

## THE METHUSELAH REPORT

### *Living to be 120 might be attainable, but is it desirable?*

By Wayne Curtis

July-August 2004

"I believe extraordinary longevity is absolutely inevitable," says Donald Louria, a professor at the New Jersey Medical School. "It's not a matter of if we'll have extraordinary longevity, but when."

How old is old? The average life span of an American born today is 77.2 years. It has stretched by about three months every year since the mid-19th century, says Louria, who organized a recent conference on longevity and its implications. Just by maintaining that pace the average American would expect to live more than 100 years by the end of this century. And that doesn't take into account revolutionary advances in health and medicine, which, Louria says, could very well boost the average life span to 110 or 120.

But will the future "buy us more life, or just more days alive?" wonders Vincent Mor, chair of the Department of Community Health at Brown University School of Medicine. Mor is optimistic that we'll be living not only longer but more fully as we age. Recent studies suggest older people are remaining more independent later in life, demonstrating an increase in what he calls "active life expectancy."

The larger unknown is what exactly this society of centenarians will look like and how well it will function in an era when some Americans may expect to spend nearly half their lives in retirement.

Advances in longevity come in two forms. The first is the prevention of diseases—including heart disease, cancer, stroke and diabetes—that tend to affect older people. Eliminating deaths from these causes would increase the average life span by 10 to 20 years, Louria predicts. "The first to fall will be heart disease and stroke," he says. "It's not going to happen tomorrow, but it is going to happen in this century."

The oldest documented human lived to be 122. To make that age commonplace, however, will require more than curing disease. "It's only going to occur by preventing aging and modifying the aging process itself," Louria says.

### SECRETS OF AGING

When Ponce de Leon thrashed around the swamps of Florida in search of the Fountain of Youth, it turns out, he was in the wrong place. The secrets of aging are actually kept in a sort of complex biologic bank vault outfitted with multiple doors. Safecrackers

from various branches of medicine and science have been striving to get in, and the faint sound you hear is that of tumblers clicking into place.

**Will the future 'buy us more life, or just more days alive?'**

Geneticists are fiddling with one door. Richard Miller, associate director of the University of Michigan's Geriatrics Center, says that genetic variations in mice can add as many as 173 days to their lives. That's not trivial. Producing a map of the genetic variations that lead to longer life would allow researchers to devise drugs that can manipulate the aging process, Miller says. We're closer to achieving this, he adds, than "we are to eliminating cancer or heart attacks."

At work on another vault door are nanotechnologists. Nanotechnology involves engineering matter at the molecular level, building miniature machines atom by atom. While regarded as among the most speculative of current sciences, it may well usher in a sweeping technological change.

"Living things are composed of molecular machines, and the tools for diagnosis are huge and imprecise," says Christopher Wiley of the Dartmouth-Hitchcock Medical Center. Nanobiotics would eliminate that disparity of scale, allowing the creation of biological robots that not only permit observation of the human body at the most refined level possible, but that can serve as sentinels to identify and prevent disease before symptoms even appear. In time, more sophisticated nanobots could be manufactured to enhance tissue or strengthen frail bones within the body, reversing more debilitating aspects of aging.

Nanobots might even be programmed to maintain homeostasis, that is, to keep our cells in a state of perfect equilibrium. "In theory, science could preserve a body at its peak physical state," Wiley says.

"It's not that complicated," he insists. While this may sound like a futurist's fevered dream for the year 2500, Wiley points out that some nanotechnology companies are already on the brink of building tools to construct nanobots. Wiley predicts we'll see major advances in the nanotechnology of health care within the next decade or two.

RADICAL CALORIE CUTS

Only slightly less bewildering is the study of caloric restriction—or the radical curbing of calorie intake to extend life. This may be the most immediately promising door to altering the aging process. The approach is based on a simple if curious fact: Cutting the intake of calories by 30 to 40 percent has consistently resulted in significantly lengthening the maximum life span of laboratory animals. It has proved more effective than exercise.

Why? It's believed that a sharp drop in calories triggers a metabolic change that strengthens the immune system and increases our cells' capacity to produce new and healthy cells. Aging slows. One theory is that this mechanism evolved to help animals

survive the lean winter months and thus ensure they pass on their genes by producing offspring in the more bountiful days of summer.

Even if similar effects are eventually proved in humans—and tests are just getting under way—few would choose to live a life of permanent hunger, admits George Roth, a senior scientist at the National Institute on Aging. But already in the works, Roth reports, is research to create drugs that would mimic the effects of a very low-calorie diet, providing the benefits of restricted calories without the hardships.

"We call it having your cake and eating it, too," he says.

### WHAT IF IT WORKS?

That your grandchildren will have children who could reasonably expect to live a century or more is the good news. And the bad news? Some experts fear we may also be engineering a world that might not be such a grand place to live.

The U.S. Census Bureau projects the population over the age of 85 to reach 21 million in the year 2050. Other demographers predict a number in the neighborhood of 53 million within a half century. With such a range of projections, it's hard to know where to start the planning. "Imagine the policy implications," says Kevin Kinsella of the Census Bureau.

"Quality of life is the big issue," says Louria, whose specialties are preventive medicine and community health. "Are we going to have large numbers of very old people who are vigorous, reasonably healthy, involved and productive? Or are we going to have a large percentage of people who are lonely, bored, not very healthy and depressed?"

Making procedures like hip replacement and cataract surgery routine are notable steps toward longer, fuller lives. Simple objects can bring welcome freedom for a great many older people, too. "The microwave oven is probably one of the most important things that has actually contributed to a reduction in dependence," Mor says, as have well-designed walkers that reduce the need for in-home assistance. "It's a very low-tech device but has a fairly substantial effect."

As the tools for longer living evolve, so too must the nation's patterns of housing, work, family relations and transportation. Having "lots of single-family homes and getting among them by SUV" may work well for people in their 40s and 50s, but it's "calamitous" for older people, says Bruce Vladeck, professor of health policies and geriatrics at the Mount Sinai School of Medicine in New York. "We have built a set of communities over the past few years to maximize social isolation."

Vladeck notes that informal care—that is, families tending elderly relatives at home—now accounts for between 66 and 85 percent of all care for those requiring assistance. But

with the rise of what some call "the super senior," he wonders if 80-year-olds will be able to care for their 105-year-old parents, or if 50-year-old grandchildren will be willing to accept responsibility for the care of family elders. "No one has seen this phenomenon before," he says.

Work patterns will also alter sharply, with more people working longer. Retirement at 65 became institutionalized decades ago when younger workers flooded the job market. With labor shortages now forecast, Vladeck predicts that corporate and government policies will likewise change to discourage retirement, so more older Americans will find incentives to remain in the work force.

Then there's that elephant in the room: How will society pay for expanded health care, retirement benefits and the building of new communities to serve the very old? "When 30 to 40 percent of the population is over age 65, and 40 to 50 percent of adult life is spent in retirement," Louria points out, "Social Security and company pensions are not likely to be viable." Knight Steel, chief of the division of geriatrics at Hackensack University Medical Center, poses another question with no easy answer: "Who will pay for the heart transplant of a 100-year-old?"

The debate over these issues is just beginning. But before hand-wringing becomes too prevalent, maybe we should step back and take a longer view of the looming breakthrough in longevity. "In some basic ways, this is what society has sought since its inception," Vladeck says. "Rather than focus on the gloom and doom, maybe we ought to start out with the celebratory aspect of these changes."

Champagne, anyone?