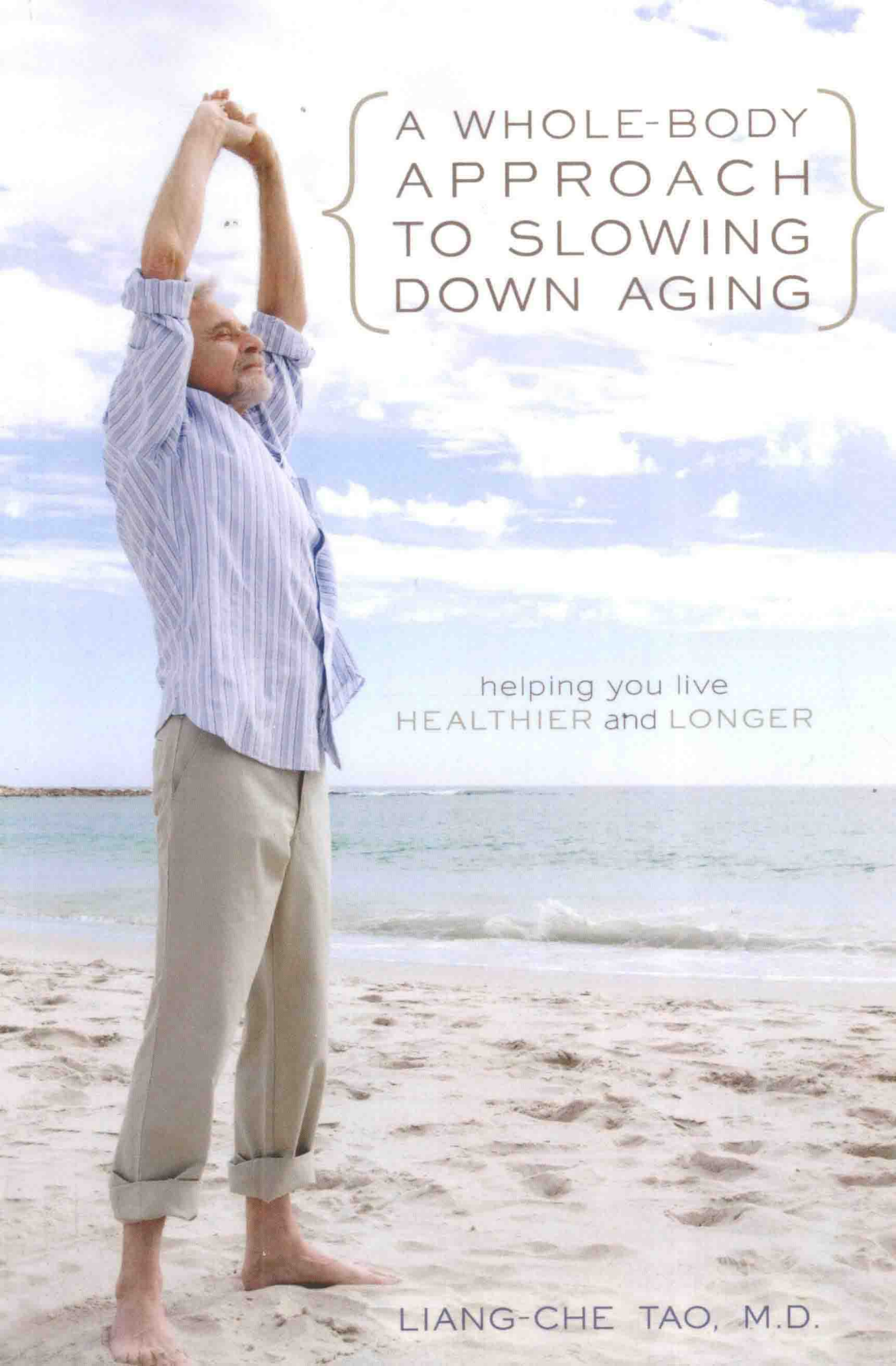
A WHOLE-BODY APPROACH TO SLOWING DOWN AGING
helping you live HEALTHIER and LONGER
LIANG-CHE TAO, M.D.

A Whole-Body Approach to Slowing Down Aging

Helping You Live Healthier and Longer

How to reduce the risks of cardiovascular disease, osteoporosis, age-related cancer, and loss of cognitive ability

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iUniverse, Inc.
Bloomington

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iUniverse
1663 Liberty Drive
Bloomington, IN 47403
www.iuniverse.com
1-800-Authors (1-800-288-4677)

ISBN: 978-1-4502-9949-7 (pbk)
ISBN: 978-1-4502-9951-0 (ebk)
ISBN: 978-1-4502-9950-3 (hbk)

Library of Congress Control Number: 2011904979

Printed in the United States of America
iUniverse rev. date: 4/8/11

A Whole-Body Approach to Slowing Down Aging

This book is dedicated to seniors everywhere who wish to reduce the risks of cardiovascular disease, osteoporosis, age-related cancer, and loss of cognitive ability

Preface

Early in the twenty-first century, there is a proliferation of articles, books, and news reports on aging. Many health programs on this topic also crowd the television airwaves. This information overload seems to bombard us with conflicting schools of thought and many seemingly unconfirmed conclusions. Many opinions are simply based on the authors' own fields of knowledge and experience. And yet aging is a very complicated process. The complexities of getting older make it difficult to pinpoint why one person ages well while another looks and acts older than his age. At least five fields of in-depth knowledge are involved in revealing the long-sought secret of slowing down aging. These include biochemistry, physiology, pathology, nutrition, and clinical medicine. Discrepancies arise when research results are based not on a synthesis of these five fields but on splintered emphasis in one or two particular fields, without sufficient consideration of others.

I studied medicine twice. My first medical degree was from Peking University Health Science Center in 1954. I then practiced in Hong Kong for a few years. When I went to Alberta, Canada, in 1964, I was required to pass the medical licensing examination in order to practice medicine there. The qualifying examinations included basic medical sciences and clinical medicine. During the ten years after I graduated from Peking University, the basic medical sciences, especially biochemistry, had changed a great deal. I decided to repeat part of my medical studies and was admitted to the University of Alberta School of Medicine. When I studied biochemistry, physiology, and pathology for the second time, I appreciated those sciences in relation to human

health much more than the first time. After I passed the medical licensing examination in Alberta, Canada, I decided to learn more about biochemistry, and I was accepted into the PhD program in biochemistry at the University of Alberta. In doing so, I stumbled upon a precious opportunity to learn advanced biochemistry, an up-and-coming field that consisted of protein biochemistry, lipid biochemistry, and nucleic acid biochemistry. Many years later, the knowledge I acquired during that time turned out to be very useful in assessing the reliability of various publications and presentations on the topic of aging.

After completing my residency training in pathology at the Toronto General Hospital and University of Toronto School of Medicine in Ontario, Canada, I gained a deeper appreciation about the body's natural defenses against diseases and its self-healing power. I wondered, *Why can't we take advantage of the body's natural protection during our senior years to prevent age-related diseases by bringing our bodies back to optimal physiological condition, including a fully functioning immune system?* Gradually, I formed my own views about an approach to slowing down the aging process.

In the 1990s, I was appointed professor of pathology, professor of radiology, and director of the cytopathology division at the Indiana University School of Medicine, in Indianapolis, Indiana. Due to a heavy workload and the pressures of directing a diagnostic clinic in the cancer center and the cytopathology division, as well as an improper lifestyle and poor eating habits, I was afflicted by numerous health problems, including hypertension, insomnia, chronic fatigue, gout, frequent episodes of cold sores and large areas of itchy rashes, constipation, severe hemorrhoids, anemia, and an old myocardial infarction (I still have an old scar in the anterior wall of my left ventricle).

After my retirement in 1999, I was relieved to not have to continue reading current professional journals in my own field, so I started to read publications on aging instead. During my retirement years, I have read over seventy aging-related books and more than one thousand

research articles in the field. At the same time, I used myself as a guinea pig, trying to improve my health and slow down aging through natural and nutritional means, according to the theory that I was gradually forming. In so doing, I developed insights based on a synthesis of five fields (biochemistry, physiology, pathology, nutrition, and clinical medicine) regarding the process of aging and how to help the body regain control over its sovereign territory. Ten years later, now in my ninth decade of life, the numerous health problems I mentioned have practically disappeared. I have now put my thoughts together. This book explains my thesis and is a summary of my theory and ten years' work on aging.

In this book, I discuss a practical approach using natural and nutritional means to slow down the aging process based on published literature and my own experience. Although aging is inevitable, some systems that I will discuss have proven to help some people slow down—and possibly even reverse to a degree—a few of the aging processes. My work regarding improving health and slowing down aging offered much greater benefits than I ever imagined, and I believe that it will be helpful information available for those who may wish to use it. In this whole-body approach, the entire body works together synergistically to keep you healthier and living longer, helping you reduce the risks of cardiovascular disease, osteoporosis, age-related cancer, and loss of cognitive ability, which we used to assume were inescapable results of aging.

My experience in transforming my health through natural and nutritional means has convinced me that disease is not an inevitable part of aging. Preventive medicine requires a multifaceted approach: proper diet with necessary supplements, regular physical and mental exercises, and changes in improper lifestyle habits. All these measures will gradually bring your body back to optimal physiological condition, with a fully functioning immune system that will put you back on the road to better health.

Contents

Chapter 1
Primary Causes of Aging

We all have a chronological age, which is time-related and involves the celebration of birthdays, and our physiological age, which reflects the rate at which we are getting older. Everyone ages at the same chronological rate, but people do not age at the same physiological rates. The rates of aging throughout the body systems vary considerably from person to person.

Aging is universal, but each of us experiences it in different ways. We are the sum of our life experiences, and the condition of the various environments throughout our life affects our health, which, in turn, affects the aging process. Aging is influenced by many factors, including genetic makeup, lifestyle, eating habits, and environmental exposure. Therefore, our calendar age has little bearing on our real, physiological age.

Scientists have begun to recognize that misplaced, unnecessary, and prolonged inflammatory response may be the common root of many chronic degenerative diseases among seniors. Every disease I studied shared a common theme: inflammation was present. Whenever I look at

a disease, everything from arthritis to heart disease, under a microscope, inflammation is always a component. Whether inflammation is simply a secondary response by the immune system or the key to the whole process of disease remains to be solved.

Genes are considered to be powerful predictors of health, susceptibility to diseases, and longevity. However, there is no question that healthy eating habits and a proper lifestyle are also powerful weapons against the susceptible genes we may be born with. Healthy living may delay many of the body changes that aging will bring. As long as no structural damage to a vital organ has occurred, it is never too late to start on the road to better health.

Primary causes of aging are summarized as follows:

1. Suboptimal Physiological Condition of the Body

For many of us, especially seniors, our bodies are no longer in optimal physiological condition due to improper lifestyle and eating habits and our increasingly toxic environment. Intracellular and extracellular tissue fluids outside of blood vessels, where most physiological functions take place, tend to gradually become acidic. The pH of the "body fluids" is traditionally believed to consistently be 7.4. In older literature, the term *body fluids* literally includes all the various kinds of fluids in the body, but in fact, this number refers primarily to the pH of the blood, which can fluctuate only slightly, from 7.35 to 7.45, due to the powerful, built-in homeostatic control mechanism by chemical buffer systems (including H_2CO_3 and $NaHCO_3$ systems, Na_2HPO_4 and NaH_2PO_4 systems, and the hemoglobin in the red blood cells). This homeostatic control mechanism in the circulating blood is extremely important; because the body cannot function properly if the pH of the blood falls below 7.35 or rises above 7.45.

When we examine sections of human tissues under a microscope with the help of special staining technique, we are able to observe a vast amount of non-circulating intracellular and extracellular tissue fluids

in the space outside of blood vessels. These chemical buffer systems, which are so effective and vigilant in the circulating blood, do not work as efficiently in these relatively stationary tissue fluids. As a result, the pH of these intracellular and extracellular tissue fluids can fluctuate a lot more, depending on our body's alkaline reserve, which is affected by the foods we eat and the lifestyle we lead.

There appears to be much confusion about what constitutes "body fluids" in the older literature, due to lack of techniques to obtain more precise measurements of the amount of fluids in specific parts of the body. Now using bioelectrical impedance analysis (BIA), we are able to accurately measure that the total amount of body fluids in a man weighing 70 kg is approximately 40 L—57 percent of the body weight. In an infant, the total amount of body fluids is around 75 percent of the body weight, but it gradually decreases from birth to old age, with most of the decrease occurring during the first ten years of life. Obesity decreases the percentage of body fluids in the body to as low as 45 percent. The total amount of body fluids in a man weighing 70 kg can be broken down into three major compartments:

(1) **Intracellular tissue** fluid amounts to 62.5 percent, or 25 L. It represents a conglomeration of fluids from all the different cells. It is not homogeneous and does not circulate.

(2) **Extracellular tissue** (or interstitial) fluid amounts to 30 percent, or 12 L. It surrounds all the various cells in the space outside of blood vessels and does not circulate.

(3) **Plasma** amounts to 7.5 percent, or 3 L. It is the fluid portion of the blood inside blood vessels and circulates continuously throughout our lives.

The amount of plasma (blood) inside of blood vessels only accounts for 7.5 percent of the total amount of the body fluids. Circulating blood supplies nutrients and oxygen to the body's cells and transports waste products away from these cells to

> keep us alive; however, the majority of physiological functions take place via enzymatic reactions in the intracellular and extracellular tissue fluids. Thus, the pH of tissue fluids, which greatly affects the efficiency of enzymatic reactions, plays an important role in maintaining one's health. Restoring acid-alkaline balance in the tissue fluids to pH 7.4 is therefore key to maintaining good health.

Restoring the acid-alkaline balance in tissue fluids to a slightly alkaline condition (pH 7.4) allows optimal physiological functions, including metabolism, tissue repair, enzymatic reactions, and immune function. Lipofuscin, a granular, orange cellular waste product, is a substance that tends to build up in aging tissues. When we look at human tissues from seniors under a microscope, lipofuscin is frequently found in liver cells, heart muscle cells, and nerve cells. If the physiological condition of our body is suboptimal, lipofuscin accumulates over time and continuously builds up, binding fat and proteins together in the cells and interfering first with cell function, then tissue function, and then organ function. However, if the body's physiological condition improves, lipofuscin buildup decreases. Researchers found a significant decrease in lipofuscin buildup following supplementation with health-promoting resveratrol.

Many major studies (including a long-range study by the European Prospective Investigation into Cancer and Nutrition that monitored 470,000 people in ten different countries, and another study by the Department of Epidemiology at Harvard University following 91,000 nurses over twelve years) found that increased risks of colon, breast, and prostate cancer were closely linked to long-standing, high consumption of red meat, refined sugar, and/or refined grains, all of which are acidifying foods. They also found that reduced red meat consumption was associated with decreased risk of colon cancer (*Journal of the National Cancer Institute*, No. 12, 2005). All these studies appear to say that high and prolonged consumption of acidifying foods increases the

acidity in the tissue fluids (even though the pH of the blood remains 7.4), resulting in the development of cancer. I will discuss this further in chapter 8.

In recent years, medical doctors have been trying to make use of the adjustment of acid-alkaline balance in the tissue fluids to correct health problems. One recent study in the *Journal of Clinical Endocrinology and Metabolism*, January 2009, by Dr. Dawson-Hughes and his colleagues is such an example. In this study, 171 healthy men and women aged fifty and older were treated with either alkaline bicarbonate or no bicarbonate. Those receiving alkaline bicarbonate, in an amount equivalent to nine servings of fruits and vegetables daily, experienced much lower levels of calcium loss in the urine, as well as a loss of N-telopeptide, the biochemical marker of bone resorption. Dr. Dawson-Hughes's team concluded that increasing the alkaline content of the diet by eating more fruits and vegetables can be used as a safe and low-cost approach to preventing osteoporosis and improving bone health in older Americans. You can discover more about this finding in chapter 7.

The natural protection against diseases and self-healing power of the human body is powerful only if the body is in optimal physiological condition, with a healthy pH of 7.4 in the tissue fluids. As a result of improper lifestyle, eating habits, and environmental changes, the tissue fluids gradually become acidic. Bacteria are often found in aging arthritic joints, arterial plaques, gums, tooth cavities, tonsils, and intestinal tracts. In fact, the mouth is the habitat of many bacteria, and there are as much as 500 million bacteria per milliliter of saliva. The presence of bacterial products, including organic acids, amines, and thiols, causes saliva to sometimes carry a foul odor. Numerous microbial species may infest us. Populations of bacteria and fungi may thrive throughout the body without causing acute disease, yet they produce copious acid waste products. Furthermore, the human body makes acid as a natural by-product of metabolism, but it produces

nothing alkaline. These factors, if they are not corrected, all contribute to the rise of acidic levels in the tissue fluids.

The proper function of the various organs is mostly carried out by enzymatic reactions that continually take place in the intracellular and extracellular tissue fluids of our body. All enzymes have an optimum pH range and can only perform their tasks correctly and efficiently in an environment with a clearly defined pH; otherwise their activity can be disrupted and even cease completely. When enzymatic activity is merely slowed down, illness appears. Following a long period of acidic tissue fluids, various physiological functions of the body, including immune function, deteriorate. The acidification of the internal terrain of our body is in fact the source of many health troubles.

2. Weakened Immune System

The human immune system, which protects our body from internal or foreign invaders, may not function properly if our body suffers from multiple nutritional deficiencies or suppression of the central nervous system due to stress, worries, and/or pressure. In order to function optimally, the immune system needs vitamins, essential minerals, essential amino acids, and essential fatty acids. People whose diets are low in certain nutrients, notably the minerals iron, selenium, magnesium, calcium, and zinc, and the vitamins A, B, C, and D, tend to have fewer and less active natural killer (NK) cells, a group of white blood cells that are the body's vital first line of defense against disease. Vitamin E maintains an adequate arsenal of T lymphocytes, virus-fighting immune cells that typically decline with age. Research also shows that vitamin D is extremely important for the immune system. It helps regulate T lymphocytes and turns on the gene that produces cathelicidin, a natural antimicrobial chemical compound that fights infection (*Future Microbiology*, November 2009).

Essential amino acids, such as lysine, tryptophan, etc., are also necessary for healthy cellular growth and immunity. However, they cannot be

produced by our bodies. The sources of essential omega-3 fatty acids, which are important components for cell membrane formation, nerve-impulse conduction, hormone production, metabolic function, brain function, and immune function, are becoming less available through food sources found in supermarkets. Omega-3 fatty acid molecules are a biochemical by-product of the happy meeting of sunlight and carbon dioxide in the chloroplasts of terrestrial plants and marine algae. The production of omega-3 fatty acids in nature has been gradually decreased by human intervention. For example, cattle are no longer grass-fed; chickens are raised in cages and stuffed full of corn; and farm-raised salmon, trout, and steelheads are fed soy pallets.

Furthermore, chronic mental stress, whether it stems from external pressure or internal perception, also impairs immunity. People who experience higher levels of stress or negative moods are more susceptible to infection, develop more severe illnesses, and take longer to heal.

In addition to mental stress, physical stress can be caused by trauma and wounds. Both mental and physical stresses can trigger the production of cortisol, a hormone that can have dire consequences for your health. When a high level of cortisol circulates in the body for long periods of time, it will raise blood glucose, elevate blood pressure, decalcify bones, destroy brain cells, and eventually damage the immune system.

Chronic alcohol abuse and smoking can also suppress immune system. Alcohol impedes the ability of white blood cells to travel to infected sites, gobble up and destroy foreign invaders, and identify dysplastic cells and malignant cells. As a result, alcoholics are more susceptible to bacterial diseases and have an increased risk of developing cancer.

3. Increased Free radical Attacks

In the 1950s, Denham Harman, professor emeritus of medicine at the University of Nebraska, identified free radicals as atoms or molecules that are missing one of their two electrons. They are unstable and will try to take another electron from any other atom or molecule in the

immediate environment. If a free radical acquires an electron from the atom or molecule next to it, then that atom or molecule may become a free radical. In turn, the new free radical attacks an atom or molecule next to it, and so on, creating a chain reaction of atoms or molecules that are desperately seeking an electron. Dr. Harman postulated that it is the damage to these molecules that leads to aging. The medical community ignored Harman's theory for some twenty years. Scientists finally found evidence of the free radical theory in the biological aging process, and it began to gain acceptance.

As mitochondria (microscopic bodies in cells containing enzymes responsible for energy production) convert nutrients into energy, they generate corrosive free radicals. Free radicals are also produced as part of many other enzymatic reactions that our body performs to sustain life. In addition, free radicals are created in very high levels throughout the body whenever there is trauma, infection, or inflammation.

Free radicals are really by-products of metabolism and act like highly reactive oxygen molecules. Every cell in our body receives an estimated 10,000 free radical hits daily. By reacting with nearby fats, proteins, and nucleic acids, free radicals give rise to many diseases. Those intracellular free radicals can attack DNA and cause cell death or mutations, resulting in precancerous dysplastic cells. Extracellular free radicals foster everything from cataracts, arthritis, and cardiovascular disease to loss of cognitive ability. In heart disease, free radicals promote the oxidation of low-density lipoprotein (LDL) cholesterol, which tends to accumulate as fatty plaques in the artery walls and may further clog or obstruct the arteries. The brain, which consists of 60 percent of fats with elevated levels of polyunsaturated fatty acids, the targets of lipid peroxidation, is uniquely vulnerable to oxidative injuries from increased free radical attacks. In nerve cells, free radical attacks dramatically cut back on the nerve cells' ability to communicate, leading to age-related cognitive decline (see chapter 9).