HEALTH AND STRESS

The Newsletter of
The American Institute of Stress

Number 4 April 2010

STRESS, HEALTHY AGING & CLUES FOR LIVING TO 100

KEYWORDS: Methuselah gene, Alexander the Great, "The Wandering Jew", Paracelsus, Ponce De Leon, David Copperfield, James Hilton, "zest for life", stable lifestyles, Milano and INDY genes, "founder effect", pogroms and the Holocaust, CETP, humanin, IGF-1, sirtuin, genetic testing scams

Why do some people live so much longer and healthier lives than others? Heredity is obviously an important influence, since extreme longevity seems to run in families. The Bible tells us that Methuselah, who had very long-lived ancestors dating back to Noah, allegedly died at the age of 969 and begat Lamech when he was 187 years old. Support comes from unique Iceland birth and death records going back to the Vikings, showing that individuals who lived to be over 90 were much more likely to be closely related than controls with average life spans. Researchers later identified a "Methuselah" longevity gene that also seemed to confer prolonged fertility.

Also Included In This Issue

The Boston New England Centenarian Study had previously reported that all the centenarians studied had similar genes that protected them from age-related conditions, including heart disease, cancer and dementia. Siblings were four times more likely than average to reach 90 and their children lived 10 -15 years longer than the norm. Brothers had a 17-fold greater chance of living to 100 and sisters had an 8 times greater likelihood. Fertility also persisted longer in centenarians.

There have been numerous accounts of very elderly men who fathered children, but verifying this is very difficult for obvious reasons. However, many centenarian women had a history of bearing children after the age of 35 and even 40 years. Studies show that a woman who has a child naturally after the age of 40, has a 4 times greater chance of living to 100 compared

to controls who do not. From an evolutionary perspective, it has been suggested that women who give birth after the age of 40 need to live longer to take care off their offspring. However, it is more likely that this merely reflects that their reproductive organs age more slowly along with other structures and systems in the body. One of the most significant findings of this study was that **90 percent of centenarians remained functionally independent up until an average age of 92 years**. **Almost a third had no change in memory loss, thinking abilities or other cognitive functions and disorders common in the very elderly**, suggesting that their longevity genes had also slowed down this aspect of biological aging.

Healing Waters, The Fountain Of Youth And Elixirs Of Life And Longevity

As an old adage states, "Everyone wants to live long, but none would grow old." The belief in an elixir of life that could confer extreme longevity or even immortality has been a recurrent theme in the oldest records available from ancient cultures. *The Epic of Gilgamesh*, which describes a mythical 22nd century B.C. Mesopotamian king's quest for an eternal youthful life, is still preserved in eight clay tablets. Early Chinese alchemists believed that long-lasting precious substances such as jade, and especially gold, would transfer their longevity and non-tarnishing properties to those who consumed them. There are various ancient Greek, Egyptian and Chinese writings describing legendary figures who drank liquid gold, or "the white drops" to achieve immortality. According to some historians, Alexander the Great invaded India in 327 B.C. to search for a river of gold said to provide such rewards. The Old and New Testaments describe biblical individuals who achieved immortality and some view such elixirs as a metaphor for the spirit of God, citing Jesus' reference to "The Water of Life" and "The Fountain of Life." In more recent times, distilled "liquid gold" became available as *uisge beatha* ("water of life), the Gaelic name for whiskey.

The term elixir, which first appeared in the 7th century, is derived from the Arabic *Al-Ikseer*, and the elixir of life from *Exeer Al-hayat*, which in turn, came from the Persian *Aab-e-Hayaat*. Other cultures referred to it as Persian "dancing water". In India, it was known as *Amrit*, the Nectar of Immortality, which the Sikhs used in baptismal ceremonies. Medieval alchemists, including Sir Isaac Newton, were preoccupied with finding the "philosophers' stone", a substance that could not only turn base metals into gold, but also an elixir of life that had rejuvenation properties that might last forever. The most famous alchemist was Paracelsus, a physician whose 1570 *De Tintura Physicorum* described a tincture that would enable people to live for centuries. Two hundred years later, the Comte de Saint-Germain, an alchemist and magician with a mysterious past, claimed to have developed a similar elixir of life that prevented him from aging. He was much sought after in Paris by the wealthy and nobility, including King Louis XV and

Madame Pompadour, and allegedly predicted the French Revolution. Many believed he was really "The Wandering Jew", a popular figure in medieval Christian folklore, who taunted Jesus on the way to the Crucifixion, and had bee condemned to walk the earth until the Second Coming.

The rumor of a river of gold that prompted Alexander the Great to invade India resurfaced 15 centuries later in a widely circulated letter from Prester John, a priest who ruled a peaceful "land of milk and honey" in "the three Indias", **which had a river of gold that was a fountain of youth**. It was now in danger of being taken over by barbarians and he pleaded for help from Christian Europeans. In 1177, Pope Alexander III sent emissaries to its presumed location to determine what was required. Although their search was futile, some of the elders they encountered during their quest had heard similar stories. Subsequent expeditions also failed to find Prester John. Herodotus, the 5th century B.C. Greek historian, wrote of a fountain containing a very special kind of water located in the land of the Ethiopians that was responsible for their exceptional longevity. This is referred to in the Qur'an, which also tells the story of the Zamzam well that is visited on pilgrimages (*Haji*) to the holy city of Mecca, which is required of all Muslims. According to Islamic belief, this gift from God miraculously and suddenly appeared in the desert thousands of years ago when Ibrahim's infant son Ishmael was thirsty, and kept crying for water. Ishmael was the grandfather of the prophet Mohammed, who was prone to frequently pouring Zamzam water on his head as well as drinking it. He also carried vessels and occasionally large containers of this holy water to be consumed or applied to the sick, stating, “The water of Zamzam heals whatever it is drunk for.” Similar claims were later made that water from Lourdes, Fatima, Guadalupe and other Catholic sacred shrines were "good for whatever ails you". The pool of Bethesda, where Jesus cured a man who had been lame for almost four decades was also believed to have healing powers for all ills.

The quest for a fountain of youth intensified in the 14th century by *Mandeville's Travels*, a very popular book designed to guide Christians making a pilgrimage to Jerusalem following the last Holy Crusade. The alleged author, Sir John Mandeville never existed, and the book consisted of tales and myths from varied sources that described Prester John's fountain of youth kingdom and other earthly longevity paradise sites reminiscent of The Garden of Eden. Stories of similar youth restoring waters circulated among the natives of the Caribbean, who told early European explorers of the remarkable powers of the water in a mythical island called Bimini. The name linked most closely to the search for a fountain of youth is Juan Ponce de Leon, who sailed on Columbus' second expedition to America but stayed in Santo Domingo and later became Governor of Puerto Rico. He set out with three ships to find the Bimini fountain of youth and after unsuccessful stops

at two islands, spotted the East coast of Florida on Palm Sunday, April 2, 1513. He named the land *Pascua de Florida* (feast of flowers), the Spanish name for the Easter season. The site where he landed was St. Augustine, which is the oldest U.S. city and port and the home of the Fountain of Youth National Archaeological Park. This has been a tourist attraction for over one hundred years because of a natural spring that some local residents still claim promotes longevity. The search continues, since in 2006, the American magician David Copperfield purchased four small islands in the Exuma chain in the Bahamas because of their magical natural water fountains. He told the press, "I've discovered a true phenomenon. "**You can take dead leaves, they come in contact with the water, and they become full of life again. Bugs or insects that are near death, come in contact with the water, they'll fly away.** It's an amazing thing, very, very exciting." He has hired scientists to conduct a thorough analysis of the water to confirm and explain these phenomena, but the islands are off limits to outside visitors.

Sir Robert McCarrison's Hunzas And The Search For Shangri-La

There had always been legends and folk tales about places around the globe with pockets of people that never seemed to grow old. One of the most persistent were rumors of a "lost race" called the Hunzas, who lived in a remote valley hidden in the high Himalayas bordering India. Because of the surrounding ice-covered mountains, it could only be reached two or three months a year after several days of a dangerous trek on foot led by an experienced guide. Explorers and others who made this formidable journey returned with incredible stories of an earthly paradise that had been isolated for 2,000 years, where the inhabitants remained youthfully active for as long as they lived, which was allegedly well over 100 or 200 years. As might be expected, as these accounts were retold over and over for decades, details became exaggerated, leading to heightened interest in the Hunzas.

The first scientific studies of Hunzas were made by Robert McCarrison, a very qualified British physician, who had been assigned to the Indian Medical Service in 1901. Not long after he arrived at his post in the Kashmir valley, he identified the cause of "three day fever", a mysterious malaria-like disorder, as being due to sandfly bites, and it is still known as sandfly fever. McCarrison subsequently carefully examined and followed 11,000 Hunza natives in Kashmir from 1904-1911, and kept detailed records. He was amazed by their remarkable health and vitality and wrote

> My own experience provides an example of a race unsurpassed in perfection of physique and in freedom from disease in general. I refer to the people of the State of Hunza, situated in the extreme northernmost point of India [now part of Pakistan]. Amongst these people the span of life is extraordinarily long. During the period of my

> association with these people, I never saw a case of asthenic dyspepsia, of gastric or duodenal ulcer, or appendicitis, or mucous colitis, or cancer.

He described individuals well into their ninth decade who retained the looks, physique, athletic abilities and endurance they had thirty or forty years earlier. Heart disease and cancer were rare, and he later attributed this to their diet that was "far removed from the refinement of civilization" and that they had been "endowed with a nervous system of notable stability" [resistant to stress]. McCarrison later served as personal physician to King George V, was knighted for his studies, and retired as a Major General in the Indian Medical Service where he had established a nutritional laboratory.

James Hilton had visited the Hunzas shortly before writing *Lost Horizon*, a story that describes a valley called Shangri-La, where peace and happiness abound, and its residents live for hundreds of years but never seem to grow old. The description of this fictional Utopia nestled in a very high mountain range fits the Hunza valley, and Shangri-La was derived from Tibetan words signifying a mountain pass. *Lost Horizon*, appeared in 1933, and proved so popular that it became the first major book published in paperback. The 1937 movie *Lost Horizon* was nominated for seven Academy Awards and won two Oscars. It was remade as a big-budget musical in 1973 featuring numerous celebrities, including Charles Boyer, John Gielgud and Peter Finch. President Roosevelt was so enamored of Hilton's novel that he named the presidential retreat, now known as Camp David, "Shangri-La" in 1942. Later that year, U.S bombers that were secretly launched from an aircraft carrier struck Tokyo in a daring raid led by Colonel Jimmy Doolittle. Because this was far out of range of any American bomber base, the press asked Roosevelt where they had come from, and his response was "Shangri-La". One of the aircraft carriers used in the Pacific Ocean was subsequently named USS Shangri-La. The estate of heiress Doris Duke near Diamond Head just outside Honolulu that began construction in 1937 was also named "Shangri-La". She eventually commissioned and collected over 3,500 objects d'art and artifacts for the main house, which is now owned by the Doris Duke Foundation for Islamic Art and remains a popular tourist attraction.

Because of all the publicity, skeptical scientists and physicians wondered whether the Hunzas lived up to the hype. Dr. Paul Dudley White, the premiere clinical cardiologist of his era, who treated President Eisenhower's heart attack, decided to find out. Along with another Harvard Medical School colleague, he made the long trip up the steep mountain paths to Hunza toting a portable, battery-operated electrocardiograph. In a December, 1964 *American Heart Journal* article, they reported that they had carefully examined and studied 25 Hunza men, **who were "on fairly good evidence, between 90 and 110 years old." Not one of these men**

showed a single sign of coronary heart disease, high blood pressure or elevated cholesterol. Dr. Allen E. Banik, an eye specialist, had also made the arduous journey to Hunza, and in his book *Hunza Land*, wrote "It wasn't long before I discovered that everything that I had read about perpetual life and health in this tiny country is true. . . . **I examined the eyes of some of Hunza's oldest citizens and found them to be perfect. . . . Many Hunza people are so strong that in the winter they exercise by breaking holes in the ice-covered streams and take a swim down under the ice."** Other intrepid visitors told of their amazement at seeing men 80, 90, and 100 years old repairing the constantly crumbling rocky roads, and lifting large stones and boulders to repair the retaining walls around their terrace gardens. They thought nothing about playing a competitive game of volleyball in the hot sun against men 50 years their junior or actively participating in strenuous polo contests so violent, they would make today's professional ice hockey brawls look meek.

Alexander Leaf's Travels To Confirm And Explain Centenarian Claims

As noted, previously, pockets of people elsewhere were said to contain large numbers of centenarians that enjoyed the same healthy longevity benefits as the Hunzas. These included the Vilcabamba Indians in valleys of the Ecuadorian Andes, Abkhazians in the Caucasus Mountains of Georgia (USSR), and Tarahumara Indians in the "Copper Canyons" of the Sierra Madre Mexican mountains. During the Cold War, Stalin upheld claims of people in his native Georgia living beyond 160, but as *The Guinness Book of World Records* has warned, "**no single subject is more obscured by vanity, deceit, falsehood, and deliberate fraud than the extremes of human longevity**." The Hunzas had no birth date documents, and it was not clear if these other sites had reliable records, and scientists wondered if these centenarian stories were true. If so, were there similar attributes that might provide useful clues on how to retard the aging process? Alexander Leaf, Chief of Staff at Massachusetts General Hospital and Jackson Professor of Medicine at Harvard had been particularly interested in this and had visited some of these alleged centenarian sites. In 1970, because of his prestige, he was invited by *National Geographic Magazine* to do a series of articles on this accompanied by one of their top photographers and other staff members to facilitate his journeys. He decided to visit three; Abkhazia in the Caucasus Mountains of southern Russia, now the Republic of Georgia, Vilcabamba in the Ecuadorian Andes, as well as Hunza in northern Pakistan.

Leaf's observations first appeared in a 1973 *National Geographic Magazine* sensational cover story entitled "Every Day Over 100 is a Gift." It highlighted his experience in the Caucasus, since these centenarians had the most valid birth and marriage documents, had been extensively studied by Russian gerontologists, and seemed to have the highest concentrations of certified

centenarians. The baptismal documents of Catholic Ecuadorian Vilcabambas were scanty, some were suspect, and Hunza estimates of age were largely based on memory with little written substantiation. Three of the photographs from this article and descriptions of these individuals are reproduced below.



Left: Gabriel Chapman, age 117, carrying a pail of harvested potatoes up a steep and long Abkhasian hill that exhausted Leaf, who struggled to keep up with him. Chapman's prescription for longevity: "Active physical work, and a moderate interest in alcohol and the ladies."
Middle: Khaf Lasuria is a 130-year-old Georgian woman who had reluctantly retired two years earlier from her tea-picking job. She still smoked a pack of cigarettes daily and drank liberal amounts of vodka, starting with a shot before breakfast.
Right: Tulah Beg, an elderly Hunza, who claimed to be over 110, flanked by his sons. both of whom are in their late sixties. Leaf was impressed how they shouldered his heavy cases of photo gear and "bounded over the forbidding terrain like agile mountain goats." Note his thick red beard and vigorous appearance.



Prior to Leaf's visit, claims had circulated about some Abkhasians who lived 150 or more years. A few years earlier, *Life* magazine ran an article with photographs of Shirali Muslimov, **born in 1805, which made him 168 years old when he died in 1973**. Leaf never met him, but included the one above on the left showing him listening to a transistor radio. The other two photos, also from the late 1960s, show Shirali chopping wood, and with his 120-year-old third wife, whom he had married over 100 years previously. Both of his parents were centenarians and his brother had died at age 134.

The oldest person Leaf interviewed, was Khaf Lasuria, the former tea-picker who smoked and drank vodka, and had also been featured in the *Life* article. Leaf was anxious to meet her and found her in the Abkhasian village of Kutol, where she sang in a choir made up entirely of centenarians. She was less than five feet tall, and although she carried a handsomely carved walking stick as seen in her photo, she was sprightly and agile and hardly used it. Her memory was excellent both for recent and past events, as she spoke lucidly about her life. When she was 75 to 80 she served as a midwife and assisted more than 100 babies into the world. She explained that "Women had a very difficult time before the Revolution; we were practically slaves." Not surprisingly, she ended the interview with a vodka toast, "I want to drink to women all over the world . . . for them not to work too hard and to be happy with their families." She said she was 141, and while greatly impressed by her charm and spirit, Leaf did not take her word, and after a lengthy investigation, estimated her age to be closer to 130.

Such exaggeration in the very elderly is quite common. People, especially women, tend to claim they are younger, when they are approaching middle age and beyond, but after they reach 80 or 90, it is the reverse. The *Guinness Book of World Records* states, "In late life, very old people often tend to advance their ages at the rate of about 17 years per decade." This is often done to increase prestige or social status, and in the case of many of these longevity sites, to increase tourism. When Leaf visited Vilcabamba in 1971, one elderly individual told him he was 122, but three years later, claimed he was 134. In the interim, Ecuadorian tourism had skyrocketed as groups poured in anxious to visit what was now called "The Valley of Longevity", and to drink, buy or bathe in the local mineral waters that had been touted as providing this benefit. A Japanese company was planning to build a spa and health restoration center in the middle of the valley and business at nearby hotels shops and restaurants was booming. The 1971 Vilcabamba reported that there were 9 centenarians/1000 people, (compared to 3/100,000 in the U.S). Of the roughly 820 centenarians that presumably existed in 1971, a thorough investigation three years later revealed that baptismal records had been forged or altered and not a single centenarian could be found. The oldest person was 96 and the average age of those claiming to be over 100 was 88. In 1982, Leaf agreed that despite his and his team's efforts to verify true ages, they had been hoodwinked.

With respect to certified centenarians in the Caucasus, it appeared that only those who were married attained extremely old age. They generally ate less, but many regularly drank homemade grape vodka and wine and a few smoked or had been smokers. A 110-year-old Armenian Georgian told him, "If one wants to be healthy, it is obligatory to drink one liter (34 ounces) of wine daily and on holidays and weddings, 17-20 tumblers are customary."

Most agreed that active physical work was important, as was being happy and free from or not being upset about stressful things they couldn't control. Leaf concluded there were **three common centenarian characteristics**.

1. **Heredity**: Most said that their parents and siblings had also enjoyed unusual longevity.
2. **Diet**: Although this varied in these locales, caloric intake tended to be between 1,200 and 2,000 calories a day of simple foods. There was little fat intake, but this may not have been by choice, since most were poor and never saw a marbled piece of meat, much less ice cream.
3. **Physical Activity**: This had little to do with strength in lifting weights or being able to run faster, but rather endurance that came from regular but not strenuous activities, like walking, especially up hills. Leaf took up jogging after he returned from this assignment.

All of these factors were well known, but Leaf discovered a **fourth**, which he described as "**A zest for life**". The very elderly generally seemed quite content and happy, but a 110-year-old retired hunter mourned the fact that he was not 15 years younger. Leaf attributed this to the fact that if you don't feel useful or needed, life is not meaningful and you are not as likely to live to a very advanced age. He frequently asked centenarians if there was anything they worried about, and that several said, "Sure, but there is nothing I can do about it. What's the sense of worrying about something I can't change?" In most of their villages, the very old were happy, their advice was often sought, and their opinions were respected.

Adding years to life is not as appealing as adding life to years. Few people would like to live longer if their last five or more years were spent suffering from Alzheimer's or some chronic disabling and painful disease. With respect to maintaining health there is an even more important **fifth** factor that Leaf failed to feature in his analysis – **a stable lifestyle and societal values**. All of these areas were fairly remote and difficult to get to, and there was very little change in lifestyle with respect to traditional dietary and occupational habits that had persisted for centuries. This was in sharp contrast to what had taken place in civilized societies, where the transfer of information about events taking place all over the world progressively accelerated. Most of the advances in machinery, tools and devices were primarily designed to make life easier or more meaningful, but as they were adopted, there were also significant societal changes that led to conflicts, as in the case of the Luddites. Time honored and deeply instilled traditions about values, as well as how to do things were abandoned and in some instances disappeared, with drastic health consequences. The British physician Cyril Donnison studied Kenyans in their native habitat and observed this when they began to adopt the white man's ways. As he noted in his 1938 *Diseases of Civilization*, there was an increase in hypertension, heart disease, diabetes, hyperthyroidism, peptic ulcer, cancer, constipation

and psychoneuroses, all of which are rare in primitive peoples where societal structures are stable. A half century later, Stewart Wolf confirmed this with a 25-year follow-up of his masterful Roseto study presented at our 1988 International Congress on Stress. Alvin Toffler, another Founding Trustee of the AIS, also predicted this in his 1970 best seller, *Future Shock*, which he defined as the individual's perception of "too much change in too short a period of time". Donnison suggested that this increased susceptibility to disease was due to the stress of pent up emotions that acted via the hypothalamus to disrupt autonomic nervous system and pituitary function, both of which were confirmed by Walter Cannon and especially Hans Selye's General Adaption Syndrome and his Diseases of Adaptation.

To Life, To Life, *L'Chaim* And Why Ashkenazi Jews Tend To Live Longer

Although Leaf believed that heredity was important, it was not necessarily a family affair, since in the Caucasus, there were Georgians, Azerbaijanis, Russians, Georgian Jews and Armenians all over 100. In addition, he told the press "There is no gene for longevity, only the absence of 'bad' genes – those that cause fatal disease." We now know that this is no longer true. A Kansas woman appears to be the only known person to have a Methuselah type gene inherited from both sides of her family. **When she was born, 7 of her great-grandparents were still alive and all her grandparents lived to their late 90s or into their 100s,** even though they had only one copy of the gene. Her unusual genetic makeup was discovered by accident in 1989, when she was 60 years old and had not seen a doctor for years because of her excellent health. She participated in a free cholesterol screening test being offered in her community and while the normal range of HDL "good" cholesterol is 40 to 60, her levels were over 230 on repeat testing, the highest that had ever been recorded. In keeping with the dogma of the day that still persists, it was erroneously assumed that her resistance to heart disease and other health benefits were due to the protective effects of high HDL. However, it is much more likely that this is merely a marker associated with her longevity gene. There is no evidence that artificially raising HDL lowers heart disease, and attempts to do this with new drugs or combinations have been halted due to adverse effects and increased deaths.

There are undoubtedly other individuals scattered around the world with a genetic makeup associated with cardioprotective and longevity effects, such as an Italian man who also had an extremely high total cholesterol and elevated HDL due to what was dubbed the Milano gene. The same was true for his entire family and many people in his town, who were descended from one couple and shared this unique mutated gene. It appeared that no matter what these individuals ate, no matter how high their cholesterol levels, it never caused heart disease. Long-lived Okinawans appear to share a different gene and the Boston centenarians have varied genetic profiles.

Others may have the INDY (I'm Not Dead Yet) gene mutation first described in fruit flies. A Dutch dowager, who was the world's oldest living person when she died in 2005 at age 115, attributed her longevity to a daily slice of pickled herring and a tumbler of orange juice. She supported herself and lived independently until she was 105 when she moved to an assisted living facility because of poor vision. Ironically, she had been very small at birth and was not expected to survive. At age 111, she contacted researchers to ask whether her body would be useful for research or teaching purposes. They described her as "an alert and assertive lady, full of interest in the world around her, including national and international politics and sports." A series of neurological and psychological examinations performed when she was 112 and 113 years old revealed no signs of dementia or problems with memory and concentration, and her mental performance was above average for adults aged 60 to 75. Postmortem studies revealed almost no evidence of atherosclerosis anywhere in her body, the number of brain cells was similar to those seen in healthy people aged 60 to 80, and there was no evidence of amyloid deposits or other abnormalities associated with Alzheimer's disease. No genetic analysis was reported, but there is no evidence that any of her ancestors or relatives were also long-lived.

Information on the important role of heredity has come from the ongoing Albert Einstein College of Medicine Longevity Genes Project study of several hundred New York Ashkenazi Jews. A surprising number of these live healthy lives well into their nineties and longer, and also retain their mental faculties. One 99-year-old from Yonkers, the home of The American Institute of Stress, recently recalled with crystal clear detail the trip he took to Los Angeles in 1938, 72 years ago. "I drove 3,000 miles to the coast, 3,000 miles back — all that within six weeks, in a 1937 Pontiac I bought for $1,002.00." Ashkenazis descended from medieval Jewish communities along the Rhine in Germany, and the Hebrew name for this region was Ashkenaz, so that Ashkenazi Jews are literally "German Jews." Many Ashkenazi Jews later migrated eastward, forming communities in Hungary, Poland, Belarus, Lithuania, Russia and other areas with foreign languages. As a result, these immigrants spoke a diversified Yiddish, which was basically a Germanic language with Hebrew influences. The majority of Jews who migrated from Europe to the U.S over the past 150 years have been Ashkenazis, who now represent the world's single largest concentration of this group. One problem facing the New York researchers is that there are subdivisions such as Jews from Galicia in the western Ukraine (Galitianers), and from Lithuania (Litvaks) that often have different characteristics as well as Yiddish dialects. In addition, over the last eight decades, Ashkenazi Jews have increasingly intermarried, both with Sephardic (Spanish) and other Jewish sects, as well as people from different faiths. Some adopted children from other ethnic

groups and raised them as Jews, and conversion to Judaism has also been increasing, so that Azhkenazis are now much more heterogeneous.

What did work in favor of the Longevity Gene Project was the "founder effect", which occurs when a population has a limited number of forebears and/or when subsequent events substantially reduces a population. A group whose ancestry includes either or both of these characteristics is more homogeneous in its genetic makeup and a much larger proportion of its individuals will exhibit similar distinctive genetic traits and mutations. For the past thousand years, the Ashkenazim were a reproductively isolated population, with little inflow or outflow from migration, conversion, or intermarriage with other groups. By the 16th century, almost all Ashkenazi Jews lived within the borders of the Polish-Lithuanian Commonwealth, which included much of present-day Lithuania, Belarus, Poland, Bessarabia, Ukraine, and parts of western Russia. This region corresponds to The Pale of Settlement created by Catherine the Great in an effort to remove Jews from Russia entirely unless they converted to Russian Orthodoxy. At its peak, this area had a Jewish population of over 5 million, which represented 40 percent of world Jewry. However, over the past 500 years, recurrent and persistent pogroms and more recently, Nazi extermination efforts such as the Holocaust, annihilated the vast majority of European Jews. As a result, the survivors are more homogeneous, since studies suggest that 40 percent of today's Ashkenazis come from just four "founding mothers." While they are more likely to share the same genes for healthy longevity, they are also at increased risk for Tay-Sach's and five other hereditary diseases.

The Longevity project researchers have shown that Ashkenazi centenarians and their offspring have a variation in the gene that regulates CETP, a protein that influences lipid levels as well as APOE, which has been linked to Alzheimer's. As a result, they tend to have higher levels of HDL, which is associated with decreased risk for heart disease, and appear to be up to 70 percent less likely to develop Alzheimer's disease resulting in increased HDL and also. This gene mutation was three times more frequent in Ashkenazis compared to the general population. Humanin is a natural protein that increases when brain tissue is injured, and has recently been found to have other neuroprotective effects. This includes resistance to Alzheimer's and r diseases associated with faulty insulin function, like Type 2 diabetes. Animal studies show that humanin helps the liver to metabolize glucose more efficiently, an insulin-like effect that is impaired in Type 2 diabetes, which accounts for over 90 percent of all diabetes in the U.S. Insulin resistant Type 2 diabetes and Alzheimer's increase significantly with age, and since Ashkenazi centenarians seem to be spared from both, researchers wondered if humanin might be responsible. Sure enough, they, as well as their offspring, had "notably higher levels" of this brain protection protein.

Another promising protein is insulin-like growth factor 1 (IGF-1), which has a molecular structure similar to insulin. It plays an important role in childhood growth and has anabolic effects in adults. A recent report stated "in female centenarians and their daughters, there seems to be a very subtle mutation in the IGF-1 receptor, which controls growth." Women shorter than 5-foot-3 have lower IGF-1 blood levels than controls 5-foot-7 or taller and are more likely to live longer. This was not true for male centenarians and while there is no explanation, researchers agree that centenarians are more apt to be short females. There may be numerous genes and related proteins that modulate telomere length at the tips of chromosomes, which determines longevity, but it is impossible to determine what each contributes. As one authority suggested, "From, say, 75 to 100, you probably need cumulative effects of 10 to 20 genes that each add a few years." There are lifespan genes in lower forms of life that can be altered to allow them to live ten times longer. Some are similar to our genes and several companies are working on modifications to increase human longevity, although a recent Federal court ruling against patents for human genes may hamper this.

There are also over 900 DNA based gene tests, some of which are helpful to health professionals for pre-natal or newborn screening for heritable diseases, or determining risk for breast cancer. But is it worth $3,000 to learn that the average risk for breast cancer is 12% and yours is 10%? The availability of DNA tests to consumers who send in a sample for their "profile" has resulted in numerous scams, such as providing "personalized" supplements to increase longevity and/or improve memory costing $1,200, which are readily available for $35.00. Gene testing is not regulated, and in one study, nine DNA swabs from the same individual had nine different results, even from the same laboratory. There are also fraudulent claims by companies that promise to predict whether you or your children are prone to addiction, environmental sensitivities, will have superior athletic abilities or intelligence and creative talents. C*aveat emptor* may be the best advice for now, but genetic tests could provide rewards in the future — so stay tuned!

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Health and Stress
The Newsletter of
The American Institute of Stress
124 Park Avenue Yonkers, NY 10703

ANNUAL SUBSCRIPTION RATE:

E-Mail.....$25.00

ISSN#108-148X

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