

# MIND ALERT



Photo: Bob Levy

**CENTENARIANS: LESSONS ON LIVING LONG AND LIVING WELL**  
**2003 SPECIAL LECTURE BY THOMAS PERLS**

A JOINT PROGRAM OF  
THE AMERICAN SOCIETY ON AGING  
AND THE METLIFE FOUNDATION

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**D**ementia affects elders of all cultures and classes, but cognitive decline is not an inevitable consequence of aging. The **MindAlert Program**, sponsored by the **American Society on Aging** and **MetLife Foundation**, is dedicated to sharing the findings of new research on how to maintain and enhance cognitive function in later life.

What does it mean to reach 100? What can centenarians tell us about our own future and the future of our aging society? According to Thomas Perls, director of the widely publicized New England Centenarian Study, the growing numbers of centenarians in our society may show us the way to finding a longevity gene—but they also demonstrate the effects of making the right health choices throughout life.

“For most people, the average set of genetic variations should get us to our mid to late 80s, which I think is fantastic,” Dr. Perls says. “That’s a great poker hand. The question is, how are you going to play that hand?”

This booklet contains the transcript of a lecture given by Dr. Perls in March 2003 at the Joint Conference of the National Council on the Aging and the American Society on Aging as part of the MindAlert program. In his lecture, Dr. Perls discusses why people who live to 100 are fascinating to medical researchers, biologists, and geneticists—and what we can learn from them about extending our own life expectancy.

Also profiled are the winners of the third annual **MindAlert Awards**, which recognize programs that support enhanced cognitive function in later life.

# CENTENARIANS: LESSONS ON LIVING LONG AND LIVING WELL

Thomas Perls

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Last year, Paul Nussbaum gave a wonderful lecture on the inner workings of the brain and its relationship to the rest of our body. (To view the transcript from Dr. Nussbaum's speech, visit [www.asaging.org/mindalert](http://www.asaging.org/mindalert).) He spoke on brain health from one to 100. I'm going to center our attention on the 100 end of that spectrum.

## Debunking the Conventional Wisdom

We started the centenarian study back in 1994, when I was a geriatrics fellow at Harvard Medical School looking for a research project. I started with some fairly ingrained notions that I shared with many people, namely that the older you get, the sicker you get. I think this notion is dissipating these days, perhaps in part because of our research. When I was an orderly in a nursing home at age 16, the things I saw weren't too different, unfortunately, from scenes out of *One Flew Over the Cuckoo's Nest*—some pretty horrendous care. Even at age 16, I recognized that some of the residents had absolutely no business being there. They were fine. There certainly should have been alternative places for them to be, if not just in their home. At the same time, though, because the only older people I knew were living in a nursing home, my view of how old people fared in general was pretty skewed.

When I went through college and medical school, the idea that the older you get, the sicker you get was pretty much a tenet of medicine. So there I was, in the second year of my geriatric fellowship at Harvard, in charge of 40 patients at the Hebrew Rehabilitation Center for Aged. Two of the patients were the first centenarians I had ever met. One of my tasks was to conduct physical exams on all the patients. Over the first six months, I got to see everybody, but every time I attempted to find these two individuals they were never around. I thought they were probably off seeing their specialists for the myriad problems they were having. But I eventually tracked them down. Celia Bloom was out playing piano

for everybody. At the age of 102, she was playing beautiful Mozart and Chopin. Ed Fisher, age 101, had been a tailor all his life. He was out and about mending everybody's clothes. And when he wasn't hemming, he was with his 85-year-old girlfriend. Robbing the cradle!

These two people sparked my interest. They were very different from what I had expected. I had been interested in Alzheimer's disease for a long time. Most neurologists back then would say that Alzheimer's disease is already very common at age 85. In the East Boston Study, Drs. Marilyn Albert, Dennis Evans, and colleagues demonstrated that about half of all people ages 85 and older had a diagnosis of Alzheimer's disease. Given that neurofibrillary tangles and neuritic plaques accumulate over time, most researchers in the field accepted the notion that by the age of 100 everybody should have Alzheimer's. Clearly, these two centenarians didn't. What was going on here?

Eventually I discovered that of the 740 people living at the Hebrew Rehabilitation Center for Aged, there were 10 other centenarians. When I went looking for the other centenarians in this long-term care setting, I found that some weren't doing so well. About three-fourths of them had some degree of cognitive impairment ranging from mild to fairly severe. The other 25 percent to 30 percent were fine, despite being in a long-term care setting.

I decided to initiate a population-based study in New England in which we would take eight towns—about 450,000 people in total—and try to find all the centenarians we could and see what they were like. By finding all the people with the specific trait we were interested in—that is, exceptional longevity—we were hopeful of minimizing selection bias and therefore obtaining a representative sample of New England's centenarians. Massachusetts is a good place to conduct such a study because it has an annual census. The 10-year census that takes place in most states as a part of the federal census is much too infrequent as a tool for

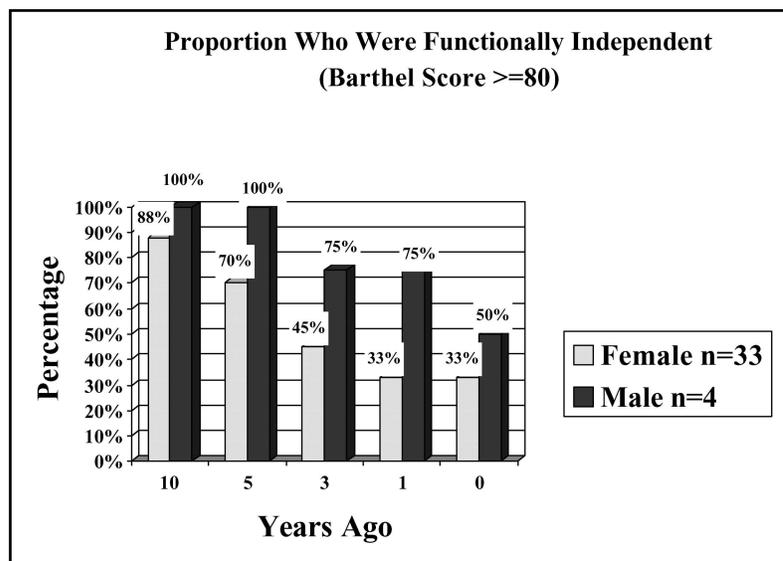
finding centenarians, given their nearly 30 percent annual mortality rate.

Margery Silver, a neuropsychologist, joined the New England Centenarian Study early in its inception and set out to see what the prevalence of dementia was among centenarians. What she found was fairly similar to the eventual findings of the handful of other centenarian studies conducted around the world: About 30 percent of the centenarians were cognitively intact and about 70 percent showed varying degrees of cognitive impairment. At first glance, a 70 percent rate of cognitive impairment would appear not to be consistent with our hypothesis that centenarians have a decreased susceptibility to Alzheimer's disease.

However, we suspected that if these individuals developed Alzheimer's disease, it was not until late in their very long lives that they clinically expressed the disease. Rachel Hitt, a medical student at Harvard Medical School who received funding from the American Federation for Aging Research and the Hartford Foundation to conduct geriatrics research during her summer break from school, obtained all the clinical information she could on these individuals. She talked to caregivers, physicians, and family members, and also interviewed patients and reviewed their medical records. What she found was that 90 percent of the centenarians had been functionally independent 10 years earlier at the average age of 92. They developed functionally significant impairment in only the remaining 10 percent of their very long lives (see figure 1).

As for the centenarians who were totally fine at 100—not to be sensationalistic, but if you're cognitively intact at 100, you're vir-

tually immortal. Normal cognitive function at this extreme age is a powerful predictor of future health. Individuals who go on to be 104, 105, or 106, and only then develop some cognitive impairment, only then tend to have a very rapid decline. But what a payoff! To live such an incredibly long period of time and then compress the time that one is sick toward the end of life is



**Figure 1. Functional status of centenarians in a population-based sample. Ninety-two percent were functionally independent at the average age of 92 years. Source: Hitt et al., 1999.**

something I think all of us would want, whatever age we live to be.

So the picture was beginning to emerge for us that living to 100 was actually a tremendous advantage. It wasn't something to be shunned. In 1999, I authored, along with Margery Silver and John Lauerman, a book titled *Living to 100: Lessons in Maximizing Your Potential at Any Age*. That book did OK, though not as well as any author hopes for his or her book. Actually, I think the issue was the title. Many people have this idea that the older you get, the sicker you get, and they looked at the cover and thought, "Who would want to live to 100?" And they'd go for the book next to it that told them they could grow young with human growth hormone and similar nonsense.

At the time, I felt that if centenarians were at least delaying Alzheimer's, it would be good to study them to find out how and

why they were able to do it. The Alzheimer's Association gave us our first grant to start to look at these issues.

### **Alzheimer's Isn't Inevitable**

Dr. Silver began to get interested in what the brains of the dementia-free centenarians would look like. We came across one woman in particular named Anna Morgan—I can say her name because she's featured in the book. She was living in Somerville, Mass., in a triple-decker house with one generation of her family on each floor. Mrs. Morgan was living on the top floor, and she was the matriarch, an unbelievable lady. Plastered on the front door of her apartment was a Bill Clinton sticker, so we already knew we were about to have a unique experience. We walked in, and

*We found that 90 percent of the centenarians had been functionally independent 10 years earlier at the average age of 92.*

there she was, at eight in the morning, on her exercise bicycle. She was wearing a dental visor with magnifying glasses and a bright light. She found that if she got up early in the morning when her eyes were fresh, she could read while she exercised. She wouldn't break that routine for us; we had to calmly sit there on the couch and watch her until she was finished, come hell or high water.

And she was grumpy. I don't know many grumpy centenarians. She was reviewing the 900-page autobiography that she had started at the age of 91. The editor had whittled the manuscript down to 650 pages, and she was swearing over every little deletion.

After Mrs. Morgan got off her exercise bicycle, we asked her to do some neuropsychological testing with us. So we sat down at the kitchen table, with a few 70-year-old kids looking on, and she was just unbelievable. Dr. Silver would recite seven digits forward to her and Mrs. Morgan could recite them to us backwards. Another test we administered was called the "Rochester Cowboy Story," in which the tester reads a story

with 10 major events in it; the story lasts about 10 minutes. The subject is then asked to retell the story. It is a hard test, but she completed it perfectly. After numerous such tests, we were just amazed. She had a spectacular neuropsychological examination. Dr. Silver looked at Mrs. Morgan and said, "You know, you're unbelievable. I'd really like to know what your brain looks like."

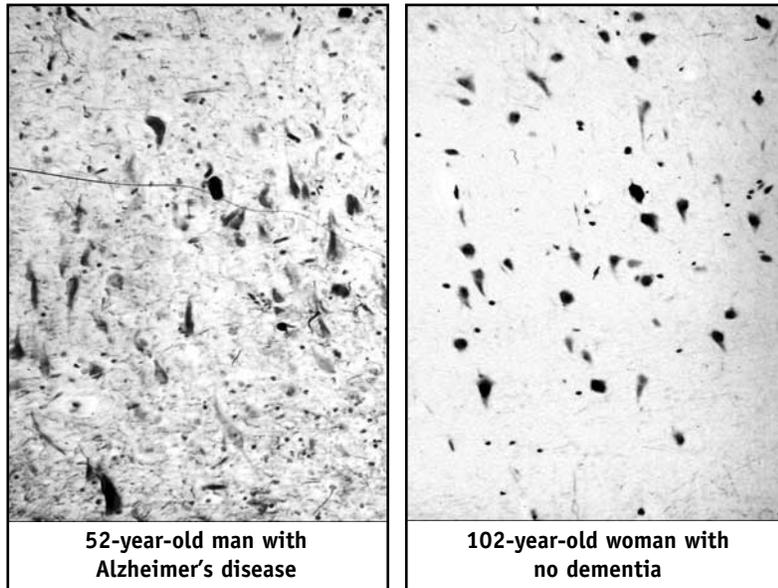
Dr. Silver and I had heard about the nun study, where older nuns were willing to undergo annual neuropsychological examinations and then allow their brains to be autopsied once they had died. A number of subjects who were cognitively intact had brains full of neurofibrillary tangles and neuritic plaques, bringing up the questions of functional reserve and adaptive capacity. Researchers like Dr. Nussbaum are now trying to figure out the neurophysiological basis of this phenomenon. Is it building a lot of dendrites, the connections between brain cells? Is it some kind of neuronal reserve? How are these individuals clinically able to be so much better than what their brain autopsies indicate?

What would Anna Morgan's brain autopsy eventually reveal in the setting of her remarkable cognitive function? Dr. Silver asked Mrs. Morgan if she would donate her brain. Her first reaction to this request was, while chuckling, "Well, I'm still using it." She was totally supportive of the idea. She was only sorry she wouldn't be around to learn the results. Six months later, we returned for another round of neuropsychological testing, and three months after that, she passed away suddenly from an arrhythmic event. Kathy Newell, the neuropathologist at Massachusetts General Hospital that we collaborated with, exclaimed two weeks later, "My God, she's got a beautiful brain." Anna Morgan had very few if any neuritic plaques or neurofibrillary tangles (see figure 2).

Here was more objective evidence, albeit in one person, that Alzheimer's disease was not an inevitable consequence of living to 100. In fact, we have come to regard cases such as Mrs. Morgan's as a neuropathological model of disease-free aging. Anna Morgan showed us both clinically and pathologically that there is no such thing as "changes consistent with age"—the

diagnosis often attributed to white matter changes often observed on the MRI of older patients. We started to get very excited about studying centenarians to figure out what made them different from other people, allowing them to live 30 or 40 years beyond the age of 60, much of that in good health. That's a third or half of a lifetime!

Anna Morgan cruised on to 100 and died



**Figure 2. Neuropathological examination of representative brain sections in a patient with Alzheimer's disease and a centenarian with no cognitive impairment.**

at 101, and she escaped Alzheimer's. But what if she had lived to 110 or 119? Would some kind of neuropathological process have become evident? Is it inevitable that she would have Alzheimer's? Well, we did have a 119-year-old who passed away and went on to autopsy: Sarah Knauss of Allendale, Penn.

People ages 110 and older are termed supercentenarians. Centenarians are rare, about one per ten thousand. Supercentenarians are about one per million. The oldest person in the world, a 119-year-old, was one per 6.5 billion. When we saw Sarah before her death, she presented quite similarly to the other oldest people in the world who have been studied by clinicians: quiet, very frail. She had difficulty with hearing and vision, and her scores on neuropsychological tests indicated that she had moderate

dementia. Looking at videotapes of the neuropsychological testing of Jeanne Calment, who still holds the record for being the oldest living person at 122 (she passed away in August 1999), we know that Mrs. Knauss had a similar clinical presentation.

Madame Calment could still sing the French national anthem. In some areas, she was very bright and then there were other

cognitive domains in which she did not do well. This type of localization of deficits (rather than global involvement) suggests a component of vascular disease contributing to her clinical impairment. A mixed picture of Alzheimer's disease and vascular disease could pan out to be the typical cause of cognitive impairment in extreme old age.

But here's the hook. Mrs. Knauss was living independently in her own apartment at the age of 110. So it's really relative. To get to 100,

you probably have to be cognitively functionally independent through age 92. Many of these people do fine up until age 98. To live to 105, perhaps one has to be cognitively functionally independent at age 102. And to live to 119, again, Sarah Knauss was doing very well at 110.

### Secrets to Living to 100

Once we realized what a tremendous advantage it was to live to 100 in terms of compressing disability toward the end of life, we of course wanted to discover the centenarians' secrets for such a tremendous survival advantage. Perhaps more for fun, we always ask them what their secrets are. Often they'll say it's faith. I think that faith is quite important in this group. Perhaps faith is an important means of effectively



managing stress. Stress has been shown to contribute to the pathogenesis of hypertension and vascular disease. They'll tell you that having a cause that gets them up in the morning is very important. Some will also tell you that it's genetic; many of their family members have reached very old age as well. They'll tell you that it's luck. And then they'll come up with goofy things. We talked to a married couple, which is rare—actually, he was 106 and she was 101—and he said that his secret was a set of early-morning range-of-motion exercises and a bowl of dates, raisins, nuts, and some fiber with a half cup of olive oil poured over the top. And I'm thinking, I'm not living to 100 if that's what it takes.

He looked at his wife kind of fiendishly and said, "Sophia Loren rubs it all over her body and she looks great!" His wife glared at him—a really bad glare—and said, "That's a bunch of hogwash. It's the two jelly donuts and glass of orange juice every morning!"

Margery Silver is leading a pilot project conducting personality testing on centenarians. She has preliminarily found that on this test called the NEO, centenarians scored quite differently than other older adults on a domain called neuroticism. Instead of internalizing stress, people who have low neuroticism scores seem to let it go. The amount of stress isn't as important as how the centenarians manage their stress. With such a personality, there seems to also be gregariousness—centenarians tend to be funny. I can only recall one centenarian I've met—now, there's big selection bias to this—who was really curmudgeonly and just not a nice person. Clearly, the centenarians we don't recruit are probably more likely to fit that category, but the ones that we have recruited tend to be a lighthearted, wonderful group of folks. Most have lost their spouses, they've lost other family members, they've lost friends, but they have personalities that really draw people into their lives. Their gregariousness likely facilitates social networks, social safety nets, that also become very important. We are still investigating personality traits. These, like many other traits that could be linked to exceptional longevity, merit much more investigation.

Beyond personality, the factors that we normally associate with longevity in the general population—more years of education, better access to healthcare, better socioeconomic status—didn't really pan out to be common among centenarians, who are quite a heterogeneous group. It was surprising to us that these factors were not important factors for living to exceptional longevity, at least among our study cohort. Some centenarians, in fact, have a history of very unhealthy habits such as significant tobacco or alcohol use. And yet, despite factors that would predispose most to premature mortality, these individuals were achieving extreme old age. The question remained, what do centenarians have that allows them to get away with such indulgences?

### **Longevity Runs in the Family**

Our research has yielded some clues. The first clue came from census findings and local newspaper announcements of people turning 100. One day we saw in the *Patriot Ledger*, the daily newspaper of Quincy, Mass., a photo of a 108-year-old man blowing out his birthday candles. That is rare enough, but then there was his 103-year-old sister looking on. I couldn't get to Quincy fast enough to meet these two. They were happy to be in the study and then said, "Swing by Hartford, Conn., where our 102-year-old sister is, and while you're at it, go down to New Jersey to visit our 99-year-old sister. It's too bad you weren't around two years ago when our other two centenarian siblings were still alive." Here was a family with five siblings out of nine achieving age 100 or older; the other four had passed away at a very young age because of childhood infectious diseases.

Back in 1900, one-quarter of the population died during childhood. In fact, the average life expectancy back in 1900 in the United States was about 46 years; childhood mortality pulled down the average life expectancy. But then the problem of childhood mortality was solved with such measures as clean water, vaccinations, antibiotics, and so on, our healthcare radically improved, and we now have an average life expectancy of 79 or 80 years.

When you find a family where a bunch of kids or a parent and kids have a particular disease, you start suspecting genetic causes. Obviously, I wasn't considering a disease but rather a wonderful trait. One day I ran into Louis Kunkel, who's a preeminent Harvard-based geneticist at Children's Hospital, and I mentioned this family of centenarians. He became pretty interested in this family, and I went out and found a few more similar families for him to study.

There were a couple of fortunate things about meeting up with Dr. Kunkel: He didn't know much about aging and he wasn't laden with a lot of preconceived notions about genetics and aging. At the time the conventional wisdom was—and still is, to a certain degree—that aging is an incredibly complex thing. Aging can be viewed as a myriad of propensities for age-related diseases influenced by many environmental and behavioral factors, genetic factors, and good old luck.

No one in their right mind would fund a study to look for such a gene. All Dr. Kunkel knew was that certain families showed significant clustering. Lou Kunkel and Annibale Puca, a talented neurologist from Italy, took it upon themselves to attempt to discover some genes related to longevity.

In order to do a sibling pair study to search for such genes, we had to search the United States for centenarians with living brothers and sisters. The way these linkage studies work is that you enroll a lot of brothers and sisters who have some trait in common—in this case, the ability to live to exceptional old age. Then, you study their DNA for any regions they have in common—much more than you would expect to occur by chance. When the researchers examined the DNA of all these centenarians, to everybody's surprise and happiness, a region on chromosome four was of significant interest.

Now, my wife, a pediatric cardiologist at Children's Hospital, always acts as my best devil's advocate. She would be the first one to tell you that these linkage studies need to be taken with a grain of salt. There have been linkage studies on diabetes, hypertension, homosexuality, and schizophrenia, for

example, and they're rife with false positive results. Probably six linkage studies—out of hundreds—have come out as reproducible.

Part of the problem is phenotyping. When you are studying the genetic basis of a trait, you need to be sure that it is extremely well defined and succinct. If you just draw blood from everybody with high blood pressure, some of the people are going to have high blood pressure because their kidneys are putting out too much aldosterone, for instance, and others may have high blood pressure because their arteries are too stiff. These two types of individuals represent a whole set of different genetic and environmental factors that cause high blood pressure. A similar scenario exists for many syndromes and illnesses currently under study.

What was to our advantage with our linkage study was that living to 100 was quite definable: First, all you had to do was count the years, and second, it was very rare. Approximately one per ten thousand in the population is a centenarian. So we felt that it was worth pursuing.

Previous Scandinavian studies of twins had shown that a relatively small amount of aging had to do with genes. When the researchers looked at pairs of twins, some of whom had been reared apart versus reared together, they found that 20 percent to 30 percent of the variation of how long these individuals lived was related to genes. Seventy percent to 80 percent was related to environment.

## **The Human Chassis: How Far Can It Go?**

The fact that 70 percent to 80 percent of aging can be dictated by one's behaviors and environment is a very enabling point of view. In their book *Successful Aging*, Jack Rowe and Robert L. Kahn reported this enabling view, and they got a lot of understandable attention for it. Basically, they indicate that if you do all the things your mom told you to do except clear your plate, you should be able to live to quite an old age in good health.

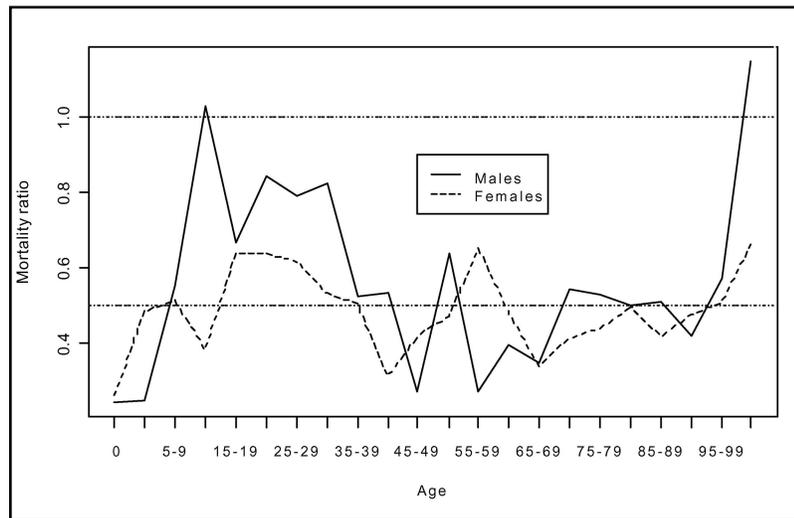
However, our centenarian studies are indicating an important genetic component

to longevity. So how do these observations jibe with one another? The key to this story is that the oldest individuals in the twins studies were in their late 70s and early 80s. So what that says to me is that for most people, the average set of genetic variations should get us to our mid- to late 80s, which I think is fantastic. That's a great poker hand. The question is, how are you going to play that hand? If you're going to smoke, if you're going to be obese, if you're not going to exercise, if you're going to have a diet that is conducive to poor heart health and

But with the centenarian study, we aren't studying average life expectancy; we are studying the ability to get to 100. Based on the findings from the chromosome-four study and some genetic epidemiological studies that we've done, I'd wager that to get to extreme old age you need some sort of genetic booster rocket.

Another genetic study we did looked at the probability of the brothers and sisters of centenarians reaching 100 themselves. It turned out that the brothers were 17 times more likely to reach 100 compared with

other people born around the same time, and the sisters were eight times more likely. These relative survival probabilities just scream genetics. Also, when we looked at the age of death of all the brothers and sisters of centenarians, we found that from age 20 to extreme old age, for every year, these siblings had half the mortality rate of their peers in the general population. I don't know of major genetic factors that



**Figure 3. Relative survival of siblings of centenarians, compared to men and women also born in 1900. The lower horizontal dotted line indicates a relative mortality rate of 0.5.**

**Source:** Perls et al., 2002.

obesity, then you're not playing that hand well. And some people have poorer hands to start with.

But by not playing our hands well, we end up with an average life expectancy of about 10 years less than what we're capable of achieving. Studies of Seventh Day Adventists support this assertion. Seventh Day Adventists hold the belief that to do things that are bad for their bodies is a sin. So they're vegetarian, they don't smoke, they don't drink (although a small glass of alcohol a day is probably good for you), they exercise, they tend to be lean. As a result, lo and behold, they have an average life expectancy of 87 years. That's what our genes are generally capable of achieving for us.

significantly influence differential survival among the general population in their 20s and 30s. We don't really start developing heart disease, stroke, or other age-related diseases until our 40s, 50s, and 60s. And diseases like childhood leukemia and retinoblastoma are so rare, they don't figure into these mortality rates.

The causes of death that I see happening in the 20s, 30s, and 40s are things like not wearing seatbelts, or going through testosterone storms as a male and shooting somebody, or driving 80 miles an hour down a country road. On the other hand, survival advantages would be at play at these ages as well. Having your mom taking good care of you and sequestering you from strep in-

fections, especially at a time when penicillin was not available, or a whole host of factors that would have given these individuals some kind of advantages in their 20s, 30s, and 40s over the rest of the population would contribute to the impressive survival advantage we were observing. As we start getting into the ages when age-related diseases start to kick in, I would imagine that some genetic factors also start to play roles in differential survival (figure 3).

Our findings thus far suggest that the chromosome-four gene is probably a similar story to apolipoprotein E4 (ApoE4). If you inherit the E4 variation of the apolipoprotein E gene from your mom or dad, you have a significantly increased risk of developing Alzheimer's disease in your 60s or 70s. While the E4 allele is very rare among centenarians there are actually centenarians who inherited a copy of apolipoprotein E4 from one parent. I've seen one centenarian with two copies (one from each parent). So having the gene doesn't mean you'll inevitably get Alzheimer's in your 60s or 70s. We don't have enough genetic epidemiological information to be able to determine what level of risk the E4 allele actually confers. Furthermore, the patterns are different for different racial and ethnic groups.

It's still too early to tell what will happen with the discovery of these genes. We have known about ApoE4 since the early 1990s, and we still don't know what to do with that information, especially since it varies from race to race. There seem to be many interactive effects with habits and health behaviors.

## The Right Combination of Factors

Becoming a centenarian is so rare that it is apparent that just the right combination of genetic and environmental factors—as well as luck—is required for a person to make it to 100. In other words, the stars have to line up just right. However, they need not always be the same combinations or “dosages” of factors. For example, we have a handful of subjects who have thrown the equivalent of an atomic bomb at their bodies and they're still getting to 100 in very good shape. I have seen three or four

centenarians who have smoked three packs a day for 50 years, and they don't have lung disease, cancer, or even heart disease.

I think that studying these extremely rare centenarians will be valuable from a genetic point of view—to find out what genetic attributes protected them. In thinking about these cases, it seems likely something protective is going on, like some type of longevity-enabling or protective gene. There are all kinds of problems with hypothesizing that such a thing exists. For example, from an evolutionary point of view,

*I think these extremely rare centenarians will be valuable from a genetic point of view—to find out what genetic attributes protected them.*

why do a rare few people rather than lots of people have such a protective factor?

I was hopeful that we'd find such a protective gene on chromosome four because it might interfere with the process of aging at a basic biological level. You know, there are lots of thoughts about what aging is. Some people think aging is free-radical damage that destroys DNA and cellular membranes. Or that the rate of aging relates to the ability to repair DNA damage. There are many theories, some of which have quite a bit of scientific evidence to support them.

A few people, including me, have a pet theory about why women live longer than men. It relates to free-radical damage. Generally speaking, up through menopause, women delay stroke and heart disease by about 10 years relative to men. People attribute that gap to estrogen. Estrogen could provide an advantage given that it is an antioxidant. But the other thing that differentiates women from men, besides making much more estrogen (at least before menopause), is that women also menstruate. Menstruating for 40 or so years, women often become iron deficient. The iron deficiency is probably key, because there are two metal ions, copper and iron, that are critical to our cells' ability to produce free radicals. We don't have that much copper in our bodies, but we have a lot of iron. Hav-

ing less iron in your body could mean producing fewer free radicals. And by being more iron deficient than men, perhaps women are producing fewer free radicals over time. Free-radical damage plays a key role in cardiovascular disease, Alzheimer's disease, and other age-related diseases. Thus, maybe having less iron is playing a role.

The major makers of adult vitamins, such as Centrum Silver, have recognized this possibility and have taken iron out of their vitamin formula. But if your doctor says you should be on iron because you're iron deficient, you better find out why. If you're a menstruating woman, then it's obvious. But if you're a man or post-menopausal woman, there's something wrong going on. You may be losing blood through your gastrointestinal tract or destroying red blood cells for some reason. There are a number of possibilities. But you shouldn't just be placed on iron. And women who feel fine even though they are anemic due to iron deficiency do not need to be on iron.

*It's the quality, not the quantity, of our years that are so important to me.*

There have also been studies looking at iron-rich diets due to meat consumption. Maybe one of the problems with meat isn't the cholesterol—maybe it's the iron in the meat. A study in the Netherlands found that individuals on heme-rich (meat) diets had a 40 percent increased risk of heart disease compared with those who weren't, after correcting for a lot of factors.

Getting back to the genes we're now searching for, I wager that whatever we find will have a significant impact upon our understanding of aging, as well as on our understanding of Alzheimer's disease. There are certainly aspects of aging that set the brain up to be susceptible for developing Alzheimer's. What are we going to do with that information? If you discover a gene that's playing an important role, you have a window into the biochemical processes that influence the disease. Once such pathways are understood, the possibility exists of

developing drugs to block or enhance the effect of the gene.

Given the possibility of discovering longevity-enabling genes or disease genes, I am not interested in joining the anti-aging industry with its outrageous claims and prevalent quackery. The reason I want to study centenarians is that they markedly delay or escape the diseases associated with aging, and compress their disability toward the end of their lives. It's the quality, not the quantity, of the years that are so important to me. So I'm not expecting my research to lead to many more people surviving to 100. Ideally, I would just love to help people get to their late 80s and compress the time they are sick until the relative end of their lives. Much of this can be achieved already by changing health-related behaviors to be conducive to longevity, not premature mortality. If our centenarian work results in some drugs that help people add a few more healthy years to what their "poker hand" is capable of achieving, that would be wonderful as well.

I am hoping that out of this work we're going to discover variations of genes that specifically predispose people to Alzheimer's. Maybe at some point we'll have enough genetic epidemiological evidence to be able to do a genetic study on an individual and estimate his or her predispositions to  $x$ ,  $y$ , and  $z$  diseases. So if you have a certain gene that combines with a smoking habit to produce a disease, we could say, "Don't smoke." Or even give you a pill to take to counteract the effect of a gene, say, that predisposes a person to Alzheimer's.

Again, regarding the anti-aging industry, there is not some magic pill or growth hormone that's going to allow people to stop aging or to reverse it. There is no such thing as anti-aging medicine. There's only anti-aging quackery.

The *Journal of the American Medical Association* just published an article ("Growth Hormone and Sex Steroid Administration in Healthy Aged Women and Men," Nov. 13, 2002) about a trial using growth hormone. The researchers saw 50 percent of the study group develop adverse effects; 15 to 20 percent actually developed diabetes. These are huge rates that cannot be down-

played. But adverse side effects are not reported for anti-aging therapies. People don't want to tell others that they fell for this stuff, and then there are a bunch of people in the anti-aging industry who are just trying to fill their greedy pockets.

Half of what I do is try to fight these hucksters. So I spend a lot of my time talking about how centenarians have this very long period of good health, and how a lot of people have the power in their hands to maximize their health through their 80s. People don't need to fall for the quackery.

### **Extending Your Own Life**

So, since I brought it up, let's talk a little bit more about what you can do to get to your mid- to late 80s in good health. There certainly are not a lot of purported answers out there, and some of the things we hear about shift with the wind. For instance, vitamin E and calcium—you'll hear one thing one day and the next you'll hear they're bad for you. But I do think some things are tried and true.

We boiled these few true things down into a life expectancy calculator (see page 14). It's basically 26 questions about things you should take into account when thinking about your life expectancy. The way it works is that you're given 85 (men) or 88 (women) years to begin with. If you smoke, it knocks off 15 years right off the bat. If you do regular strength training exercise, you add a couple of years. If you have a vegetarian diet, well, maybe it will just keep you the way you are; you're taking advantage of your genes but you may not be adding much. If you go do something novel

and complex as Paul Nussbaum suggests, like learning a new musical instrument or learning a new language, and thus increase the functional reserve of your brain, you might add a couple of years.

That's how the calculator works—and I think that's how we should all think about aging. Many people believe the older you get, the sicker you get, so there's no reason to worry about your health or put effort

*Centenarians are important to us because they raise the bar for what the rest of us think is possible.*

into being healthy at these older years. However, if it's really a case of the older you get, the healthier you've been, one realizes they could have 20 to 30 years of good health beyond the age of 60.

The last thing I would say along these lines is that centenarians are important to us because they raise the bar for what the rest of us think is possible. When I was growing up, I thought 65 was ancient. Eighty-five now seems to be pretty plausible when you've got a bunch of 100-year-olds running around. It's not too different from when Roger Bannister first ran the four-minute mile. All of a sudden, there were a lot more people running five-minute miles. Now that so many people run marathons, I would wager there's even more people running 10K races. Having the centenarians around has a pretty significant impact upon what the rest of us think we're capable of doing.

## ABOUT THE AUTHOR



**Thomas Perls** is a physician and researcher in the study of aging at Boston University Medical School. As associate professor in medicine and a geriatrician, he cares for older patients at Boston Medical Center. Since he first discovered that his centenarian patients were among his healthiest, Dr. Perls has become one of a handful of experts in the world who are studying these exceptional human beings. For the past eight years, he has directed the New England Centenarian Study (NECS). Funded by the Institute for the Study of Aging, the Ellison Medical Foundation, the Alzheimer's Association, and the National Institute on Aging, the NECS is the world's largest genetic and social study of centenarians and their families.

## FOR FURTHER READING

Here are a few of the research studies referred to in Dr. Perls' lecture:

Hitt, R., Young-Xu, Y., and Perls, T. 1999. **"Centenarians: The Older You Get, the Healthier You've Been."** *The Lancet* 354(9179):652.

Perls, T., Shea-Drinkwater, M., et al. 2000. **"Exceptional Familial Clustering for Extreme Longevity in Humans."** *Journal of the American Geriatric Society* 48:1483-85.

Perls, T., Silver, M., and Lauerman, J. 1999. ***Living to 100: Lessons in Living to Your Maximum Potential at Any Age.*** New York City: Basic Books.

Perls, T., Wilmoth, J., et al. 2002. **"Life-Long Sustained Mortality Advantage of Siblings of Centenarians."** *Proceedings of the National Academy of Sciences USA* 99:8442-47.

Puca, A., Daly, M. J., et al. 2001. **"A Genome-Wide Scan for Linkage to Human Exceptional Longevity Identifies a Locus on Chromosome 4."** *Proceedings of the National Academy of Sciences USA* 98:10505-508.

Silver, M. H., Jilinskaia, E., and Perls, T. 2001. **"Cognitive Functional Status of Age-Confirmed Centenarians in a Population-Based Study."** *Journal of Gerontology: Psychological Sciences and Social Sciences* 56B:134-P140.

# THE *LIVING TO 100* LIFE EXPECTANCY CALCULATOR

Reprinted with permission by the author from *Living to 100: Lessons in Living Your Maximum Potential at Any Age* (New York: Basic Books, 1999).

*We designed the Life Expectancy Calculator to translate what we've learned from studies of centenarians and other longevity research into a practical tool for individuals to estimate their longevity potential. Better scores indicate a reduced risk of disability toward the end of life. Of course, no one can guarantee either continued health or longevity. However, everyone should be aware of the factors that increase or decrease mortality and disability risk. Some of these are under individual control, and people who want to live longer, healthier lives should try to fashion their lifestyles accordingly.*

*The average person is born with strong enough longevity genes to live to age 85 and maybe longer. People who take appropriate preventive steps may add as many as 10 quality years to that. People who fail to heed the messages of preventive medicine may subtract substantial years from their lives.*

To use this calculator, add your negative and positive scores separately.

1. Do you smoke or chew tobacco, or are you around a lot of secondhand smoke? If yes . . .	<b>-10</b>	Do you smoke or chew tobacco, or are you around a lot of secondhand smoke? If no . . .	<b>+1</b>
2. Do you eat more than a couple of hot dogs, slices of bacon, or a bologna sandwich a week? If yes . . .	<b>-3</b>	Do you stay away from processed meat? If yes . . .	<b>+2</b>
3. Do you cook your fish, poultry, or meat until it is charred? If yes . . .	<b>-2</b>	Do you minimize the amount of meat in your diet? If yes . . .	<b>+7</b>
4. Do you use butter or cream regularly? Do you eat cheese or fried foods regularly? If yes . . .	<b>-5</b>	Do you stay away from butter, cream, and other saturated fats, as well as fried foods? If yes . . .	<b>+7</b>
5. Do you drink wine and liquor in excess? If yes . . .	<b>-5</b>	Do you drink one glass of red wine daily? If yes . . .	<b>+2</b>
6. Do air pollution warnings occur where you live? If yes . . .	<b>-4</b>	Do air pollution warnings occur where you live? If no or rarely . . .	<b>+3</b>
7. Do you drink more than 16 oz of coffee a day? If yes . . .	<b>-3</b>	Do you take an aspirin a day? If yes . . .	<b>+4</b>



8. Do you floss your teeth every day? If no . . .	-4	Do you floss your teeth every day? If yes . . .	+4
9. Do you have a bowel movement less than once every two days?  If yes . . .	-4	Do you make a point of eating plenty of fruits, vegetables, and bran every day, preferably in place of foods that are bad for you? If yes . . .	+7
10. Do you engage in risky sexual or drug-related behavior that increase your risk of getting HIV or a cancer-related virus? If yes . . .	-7	Do you engage in risky sexual or drug-related behavior that increase your risk of getting HIV or a cancer-related virus? If no . . .	+1
11. Do you try to get a suntan?  If yes . . .	-4	Do you avoid the sun and use sun block? If yes . . .	+3
12. Are there dangerous levels of radon in your house?  If yes . . .	-6	Have you checked and found that there is no detectable radon in your house? If yes . . .	+1
13. Does your body mass index* put you in the obese category? If yes . . .	-10	Does your body mass index* put you in the lean category? If yes . . .	+10
14. Do you live too far away from other family members for visits to be spontaneous? If yes . . .	-4	Do you live near enough to other family members that you can drop by spontaneously? If yes . . .	+5
15. Does stress bother you to the extent that you can't seem to shake it of?  If yes . . .	-7	Can you shed stress? This might be by praying, exercising, meditation, being able to respond to humor, or by other means. If yes . . .	+7
16. Does more than one member of your immediate family have diabetes? If yes . . .	-4	Is there diabetes in your family? If no . . .	+1



17. Were both of your parents dead or very frail by their 70s?		Is there more than one of the following relatives in your family who have reached at least age 90 in excellent health: parents, aunts/uncles, siblings, grandparents?	
If yes . . .	-10	If yes . . .	+10
18. Are you a couch potato (no regular aerobic or resistance exercise)?		Do you exercise 20 minutes or more a day?	
If yes . . .	-6	If yes . . .	+6
19. Do you take vitamin E (800 IU/day) and selenium (200 mcg) daily?		Do you take vitamin E (800 IU/day) and selenium (200 mcg) daily?	
If no . . .	-5	If yes . . .	+5

Divide each of the two scores (negative and positive) by 5.

75 = 15	50 = 10	25 = 5
70 = 14	45 = 9	20 = 4
65 = 13	40 = 8	15 = 3
60 = 12	35 = 7	10 = 2
55 = 11	30 = 6	5 = 1

Now, add the negative score to the positive score for an estimate of the number of years you should add or subtract from your life expectancy.

For example:

$$-25 / 5 = -5 \text{ (negative score divided by 5)}$$

$$75 / 5 = 15 \text{ (positive score divided by 5)}$$

$$-5 + 15 = 10 \text{ (negative score added to positive score)}$$

$$10 + 85 = 95 \text{ (final score added to life expectancy)}$$

For most men, life expectancy is about 84 years, and for most women, about 87 years.

**\_\_\_\_ Years added to or subtracted from your life expectancy**

*\*To calculate your body mass index determine your weight in kg (pounds/2.2) and height in meters (inches x 2.4/100) and then calculate your BMI as kg/m<sup>2</sup>. A BMI > 27 would qualify as "obese." A BMI < 24 would be "lean."*

# 2003 MINDALERT AWARDS

**T**he ASA-MetLife Foundation MindAlert Awards were established to recognize innovations in mental fitness programming for older adults. Based on research showing that cognitive decline is not inevitable with aging, these awards recognize programs, products, or tools that promote cognitive fitness in later life. The programs are judged for their innovation, their basis in research, demonstration of their effectiveness, potential for replicability, and the extent to which the programs are accessible to diverse populations of elders.

This year's awards were given in three categories: Normal Mental Fitness, Early-Stage Dementia Programs, and Innovative Older Adult Learning Programs.

## **NORMAL MENTAL FITNESS**

CyberSeniors/CyberTeens CyberHealth  
CyberSeniors.org  
Portland, Maine

CyberSeniors/CyberTeens CyberHealth is a unique, intergenerational partnership among CyberSeniors.org, the AARP National Retired Teachers Association, the National 4-H Organization, Maine Health, Maine Partnerships for Healthy Aging, the University of New England's Health Literacy Center, Harvard University's Geriatric Education Center, and the NIH/National Library of Medicine.

The coalition's purpose is to raise awareness of the many ways computer and Internet technologies can help elders retain their independence as they age, provide training resources that allow elders to develop computer skills at their own pace, teach elders how to locate and use meaningful content regarding their health and well-being on the Internet, and communicate safely online.

Available in Spanish and English, CyberHealth is an inclusive, community-based, interactive health literacy program that teaches elders to use computers to obtain, interpret, and understand basic health information and resources available to them on

the Internet so that they can become partners in their healthcare. The project addresses a major barrier to health literacy in elders: the wasted potential of the Internet to empower elders to take charge of their health, due to their inability to use computers and their inability to find and read most of the health information on the Internet. CyberSeniors has a successful educational tool in place that uses hands-on workshops, features an interactive website ([www.cyberseniors.org/cyberhealth](http://www.cyberseniors.org/cyberhealth)), and makes elders eager to learn.

## **EARLY-STAGE DEMENTIA PROGRAMS**

Creativity and Dementia  
Dalia Gottlieb-Tanaka, Consultant  
West Mall Vancouver,  
British Columbia

Creativity and Dementia, developed by Dalia Gottlieb-Tanaka, builds on a program promoting creative expression for older adults with early-stage dementia, providing them with opportunities to socialize, express, be heard, and be valued. Two components of this program were recognized for the award in the area of early dementia: an educational training workshop for caregivers of older adults with dementia, and an exhibit of art produced by elders with dementia scheduled to travel across Canada and the United States.

The workshops, already in progress, are presented by Gottlieb-Tanaka and her adviser, Jeff Small of the University of British Columbia. The workshops are offered to community-based professionals and to formal and informal caregivers. They consist of four segments:

- A brief overview of the neurological, cognitive, and psychosocial aspects of dementia and how these relate to creative expression
- The program of creative expression, which includes a historical background and examples from sessions with elders in which principles and strategies that facili-



tate creative expression are discussed

- Audience participation in a simulated session that provides hands-on understanding of the content and process of the creative expression program

- Questions, discussion, and workshop feedback

The traveling art exhibit began in 2003 at the Ferry Building Gallery in West Mall Vancouver, B.C., and finishes with an exhibit and education seminar at the Harbor-UCLA Medical Center, Torrance, Calif. The goal of this exhibit is to increase public awareness and appreciation for the capacity of elders with dementia to use their remaining abilities for creative expression.

### **INNOVATIVE OLDER ADULT LEARNING PROGRAM**

Autobiographical Studies Program  
University of California, Los Angeles,  
Center on Aging and UCLA  
Extension, Education Division  
Los Angeles, California

The UCLA Autobiographical Studies Program is designed to help reduce the confusion and uncertainty that middle-aged and older adults often experience in a rapidly changing society. For many people, the later years of life can provide the best years in terms of new activities such as volunteering, learning, and expanding personal relationships.

The courses in the program—Guided Autobiography, Guided Autobiography II, e-GAB, Life Portfolio, and Family His-

tory—are designed to release the cognitive and motivational potentials of pre- and post-retirees. Participants become aware of the life they have lived and become more confident and optimistic about facing the years ahead. The organizers hope to encourage the emergence of late-life bloomers among people who until recently have been preoccupied with life obligations and are now free to use their latent talents. Many current and past participants report that they feel empowered in their self-knowledge and are forging new friendships, beginning new endeavors, and pursuing new interests.

### **AWARDS REVIEW COMMITTEE**

ASA thanks the members of the Mind-Alert Awards review committee for their work in reviewing submissions: **Sandra Cusack**, Gerontology Research Centre, Simon Fraser University, Vancouver, B.C.; **Marian Diamond**, Integrative Biology Department, University of California, Berkeley; **Nancy Emerson Lombardo**, Center for Research on Women, Wellesley College, Wellesley, Mass.; **Marge Engelman**, University of Wisconsin, Madison; **Barbara Ginsberg**, My Turn Program, Kingsborough Community College, Brooklyn, N.Y.; **Paul Nussbaum**, Neurobehavioral Services, Aging Research and Education Center, Mars, Pa.; **Arnold Scheibel**, Neurobiology Department, UCLA Medical Center, Los Angeles, Calif.; and **Beatrice Seagull**, Professor Emeritus, Rutgers University, New Jersey.

## ABOUT THE MINDALERT PROGRAM

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The American Society on Aging's MindAlert Program seeks to disseminate research and innovative practices that address the steps that older adults can take to maintain and enhance their cognitive and mental functions in their later years.

To support this ambitious goal, ASA established MindAlert with funding from MetLife Foundation and Archstone Foundation. The program, now in its fourth year, has the following components:

- An annual MetLife Foundation MindAlert lecture and booklet, which disseminate the latest research findings on maintaining and enhancing cognitive function in late life.
- Annual MetLife Foundation MindAlert Awards, which identify and recognize innovative community-based programs that translate research into practical cognitive-health-promotion activities.
- A clearinghouse of resources related to late-life maintenance and enhancement of cognitive and mental functioning.
- A cognitive-health-promotion curriculum that aging-services and healthcare providers can implement in a wide variety of settings with older adults.
- A trainers bureau and train-the-trainers program to facilitate the implementation of cognitive vitality programs in such settings as senior centers, adult learning programs in community colleges, and park and recreation programs.

If you would like more information about the MindAlert program, including its Web-based clearinghouse of resources on mental fitness, visit [www.asaging.org/mindalert](http://www.asaging.org/mindalert), or contact the American Society on Aging at [mindalert@asaging.org](mailto:mindalert@asaging.org).

### About the American Society on Aging

With 6,000 members, the American Society on Aging (ASA) is the United States' largest association of professionals in the field of aging. Founded in 1954, ASA's mission is to promote the well-being of aging people and their families by enhancing the

abilities and commitment of those who work with them. To that end, ASA sponsors a wide variety of conferences and offers annual networking opportunities and Web-based training. The society also publishes a bimonthly newspaper, a quarterly journal, and eight quarterly newsletters for its members. To obtain more information on ASA or to join, call (800) 537-9728 or visit [www.asaging.org](http://www.asaging.org).

### About the MindAlert Lecture Sponsor: MetLife Foundation

MetLife Foundation, established in 1976 by the Metropolitan Life Insurance Company, has been involved in a variety of aging-related initiatives. Since 1986, the foundation has supported research on Alzheimer's disease through the MetLife Foundation Awards for Medical Research program and has contributed more than \$8.5 million to efforts to find a cure. In addition, the foundation has provided support for a traveling exhibit on memory; a public education video for use by caregivers and families of people with Alzheimer's disease; and support for healthy-aging projects addressing issues of caregiving, intergenerational activities, health and wellness programs, and volunteer opportunities. MetLife Foundation supports health, education, civic, and cultural programs throughout the United States. For more information about the foundation, visit [www.metlife.org](http://www.metlife.org).

## MetLife Foundation



## **MindAlert on the Web**

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The MindAlert monographs from 2001, 2002, and 2003 are available on ASA's website at [www.asaging.org](http://www.asaging.org)

### **Good News About the Aging Brain!**

The MindAlert monograph for 2001 presents special lectures by the nationally known brain researchers Marian Diamond and Arnold Scheibel, who describe their ground-breaking research on brain function and the optimistic implications for successful aging.

### **Brain Health from 1 to 100**

In the MindAlert monograph for 2002, the special lecture by Paul Nussbaum, a leading clinical neuropsychologist, describes what he refers to as a health-promotion opportunity of unprecedented stature: our ability to foster our own "brain wellness" for healthy and functional aging.

### **Centenarians: Lessons on Living Long and Living Well**

In the MindAlert monograph for 2003, Thomas Perls, head of the renowned New England Centenarian Study, shares the findings of his research and talks about how we all can make our later years healthy, vital ones.

**Included** with all of the above are descriptions of the programs that won the 2001, 2002, and 2003 MindAlert Awards, sponsored by the American Society on Aging and the MetLife Foundation.

**O**ur culture alternately praises and fears extreme longevity. Is longevity due to genetic or environmental factors? Is everyone capable of living to 100? And why would we want to? In this monograph, Dr. Thomas Perls, head of the renowned New England Centenarian Study, shares the findings of his research—and talks about how we all can make our later years healthy, vital ones.

**MetLife Foundation**

