Preface

As a physician, I have witnessed the horrors of Alzheimer's countless times. The disease killed my mother and three of her four siblings. Watching my patients and loved ones slip into confusion and forgetfulness is dreadful—the mental memory slates of their minds gradually and systematically wiped clean, including even their own identities. Perhaps more frightening is their inability to care for themselves and protect themselves from danger.

My mother, Elizabeth Foote-Smith, was an intelligent and accomplished woman—a college professor, author, researcher, musician, and artist. But despite her exceptional brain, Mom ended up completely demented—slumped in a wheelchair in a nursing home, her brain riddled with damage—incapable of understanding who or where she was. No words can express how sad this is. I believe that if we knew twenty years ago what we know today, her Alzheimer's probably could have been prevented.

Mom maintained an enviable level of physical and cognitive health through her seventies and early eighties, writing books and research papers, maintaining an active social life, managing a household with two dogs, and exercising every day. Mom was always feisty, but as she moved into her mideighties, she became withdrawn, irritable, paranoid, cantankerous, and argumentative; she'd quibble over trivialities. She started misplacing things and forgetting names.

Searching for answers, I turned to the dementia literature. After all, about a hundred years had passed since Alois Alzheimer, MD, published the first accounts of the disease named after him, billions of research dollars had been spent, and thousands of researchers had

generated tens of thousands of papers—so I figured I'd find some ideas that might help. I figured wrong. To my astonishment and disappointment, the literature pointed to no medication, no treatment of any kind, that could favorably impact the course of my mother's disease or even relieve her symptoms, and she slowly declined.

In the last few months of her life, Mom did not know who or where she was. She couldn't identify people or objects. One day I took her for a ride out to the beach at Bodega Bay, and when we got back, I asked her if she knew where we had been. She shook her head.

I once rolled her wheelchair over to the piano. Four years earlier she had done performances of Rachmaninoff and Beethoven for family and friends and could discuss the deeper meaning of classical music; now she stared blankly at the keyboard, unable to play a single note, unable to even remember what the piano was for.

One morning, a nurse's aide got Mom out of bed and into her wheelchair and pushed her down the hall, dropping her off in front of the nurses' station so they could keep an eye on her. The aide neglected to fasten Mom's seatbelt, but no one noticed this seemingly innocuous error. Unable to remember that she couldn't stand or walk, Mom tried to get out of the wheelchair. She fell and fractured her femur (thigh bone). She was writhing on the floor in agonizing pain. Fortunately, a nurse saw her fall, knew the femur was fractured, and quickly gave Mom a morphine shot.

Mom was moved to a nearby hospital. She never regained consciousness. She died ten days later.

That was seventeen years ago. If Mom went into cognitive decline today, we would deploy the wealth of tools I discuss in this book. We'd diagnose the causes of her brain disease and reverse them. Her prognosis would be exceptionally good.

In the last seventeen years, our scientific understanding of how the brain works has seen exponential growth. We discovered that our brains possess the fantastic ability to grow new neurons from stem cells as needed and can rapidly change their structure and function in response

to environment and experience. We also now realize that Alzheimer's disease is caused by multiple metabolic disruptions. Although this new understanding of Alzheimer's came too late for my mother, it has catapulted us into a dramatically different mind-set. It has become compellingly clear that in each patient we must identify and repair the unique biochemical malfunctions that are causing the disease.

I hope you find this book useful. If it helps you and your loved ones, I am certain that this would have made my mother very happy.

CHAPTER 1

What Is Alzheimer's Disease?

Alzheimer's disease is memory loss, but it's not just the inability to recall a phone number or a name. It is forgetting on a more profound level; it's losing access to the memories necessary to live a normal life.

All of us occasionally lose keys or forget names, dates, and places. We usually remember them later. Alzheimer's patients forget more often and don't remember later.

Alzheimer's patients often have language problems. They may not be able to find the correct word, or they may forget simple words and replace them with inappropriate or even incomprehensible words.

They may become disoriented. Even on a short trip in a familiar town they may ask, "Where are we going. What are we doing?"

Personality change is common in Alzheimer's patients, and it's often tinged with suspicion, confusion, or fearfulness.

Judgment is often compromised. For example, Alzheimer's patients may dress inappropriately or forget to complete necessary tasks.

Loss of initiative is common. We all get tired of the daily grind of work and social obligations, but we get over it and carry on. Alzheimer's patients become passive and detached, requiring prompting or cues to get involved.

They have problems with abstract thinking, which can translate into trouble keeping track of a checking account or dialing the wrong sequence of numbers on a phone.

We all have mood swings, but people with Alzheimer's can have rapid or wide mood swings for little or no reason. They may react inappropriately emotionally, such as suddenly becoming extremely sad over a long-lost relative.

They will misplace things. Putting away groceries properly can be a great test for this. (The ice cream should not end up on the back porch.)

In a very real sense, our memories are who we are. With Alzheimer's, these fade or disappear altogether, and with them, a sense of self—not knowing who, what, or where you are or not knowing what to do because the continuity of doing things requires lots of memory.

CONFUSING TERMS

Alzheimer's disease (AD) is used two different ways. To neurologists and neuroscience researchers, the term refers to a specific diagnosis of a type of dementia characterized by amyloid beta plaques and neurofibrillary tangles.

The term is also used by laypeople in everyday conversation as a synonym for dementia to describe any type of memory loss. This colloquial, though technically inaccurate, usage could refer to mild cognitive decline, Alzheimer's disease, or other types of dementia.

In this book, I'll try to keep things simple by using the term *Alzheimer's disease* in the common, broader sense to refer to any and all dementias.

ABOUT DEMENTIA

Dementia is not a specific disease. The term describes a wide range of symptoms associated with a decline in memory or other thinking skills, severe enough to compromise one's ability to perform everyday activities.

Dementia always starts with mild cognitive impairment (MCI) and is usually, but not always, accompanied by memory loss. MCI might or might not progress to dementia and might or might not become Alzheimer's. Either way, detected and treated early, it is reversible.

No single test can determine whether someone has Alzheimer's or dementia. Doctors diagnose dementia based on a careful medical history, a physical examination, laboratory tests, imaging, and a mental status exam focused on changes in thinking, day-to-day function, and behavior.

The problem of diagnosis is compounded by the fact that definitively diagnosing Alzheimer's disease in a living person is impossible. That requires an autopsy and a microscopic examination of brain tissue. When referring to living patients, only specialists can authoritatively diagnose Alzheimer's disease, and even specialists will be wrong some of the time. Though advanced imaging techniques have improved diagnostic accuracy, autopsy remains the gold standard for diagnosis.

A diagnosis of dementia, on the other hand, can be made on the basis of symptoms alone (in a living patient, without an autopsy). If someone has significant memory problems, most likely that person is demented.

SOME SOBERING STATISTICS

The Alzheimer's Association estimates that one in three persons alive today in the United States will die with dementia.[1] Every 67 seconds, someone in the United States develops Alzheimer's disease. Fourteen percent of Americans over the age of seventy-one have some form of dementia, and over 5 million Americans now have Alzheimer's disease. The estimated proportion of the general population aged sixty and over with dementia at a given time is 5 to 8 percent. More than one hundred thousand Americans die of Alzheimer's each year.[2]

The economic impact is huge: $818 billion a year in the United States alone.[3] Nearly 16 million unpaid caregivers provide some 18.4 billion hours of care, worth an estimated $238 billion, according to the Alzheimer's Association.[4]

Dementia is a worldwide public health disaster: nearly 44 million people are living with Alzheimer's disease or dementia. Every three

seconds, someone in the world is diagnosed with dementia, and every year, there are nearly 10 million new cases. The World Health Organization estimates that the total number of people with dementia will reach 82 million in 2030 and 152 million in 2050.

Until recently, Alzheimer's had been considered the sixth most common cause of death, but Alzheimer's deaths have been underreported. Some people with the disease never receive a diagnosis. Many others have dementia-related conditions, such as aspiration pneumonia, listed as the primary cause of death, while the underlying cause, Alzheimer's, is not reported. Studies funded by the National Institute on Aging have shown that the number of deaths due to Alzheimer's disease in people seventy-five and older could be six times higher than the official count. This would make it the *third leading cause of death*, behind heart disease and cancer.[5] A related study by Jennifer Weuve and colleagues at Rush University Medical Center in Chicago found that 32 percent of deaths in persons sixty-five years or older were due to AD and projected that by 2050, this number will rise to 43 percent, or 1.6 million deaths.[6]

What's more, the brain changes that lead to Alzheimer's may begin twenty years or more before symptoms appear.[7]

The human toll of AD is not reflected in these mind-boggling numbers. For example, caregivers experience overwhelming stress and require support from medical, social, financial, and legal systems. People with dementia and their families are frequently discriminated against and denied basic rights and freedoms available to others. Often physical and chemical restraints are used in age care facilities and acute care settings. Increased awareness will reduce discrimination and improve the quality of life for people with dementia, as well as their families.

Addressing dementia is a public health necessity. Interventions aimed at improving the quality of life for people with dementia by reducing the modifiable risk factors outlined in this book should be instituted at a local level in clinics and healthcare settings.

This book will show you how to determine the causes of dementia and apply effective treatments to modifiable risk factors. Addressing them works.

A NEW WAY TO DIAGNOSE AND TREAT ALZHEIMER'S DISEASE AND A NEW LANGUAGE EMPHASIZING CAUSALITY

The remainder of this chapter outlines current mainstream concepts used to describe and diagnose Alzheimer's disease and dementia. A major goal of this book, however, is to present a new and very different way of defining Alzheimer's disease. Breakthroughs in understanding the causes of dementia—the molecular biological underpinnings—are shifting our attention away from the *effects* of the disease (symptoms, signs, plaques and tangles, and atrophy) and redirecting the spotlight onto *causality*. Each individual case of Alzheimer's disease, we now know, represents a combination of several possible causes. Patient A might have low vitamin D, elevated homocysteine, high blood sugar, and sleep apnea. Patient B might have a disrupted gut microbiome, high blood pressure, lacunar strokes, mercury exposure, and hypothyroidism. Patient C might have a different biochemical landscape with similarities and differences. Figuring out each patient's unique combination of causes is achieved through molecular biomarker testing, which we use to generate an individual biochemical profile.

Defining the biochemical changes that cause the disease empowers corrective action in the form of treatments that alter the course of the disease. We can lower homocysteine and blood pressure, fix hypothyroidism, lower high blood sugar, supplement vitamin D, and remove sources of cadmium, lead, and mercury. The earlier we make this causative diagnosis and implement corrective therapies, the greater the chance of reversal.

The odds of any healthy person getting Alzheimer's is one in three. If your brain is working fine and you want to keep it that way, do the testing to determine your areas of vulnerability, and then treat them

preventively. By adopting a preventive lifestyle, you can dramatically reduce the probability of developing the disease.

Now that we can identify and correct the multiple metabolic factors that cause Alzheimer's, clinicians will need to integrate this new information into clinical practice. For many, this will be akin to learning a new language. I hope that doctors and patients alike will find this book useful in easing that transition.

DIAGNOSING DEMENTIA

Dementia is a symptom complex (again, it's *not* a specific disease) characterized by cognitive dysfunction, memory loss, personality changes, and impaired reasoning. Dementia is commonly seen across a wide spectrum of neurodegenerative diseases of which Alzheimer's disease and vascular dementia are by far the most common.

The Handbook of Alzheimer's Disease and Other Dementias—an encyclopedic reference work written by specialists for physicians and other health professionals—defines dementia as a "syndrome of acquired persistent intellectual impairments characterized by deterioration in at least three of the following domains: memory, language, visuospatial skills, personality or behavior, and manipulation of acquired knowledge (including executive function)."[8]

The symptoms of dementia can be grouped into four main categories:

- *Cognitive symptoms* include memory loss, mental decline, confusion, disorientation, language problems, inability to speak or understand, making things up, and inability to recognize common objects.
- *Behavioral symptoms* include irritability, restlessness, lack of restraint, wandering and getting lost, and falling.
- *Psychological changes* include personality changes, anxiety, depression, mood swings, loneliness, hallucinations, and paranoia.
- *Musculoskeletal symptoms* include inability to coordinate muscle movements, unsteady walking, and jumbled speech.

Assessing Levels of Cognitive Functioning

Cognitive testing determines the presence and extent of cognitive decline. If you suspect cognitive decline, performing baseline testing is helpful as it will (1) determine whether your cognition is compromised and (2) provide a basis for comparison down the road to determine whether your program is working.

(Don't confuse cognitive/mental status testing with metabolic marker testing. Cognitive testing is a way to determine whether a loss in brain function has occurred; it in no way identifies or addresses possible causes. Metabolic marker testing, on the other hand, identifies the causes of the damage and provides the road map to treatment.)

Mental status testing evaluates memory, ability to solve simple problems, and other thinking skills. Such tests give an overall sense of whether a person is aware of his or her symptoms; knows the date, time, and where he or she is; and can remember a short list of words, follow instructions, and do simple calculations.

The Mini-Mental State Examination (MMSE) and the Mini-Cog test are two commonly used assessments.

The MMSE (also known as the Folstein test) is a thirty-point questionnaire designed to test a range of everyday mental skills. It is used extensively in clinical and research settings to evaluate the severity and progression of cognitive impairment and to follow cognitive changes over time.[9]

The Mini-Cog is an assessment in which a health professional asks the patient to complete two tasks: (1) remember and a few minutes later repeat the names of three common objects and (2) draw a face of a clock showing all twelve numbers in the right places and a time specified by the examiner.[10]

Types of Dementia

Alzheimer's disease, a specific type of dementia, is defined as a progressive neurodegenerative disorder displaying two classical hallmark

pathologies: extracellular (outside the neurons) amyloid beta plaques and intraneuronal (inside nerve cells) neurofibrillary tangles. Again, a corpse, biopsy, and microscope are required.

Vascular dementia (VaD) is loss of cognitive function due to atherosclerotic damage to brain blood vessels that blocks the flow of blood. This obstruction may develop gradually or suddenly. Uncontrolled hypertension is *by far* the single leading cause of blood vessel damage, stroke, and dementia.

A lacunar stroke is a specific type of stroke that occurs when blood flow is blocked to one of the small arterial vessels that lie just beneath the outer cerebral cortex. Lacunar strokes are the most common cause of vascular dementia, and about one-fifth of all strokes are this type. The most common cause of lacunar strokes is chronic high blood pressure. (Read the story of my lacunar strokes in chapters 7 and 10.) The cumulative damage caused by repeated lacunar strokes leads to dementia. (For an in-depth discussion of VaD, see chapter 7.)

Mixed dementia is the simultaneous coexistence of more than one type of dementia. Though mixed dementia may include any combination of types, over 90 percent of patients have the mixed AD/VaD type.

Because both AD and VaD cause the same symptoms, it is usually impossible to differentiate between the two in living patients. Nor is it possible, in any given patient, to determine how much of his or her dementia is caused by Alzheimer's and how much is caused by vascular dementia. A definitive diagnosis is possible only on autopsy. Pure AD (AD without the vascular component) is rare.

Less common dementias include the following:

- Dementia from Parkinson's disease and similar disorders
- Lewy body dementia
- Frontotemporal dementia (Pick's disease)
- Creutzfeldt-Jakob disease
- Dementia caused by
    - Drug interactions

- Infection
- Brain tumors
- Depression

Advanced Disease

Though it selectively attacks specific memory areas in the hippocampus, Alzheimer's also changes the entire brain, causing nerve cell death and tissue loss throughout. Over time, the brain dramatically shrinks, and nearly all its functions are compromised.

As dementia gradually progresses, memory loss is increasingly accompanied by impaired judgment, personality changes, loss of concentration, confusion, disorientation, restlessness, irritability, inability to communicate, forgetfulness, and inattention to personal hygiene. These conditions worsen until patients are no longer able to read, write, speak, take care of themselves, recognize loved ones, or even swallow and walk. Survival after onset of symptoms is usually five to ten years but can be as long as twenty years.

In advanced Alzheimer's disease, massive cell loss shrivels the outer cortex, damaging areas involved in thinking, planning, and remembering. Shrinkage (atrophy) is especially severe in the hippocampus, the area of the cortex that plays a key role in formation of new memories (fig. 1.1).

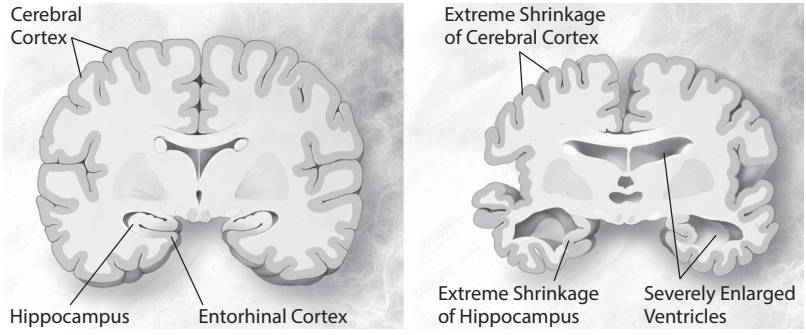

Figure 1.1. Brains with and without Alzheimer's disease

Under a microscope, tissue from an Alzheimer's patient's brain reveals devastating changes. It has many fewer nerve cells and synapses than tissue from a healthy brain. Clumps of amyloid beta plaque have accumulated in the tissue between nerve cells. These disrupt normal nerve cell functioning by blocking cell-to-cell synaptic signaling. These amyloid clumps also cause a local inflammatory reaction and activation of immune system cells that gobble up disabled nerve cells. When we focus our microscope on the insides of the sick, dying, and dead nerve cells, we also spot neurofibrillary tangles—twisted strands of tau protein.

IF MILD COGNITIVE IMPAIRMENT APPEARS, IT IS TIME TO TEST

Forgetfulness and memory delays are often part of the normal aging process. We all slow down as we get older, and we sometimes need more time to learn a new fact or remember an old one.

Between "normal," age-related memory loss and true dementia lies a condition called mild cognitive impairment. Individuals with MCI have persistent memory problems—for example, difficulty remembering names and following conversations or marked forgetfulness. Symptoms of MCI may also include depression, irritability, anxiety, and even aggressive or apathetic behavior. MCI patients generally have normal reasoning skills, judgment, and perception. Many individuals who develop MCI will never progress to dementia, but some will—and in the early stages it is not possible to determine who will go on to develop full-blown dementia.

Until very recently, we could not determine whether those earliest signs of a failing memory were a part of normal aging or the first symptoms of a dread disease. We could not treat the memory loss, so we could do nothing in the mild cognitive impairment stage but wait and see whether it was the beginning of dementia.

That has all changed. Now that cognitive decline and AD have been linked to abnormalities of specific biomarkers that can be identified

and reversed, we are no longer at the mercy of fate—or even of our DNA. We can protect our brains from the ravages of both MCI and AD by getting tested and addressing those abnormal markers. Lowering our elevated blood sugar or cholesterol, getting our sleep apnea and hypertension under control, making sure we get daily exercise, taking vitamin D if needed, avoiding neurotoxic exposures, eating dementia-preventive foods, and taking nutritional medicine supplements that reverse dementia will prevent and reverse these causative disease processes.

WHAT TO DO IF YOU SUSPECT DEMENTIA

If friends and family have told you that they notice increasing memory loss that interferes with your daily activities, work productivity, and social interactions, it's time to seek professional help. The first step would be to consult your family doctor or healthcare provider for an evaluation—and, if necessary, a referral to a neurologist for diagnostic assistance and to rule out causes of dementia best treated via conventional medicine, such as stroke, drug interactions, infection, brain tumor, depression, and Parkinson's disease.

If the diagnosis is AD, VaD, or MCI, however, a conventional neurologist might be a poor choice for *treatment* because the mainstream approach to dementia is therapeutically bankrupt. To put it bluntly: no conventional treatment works.

What's more, the current mainstream medicine neurology system will fail to appreciate and diagnose—or even understand—the true causative elements. Neurologists are typically not trained in the metabolic approach and will prescribe only conventional drug therapy, which is ineffective because it fails to address the multiple causative metabolic imbalances that are the driving force behind the disease. Drugs merely suppress the symptoms and are only marginally effective at that. You want to stop and reverse the course of the disease, if possible, and no pharmaceutical agent can do that. Dementia is a progressive disease, so don't waste valuable time trying drugs when you could have been addressing causes. The proactive multimodality

approach, which identifies and addresses causative factors, makes a lot more sense.

MCI is reversible using the methods outlined in this book, but as the disease progresses, it becomes more entrenched and increasingly resistant to treatment. To increase the probability of successful reversal, the best approach is to assume that all significant memory problems are early signs of dementia and begin the diagnostic and treatment process as soon as possible. Find a physician who understands that symptom suppression does not work and wants to focus on reversal by addressing the underlying causes, using the program outlined in this book.

CHAPTER 2

How to Prevent and Reverse Alzheimer's

This book describes a new theoretical framework for understanding Alzheimer's disease. The therapeutic system based on this framework is the first ever to successfully reverse the disease. It is based on the most up-to-date peer-reviewed published scientific research. It applies mainstream, alternative, complementary, functional, and naturopathic medical models.

Alternative means finding biocompatible treatments that bypass the drugs and surgery of mainstream medicine. *Complementary* means integrating mainstream and alternative approaches, using the best of both. *Functional* means identifying and addressing known biochemical and metabolic causes of disease rather than treating the symptoms. *Naturopathic* means encouraging the body's ability to heal, using foods and nondrug medicines whenever possible.

Nontoxic, nondrug, bioidentical, biocompatible therapies restore metabolic harmony and gently nourish the brain back to health. These include dietary changes, brain-nourishing foods, a daily exercise program, toxin avoidance, and nutritional medicines, including vitamins, minerals, herbs, essential fatty acids, phytonutrients, and bioidentical hormones.

Although drugs have their place in medicine, they should be used not as a first choice but as a last resort.

A NEW WAY TO DIAGNOSE DEMENTIA

I am a big fan of the microscope. As a medical student I spent hundreds of hours peering into a magical world of untold complexity. But a microscope can take you down to the cellular level only; it is unable to reveal the molecular world of activity unfolding inside each cell. Every human cell has a biochemical complexity rivaling that of a large city, almost none of which can be seen by looking through a microscope. Viewing a cell through a microscope is like looking at New York City from the moon: you know a lot is happening down there, but almost none of it is visible.

The metabolic dysfunctions that cause dementia transpire at the molecular level. Solving the riddle of dementia requires that we shift our focus to the deeper, submicroscopic realms of molecular biology where the changes that lead to neurodegenerative disease occur. To be able to see what is happening (and what is going wrong) at that level, we need to blow it up, and we do that by examining the kinds of chemical molecules that are present. This is a challenging task because hundreds of thousands of different kinds of molecules exist, and they are constantly moving and changing. Biomarker testing, however, provides a powerful tool that allows us to sort through the possibilities and identify the abnormalities that are causing neurodegeneration.

MULTIPLE SYSTEMS, MULTIPLE CAUSES

The symptoms we see in dementia patients—diminished cognition, memory defects, emotional changes, and behavioral problems—are classic signs of central nervous system (CNS) malfunction, so we could easily assume that the pathology that causes dementia originates in the CNS. That would be a mistake.

Even though the CNS is the window through which we view the symptoms, the actual causes of dementia usually originate outside the CNS—most commonly in the vascular, immune, endocrine, and gastrointestinal (GI) systems. Those causes include nutritional deficiencies,

hormonal disruptions, blood sugar regulating abnormalities, atherosclerotic changes, hypertension, toxic exposures, inflammatory reactions, sleep disturbances, gut microbiome disruption, gut wall (intestinal mucosal) inflammatory damage, intestinal absorption issues, autoimmune reactions, inappropriate diet, and insufficient exercise (fig. 2.1). Though they originate elsewhere, these metabolic disruptions undermine the harmonious functioning of nerve cells, causing neurodegenerative disease.

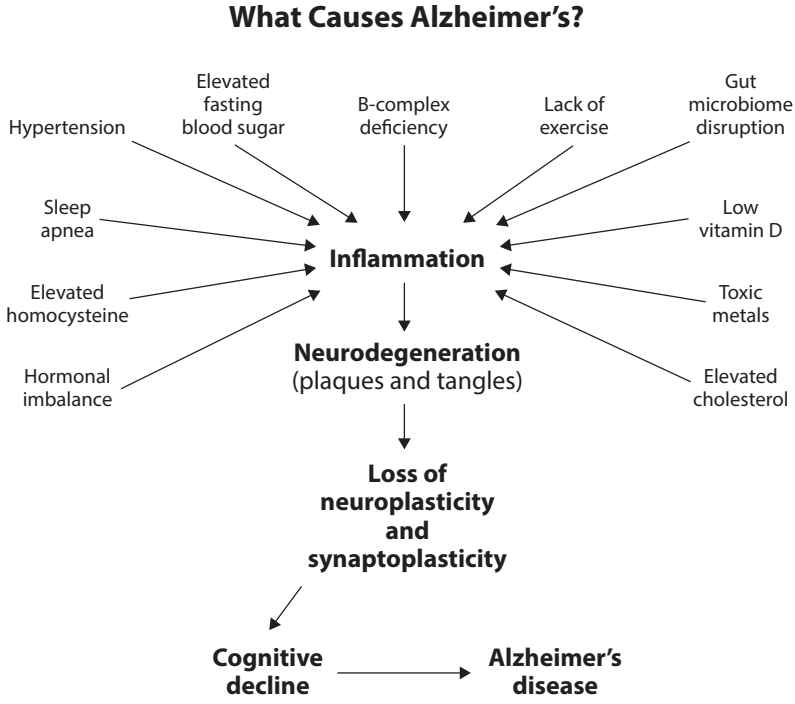

Figure 2.1. Addressing the causes of Alzheimer's

To initiate reversal of Alzheimer's, we must first identify these derangements using Alzheimer's metabolic biomarker testing, which provides a unique profile—a biochemical landscape that serves as a guide to the deep causes of neurodegeneration. An abnormal result

on an AD biomarker test reveals that the changes leading to AD are underway and pinpoints exactly where, in the amazingly complex metabolic network of bodily systems, the malfunction is located. Abnormal results also guide us directly to specific and effective treatment options.

Testing reveals which molecular systems are malfunctioning and allows us to identify the changes that are leading toward dementia. Using this information, we can easily generate a treatment program that addresses each causative factor (i.e., each abnormal lab value). For example, if your vitamin D is low, you'll know you need to take a D supplement. If your thyroid hormone level is low, that needs to be balanced. If your homocysteine is high, you will need to supplement your diet with B-complex vitamins. If a polysomnogram reveals sleep apnea, you'll need to use a CPAP (continuous positive air pressure) machine. If hair analysis shows a high mercury level, you'll know to stop eating fish and have amalgam fillings removed. If your blood pressure, blood sugar, or cholesterol are elevated, those need to be fixed.

For each marker, I have written a chapter explaining why it is important, how the testing works, what the results mean, and how to fix them if they're out of balance (see chapters 10–19). Once your treatment program has been in place for a few months, retesting is necessary to determine whether the program is working to reverse the neurodegenerative metabolic disruptions.

Metabolic testing provides a comprehensive picture that is useful whether a person already has symptoms of cognitive decline or simply wants to learn which areas are vulnerable.

THE AD BIOMARKERS

Here are the tests that identify the specific causes of Alzheimer's and neurodegenerative disease:

- Blood pressure
- Fasting blood sugar
- Cholesterol

- Homocysteine, vitamin B12, and folic acid
- Vitamin D
- Polysomnogram (to diagnose sleep apnea)
- Gut microbiome assessment
- Thyroid
- Hair analysis for toxic metals (mercury, lead, aluminum, and cadmium)
- Ferritin (to detect excess iron)
- Sex steroid hormones (estrogen, progesterone, testosterone, and DHEA-S [dehydroepiandrosterone sulfate])

Once testing has identified the "broken" metabolic systems, the next step is implementation of your treatment program to restore metabolic harmony, reverse the abnormal markers, repair the damaged neurons, and get them up and running again. Then you can take it to the next level by learning how to reprogram your brain for neurogenesis: a surge in the growth of new healthy brain cells (see chapter 8).

START NOW!

It is impossible to overemphasize the importance of early preventive action. The early changes that lead to dementia begin decades before overt symptoms appear. The earlier these are addressed, the greater your protection from eventual cognitive decline. These changes can be easily identified using biomarker testing, and—once again, if detected early—the disease can be reversed with simple diet and supplement changes. Know your markers! Manage them.

CHAPTER 3

How We Would Treat Mom's Alzheimer's Today

My mom epitomizes the kind of person this book would have helped, had this information been available twenty years ago when she began showing signs of cognitive decline. This chapter looks at how we would have treated Elizabeth if we had known then what we know today.

ADDRESSING AD *AND* VaD

Vascular dementia and Alzheimer's disease are the two most common types of dementia. In AD, the dementia is caused by a breakdown of *nerve cells* and brain tissue. VaD, on the other hand, usually results from high blood pressure that damages the *blood vessels* that supply the brain. This, in turn, damages downstream nerve cells.

Brain blood vessel disease is rampant in older adults, and with it comes the risk of Alzheimer's disease. MRI studies reveal that 63 percent of people over sixty have multiple white matter hyperintensities—evidence of a previous lacunar stroke. That number goes up to 96 percent in people over eighty.[1]

In any given patient, vascular dementia and Alzheimer's almost always coexist. Over 90 percent of people diagnosed with Alzheimer's suffer from both VaD and AD. Since VaD and AD cause more or less the same symptoms, they are clinically indistinguishable in living patients.[2] Mom, like most people, had both.

We now know that the vascular portion of the dementia damage equation virtually always involves abnormalities in one or more of the four vascular markers: blood pressure, blood sugar, cholesterol, and homocysteine. This is important information because these abnormalities are all treatable and reversible, and spotting them early tells us what needs to be fixed to prevent brain damage. With proper attention to the vascular markers, we can alter how genes are expressed and alter the course of the disease. In Mom—as in all dementia patients—the VaD component would have been eminently treatable.

First, I'll focus on the four main vascular markers. Then I'll go on to discuss each of the other markers.

BLOOD PRESSURE

Twenty years ago, doctors had not yet connected the dots between high blood pressure and dementia. Now we know that any elevation of blood pressure increases the risk of dementia, so I would have made certain that Elizabeth's elevated blood pressure was aggressively tracked and treated. (Normal blood pressure is 120/80 or less; pressures above 130/85 are cause for concern and must be lowered.)

The importance of blood pressure control cannot be overemphasized. Even slight blood pressure elevations can damage the brain, causing VaD. Also known as multi-infarct dementia, vascular dementia can be stopped and reversed only if the high blood pressure that causes it is caught early, treated aggressively, and normalized.

The pounding from Elizabeth's long-term elevated blood pressure damaged the blood vessels in her brain. The cumulative damage from untreated hypertension coupled with multiple small strokes played a major role in Elizabeth's death. (See chapter 10 for more about blood pressure and dementia.)

BLOOD SUGAR

Fasting blood sugar (FBS) had been tested in Elizabeth, but twenty years ago, we didn't know that even minimal increases over normal

(anything over 90 milligrams per deciliter [mg/dL]) indicated damage to her blood-sugar-regulating systems. This damage posed a danger to her brain. Elizabeth's FBS ran in the mid- to high 90s (numbers routinely dismissed as normal back then). We didn't know it, but she was at significant risk of diminished cognition, stroke, memory problems, hippocampal (memory center) damage, brain atrophy, and dementia. (See chapter 11 for more details.)

Today, we would bring down Elizabeth's blood sugar by putting her on a very low-carbohydrate ketogenic diet, eliminating all grains and sugars, and having her do as much exercise as possible given her age and health.

We would include lots of high-polyphenol foods. These compounds help the body regulate blood sugar—for example, blueberries, cherries, raspberries, blackberries, pomegranate, grapes, green tea, nuts, curcumin, cabbage, eggplant, greens, onions, garlic, and olives. (See chapters 20, 24, 25, 26, 29, and 30 and appendix 2 for other choices.)

CHOLESTEROL

We would make sure Elizabeth's cholesterol and lipids were normal. Mom's cholesterol ran around 220–230 mg/dL. Back then, we thought this was a little high, but since her diet was excellent and her heart was fine, we didn't worry much about it. The research is now very clear, however: a cholesterol number over 200 increases the risk of strokes and dementia.[3] With the wisdom of hindsight—and more definitive research—it is easy to see that her high cholesterol, coupled with her modestly elevated blood pressure and blood sugar, played a significant role in accelerating the progression of her Alzheimer's. We should have gotten her numbers down.

We'd treat her cholesterol naturally with red yeast rice extract, plant sterols, bergamot, and berberine, and if that didn't get it under 200, we would add the smallest possible (effective) dose of a statin. (See chapter 12.)

HOMOCYSTEINE

In 1998, researchers found that individuals low in B-complex vitamins are more likely to have elevated homocysteine levels and are more likely to develop Alzheimer's disease.[4] We didn't test homocysteine routinely back then, but it is safe to assume Mom's level was high, indicating a B-complex deficiency, which is extremely common in people over fifty.

In 2010, researchers discovered that (regardless of homocysteine level), people who supplement their diet with B-complex vitamins were less likely to develop cognitive impairment.[5] Researchers also showed that supplementing with B-complex vitamins not only lowers homocysteine levels but reverses brain atrophy and prevents Alzheimer's. However, this research came out in 2013, ten years after Elizabeth died. Now we know that all eight of the B-complex vitamins play crucial roles in supporting healthy brain metabolism and that they work together as a team. A deficiency of any of them can cause cognitive erosion and cerebral atrophy and dramatically heighten the probability of dementia.[6] At the earliest sign of memory problems, we'd have put Elizabeth on both the active form of B-complex and regular B-complex vitamins plus a multivitamin. (See chapter 13 for details.)

VITAMIN D

Twenty years ago, we knew vitamin D was important for strong bones, but we had no idea how important it is for brain health and a raft of other chronic diseases. Optimum levels of vitamin D are also necessary to prevent cancer, autoimmune disease, and blood sugar imbalances.

Nowadays, we know that a low level of D causes dementia risk to skyrocket.[7] Most people with cognitive impairment have a vitamin D deficiency (levels less than 50 nanograms per milliliter [ng/mL]), and studies have shown that the greater the deficiency, the higher the risk.[8] Individuals with the lowest vitamin D levels are twenty-five times more likely to develop mild cognitive impairment when compared to those with the highest vitamin D levels.

Why is D so important for the brain? Perhaps it's because vitamin D is not a vitamin; it is a neurohormone that exerts a broad and powerful spectrum of effects that control the health of our nervous systems. It suppresses inflammation, stimulates removal of amyloid beta plaque deposits from the cerebral cortex, prevents oxidative nerve damage, regulates blood sugar and blood pressure, optimizes the effectiveness of glial cells (supporting cells of the nervous system), and regulates calcium balance inside and outside of cells. A complete list would be very much longer because D controls the expression of about 25 percent of our genes.

To reverse the disease process, we would get Mom's levels of 25-hydroxy vitamin D up into the 70–100 ng/mL optimum range. (For more about D, see chapter 14.)

GUT MICROBIOME

The bacteria in our gut microbiome (GM) outnumber the body's cells by a factor of one hundred and provide over 95 percent of our genetic material.[9] This powerful force helps us break down food and extract nutrients from it, generate energy, produce certain vitamins, stave off infections, bolster our immunity, and—perhaps most important of all—enhance brain health and vitality. Your GM controls the destiny of your brain by exerting powerful control over nerve impulse transmission, neuroinflammatory reactions, and neuroimmunity.[10]

We would take a close look at Mom's bowel health to determine whether her gut microbiome population had been damaged and whether healthy probiotic bacterial microbes had been replaced by pathogenic species. If Elizabeth had food intolerances, indigestion, gastric acid reflux, bloating, gas, loose stools, cramps, irritable bowel syndrome (IBS), leaky gut, any autoimmune disease, or other signs of microbiome distress, we would prescribe digestive enzymes, acidophilus to repopulate her GI tract with healthy microbes, prebiotics to nourish and support the probiotics, natural antibiotics that kill pathogenic bugs while leaving the good guys alone, and biofilm disrupters

that break down the walls bacteria build around their colonies to protect them from the immune cells and antibiotics that would otherwise kill them. (See chapter 16.)

SLEEP APNEA

Obstructive sleep apnea (OSA) involves an involuntary cessation of breathing in which the walls of the pharynx collapse. As inhaled air flows past the partially collapsed walls, they flap in the wind, so to speak, causing the snoring sound.

Such episodes of airway occlusion reduce the oxygen supply to the brain and blood vessels. Recurring oxygen deficit causes body-wide inflammatory damage to the vascular endothelium (the inner lining of blood vessels) and central nervous system, causing high blood pressure and stroke and setting the stage for dementia.

Apnea episodes may occur thirty times or more per hour and often hundreds of times during a night. The sleeper is unaware of these stoppages, but they chisel away at the quality of sleep without triggering full awakening. OSA victims may experience daytime fatigue but often have no clear symptoms to warn them that brain damage is accumulating. OSA is associated with a high risk of hypertension, stroke, other cardiovascular disease, and Alzheimer's.

Experts publishing their data in a 2018 article in the *American Journal of Respiratory and Critical Care Medicine* estimate the worldwide prevalence of obstructive sleep apnea at 1 billion people.[11] OSA affects an estimated 30 million Americans. About 24 percent of women and 9 percent of men have it.[12] Over 90 percent of these people remain undiagnosed and untreated. A study of 15,699 sleep-disordered patients participating in the Sleep Heart Health Study revealed that only 0.6 percent of sleep apnea patients were actively receiving physician treatment for their sleep apnea. Most of them were unaware they had the disease.[13]

According to American Academy of Sleep Medicine president Dr. Timothy Morgenthaler, "Obstructive sleep apnea is destroying

the health of millions of Americans, and the problem has only gotten worse over the last two decades."[14]

Most people who snore have sleep apnea. Mom didn't snore and probably didn't have sleep apnea, but we never even considered that possibility because twenty years ago, when she developed cognitive decline, we didn't know that sleep apnea caused dementia.

Snoring is the most common symptom of sleep apnea, so all snorers should be tested. Sleep apnea can cause high blood pressure, so a polysomnogram should be done on all hypertensives.

LOW THYROID

The thyroid gland controls metabolism everywhere in the body, including the brain and CNS. Low thyroid (hypothyroidism), also known as subclinical hypothyroidism, is a very common condition that can impair brain function and cause cognitive decline.

According to the American Thyroid Association, an estimated 20 million Americans have some form of thyroid disease, and up to 60 percent of those with thyroid disease are unaware of their condition. Women are five to eight times more likely than men to have thyroid problems. Undiagnosed thyroid disease may put patients at risk for numerous serious conditions.[15]

Hypothyroidism has been dubbed the "unsuspected illness" because it usually presents with vague symptoms that impersonate other ailments and physicians often miss the diagnosis. The epidemic of undiagnosed hypothyroidism causes a great deal of human suffering and disability, including dementia.[16]

Mom had three classic symptoms of low thyroid: fatigue, constipation, and depression. From these, plus lab testing, I had diagnosed her hypothyroidism many years earlier, and her treatment program had reversed the disease.

Untreated hypothyroidism serves as a launchpad for dementia—so if Mom hadn't already been diagnosed, we would have taken a close look at her thyroid numbers. Her dementia would likely have

begun sooner and progressed more rapidly if her hypothyroidism hadn't been treated. (See chapter 17.)

TOXIC METALS

Mom's dementia may have been caused or accelerated by her exposure to toxic heavy metals. To explore this possibility, we would do a hair toxic mineral analysis—a simple, easy, reliable, inexpensive, and revealing test that is done from home. (See chapter 18 for more details.)

The following toxic metals are most likely to cause neurodegeneration:

- *Mercury*—from fish (this includes *all* seafood, including farm-raised) and amalgam dental fillings. People who consume a serving of fish more than once a week usually have dangerously high levels.
- *Lead*—from old paint, imported dishes, water contamination, lead pipes and fittings, brass or bronze faucets and valves, and many national brands of chocolate.
- *Cadmium*—from almost all brands of chocolate and cocoa.
- *Aluminum*—from deodorants and cookware.
- *Arsenic*—from building materials, pressure-treated wood, and pesticides.
- *Iron*—Iron is an essential mineral, but high levels are neurotoxic. Causes include too many iron supplements, cooking with an iron skillet, liver disease, and repeated blood transfusions.

EXERCISE AND BDNF

Everyone knows about the vital importance of exercise. But you might not be aware that exercise is the single most effective way to improve brain function—including both cognitive power and memory.

Mom jogged—and later walked—several miles every day. She also used hand weights. Mom knew exercise was good for her, but she had no idea how good it was. Exercise, we now know, stimulates the production and release of brain-derived neurotrophic factor, a hormone-like molecule that enables the four most important features necessary to

prevent and reverse dementia: neurogenesis (growing new nerve cells), neuroregeneration (healing damaged nerve cells), and neuroplasticity and synaptoplasticity (having a nervous system with synapses responsive to change). (See chapter 8 for more on this subject.) I am certain Mom's daily exercise slowed or stalled the progression of her dementia for several years.

Although nothing comes close to exercise in terms of power to release BDNF, certain foods, nutritional supplements, and practices also trigger its production:

- Intermittent fasting
- Lithium
- Omega-3 fatty acids such as DHA (docosahexaenoic acid) and flaxseed oil
- Blueberries
- B-complex vitamins (including B12)
- Folic acid (methylfolate)
- Curcumin
- Zinc
- Caffeine
- Resveratrol
- Flavonoids (green tea, cocoa, chocolate)
- Other flavone-rich foods such as strawberries, raspberries, blackberries, cherries, peaches, apples, pear, oranges, romaine lettuce, celery, tomatoes, garbanzo beans, almonds (and much more, see chapter 24)

The following have been shown to inhibit BDNF production:

- Ethanol (all alcoholic beverages)
- Vitamin A deficiency
- Vitamin E deficiency
- High saturated-fat diet
- Sugar

DIET

Mom's diet would be limited to foods shown to prevent or reverse dementia. She'd be on a ketogenic diet, which eliminates all grains, sugars, and other high-carbohydrate foods while emphasizing healthy fats and modest amounts of high-quality protein.

We'd make sure she got large doses of antidementia oils: medium chain triglycerides (MCTs) from coconut, omega-3s from flaxseed, and DHA derived from algae. Other brain-beneficial fats include avocado, walnut, and olive oils. (See chapters 21, 23, and 28.)

We'd also remove sources of pro-inflammatory omega-6 oils such as soy, sunflower, safflower, corn, cottonseed, and canola. A little saturated fat (from clean, humanely raised lean meat and eggs) is okay, but we'd keep her intake on the low side because too much saturated fat blocks the availability of the all-important omega-3 oils.

We'd take advantage of the incredible neuroregenerative powers of polyphenols by loading Mom's diet with fruits such as blueberries, raspberries, strawberries, cherries, blackberries, pomegranate, and grapes and polyphenol-rich vegetables such as artichokes, broccoli, red cabbage, celery, eggplant, garlic, dark leafy greens, kohlrabi, leeks, onions (red, white, and yellow), scallions, peppers, peas, spinach, sweet potatoes, tomatoes, nuts, and green tea.

I'd make sure that most days she ate two eggs cooked in coconut oil. Absolutely no fish or other seafood and no processed foods would be allowed.

You will learn a lot more about antidementia dieting in chapter 20.

Autophagy

Autophagy is the practice of fasting twelve to sixteen hours every day to activate cellular housekeeping systems that remove the waste material that would otherwise cause metabolic dysfunction and neurodegenerative disease. It is relatively easy to do. (See chapter 22.)

Autophagy is how our cells eject or recycle all kinds of used-up or broken biomolecules—an enormous hodgepodge of cellular debris, including proteins, nucleic acids, carbohydrates, lipids, viruses, bacteria, and toxins.

It also plays a dramatic role in slowing and reversing cognitive decline. Optimizing autophagy in nerve cells is essential for repair, renewal, and regeneration—for both maintaining a cognitive edge in a healthy brain and restoring it in a brain with cognitive decline.

Nutritional Supplements

Research studies have shown that specific nutritional medicines prevent and reverse cognitive decline. In this book I have included only those with the strongest research support.

I would have prescribed several nutritional supplements for Mom. At the top of the list would be lithium, a "magical mineral" that not only prevents Alzheimer's but has been shown to increase BDNF, stimulate neurogenesis, and reverse cerebral atrophy. Lithium has been shown to halt the progression of—and even reverse—Alzheimer's disease. Anyone who wants to prevent dementia and keep the sharpest possible mental edge should include this mineral in his or her supplement program. (See chapter 27.)

Since Mom had a significant vascular component to her dementia, the herb berberine would also have been an excellent choice.

Several other nutritional medicine supplements have been shown to provide basic brain support, enhance cognition, and block or reverse the Alzheimer's disease process. Examples include B-complex vitamins, curcumin, Bacopa, DHA, flaxseed oil, phosphatidylserine, green tea extract, citicoline, and probiotics.

I would also prescribe specific supplements to correct specific metabolic defects—for example, berberine for high blood sugar, B-complex for high homocysteine, red rice yeast extract for elevated cholesterol, curcumin for inflammation, and vitamin D3 for low vitamin D.

To assure purity and effectiveness, I'd make sure Mom's supplements were professional-level quality and didn't come from any drugstore chain or big box store. Trying to save money on vitamins is a really bad idea. Substandard quality, offshore unregulated products, and toxic source materials are common in the cheaper products. Purity and efficacy go hand in hand. Professionally produced, pharmaceutical quality nutritional medicines are highly recommended.

It saddens me that Mom couldn't benefit from these new treatment approaches.