

*Research to promote a longer, healthier life for you, your children and your grandchildren.*



Vol. 9, Issue 5

## THE GROWING EFFECTS OF ALZHEIMER'S DISEASE

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Alzheimer's is the most common type of dementia, accounting for 60 to 80% of all cases. Early in the disease process, most patients diagnosed with Alzheimer's have difficulty remembering names and recent events, while later symptoms include impaired judgment, disorientation, confusion, behavior changes and trouble speaking, swallowing and walking. It is a degenerative and terminal disease for which there is no known cure. In its most common form, Alzheimer's afflicts individuals over 65 years old, although a less prevalent early-onset form also exists. An estimated 4.5 million Americans, more than half of them women, currently have Alzheimer's disease. Given the aging of the baby boomers and the growing numbers of the "oldest old," those 85 and above, that figure is expected to more than triple by the year 2050, when an estimated 13.1 million Americans will be living with the disease. For women, these statistics are particularly concerning.

Increasing age is the primary risk factor for developing Alzheimer's disease. In 2004, the

Alzheimer's Association's National Women's Report released a publication emphasizing that Alzheimer's disease has particular relevance for women. This is because the number of women living with the disease is twice as high as for men, simply because women live longer. On average, the life expectancy for women is 80 years versus 75 years for men. Based on this statistic, about half of all women over 85 will eventually be diagnosed with Alzheimer's disease.



*continued on page 4*

## WHO WE ARE

Kronos Longevity Research Institute (KLRI) is a not-for-profit, 501(c)(3) organization that conducts state-of-the-art clinical translational research on the prevention of age-related diseases and the extension of healthier human life. KLRI tests new strategies to detect and prevent chronic diseases associated with aging and investigates the effects of innovative interventions to slow the aging process and improve health outcomes for older persons. In addition, KLRI helps the medical and lay communities understand important aging issues. KLRI research findings support a healthier quality of life and a robust lifestyle in our senior years.

### **KLRI's Mission**

KLRI is dedicated to understanding the human aging process and preventing age-related disease. KLRI conducts and fosters research that moves basic discoveries into clinical practice and communicates our research results to scientific and healthcare professionals and to the public so that people may enjoy longer and healthier lives.

### **KLRI's Vision**

KLRI will be the leading independent research institute for translating basic discoveries on aging and longevity into improved preventions and treatments. We will be recognized as the thought-leader in the field of clinical gerontology and an authoritative source of sound scientific information.

### **Governance**

A distinguished board of directors, with a unique mix of scientists, longevity specialists, and community leaders govern KLRI. There is also a scientific advisory board of recognized international experts in medical and scientific fields, including nutrition, exercise, hormones, bone and joint diseases, cancer and heart disease.

### **What Is Translational Research?**

Translational research takes promising findings from the basic research laboratory and carries them forward into the clinical arena. It is the link between basic research (experiments done with animals or cultured cells, genes, etc.) and improved clinical care. It requires controlled studies of living human participants.

### **Contact Us**

To contact us, please call 602-778-7499 or visit our Web site at [www.kronosinstitute.org](http://www.kronosinstitute.org) or write to 2390 East Camelback Road, Suite 440, Phoenix, Arizona 85016



## DIRECTOR'S MESSAGE IN MEMORY OF CHRIS HEWARD

KLRI has lost a good friend. Christopher B. Heward, Ph.D. died on January 10, 2009 after a stormy 3-month battle with an aggressive cancer of the esophagus. Chris was a dedicated gerontologist and a superb laboratory scientist. He completed a BA at the University of Arizona with dual majors in Chemistry and Psychology in 1972, and then stayed on an additional year to earn a BS in Biology. Chris went on to graduate school at the same institution and was awarded an MS in Anatomy in 1977 and a PhD. in Biology in 1981, with his thesis work on the endocrine actions of melatonin and related peptides.

Never an "ivory-tower" academic, Chris found his niche at the interface of business and biomedicine, founding Emerald Research Laboratories, a biotech/nutraceutical company, working for a time with Dr. Gregory Stock at the UCLA School of Medicine's program on Medicine, Technology, and Society, and then becoming involved from its inception with the Kronos health care and health research companies. As President of the Kronos Science Laboratories, he conceived and pursued a variety of research and development projects aimed variously at early detection and prevention of age-related diseases and understanding and slowing the aging process. He was internationally recognized as a seminal thinker in the area of biological aging and was the author and co-author of numerous scientific articles and book chapters.

Chris brought to all his endeavors an astounding keenness of intellect and a broad-ranging interest in how things work. He was a consummate skeptic, with an incredibly sensitive nose for B.S. Chris loved a good debate; controversy was his métier. His watchword was, "Show me the data," which he would then mercilessly dissect. There was no possibility of slipping shoddy work or faulty thinking past Chris Heward. Yet, he was also an enthusiast. His excitement and commitment were infectious, consistently motivating those he supervised as well as his peers and collaborators to push harder and try new approaches.

It is hard to speak or write about Chris in the past tense. His was such a powerful and compelling presence that it does not seem possible he could be gone. His energy simply lit up the space wherever he was. His ready smile, his keen humor, and his concern for others, which contrasted with his loudly proclaimed self-reliant libertarianism, endeared him to all who had the privilege of knowing and working with him. The other great thing about Chris was you always knew where you stood with him. He said exactly what he thought and he meant what he said. Diplomacy was never his long suit.

No description of Chris would be complete without mention that, as busy as he was, he was also a loving husband and good friend to his wife Pam and the proud active father of five children, an adult son and daughter, a second daughter in college, and two younger boys, one in high school and the other in middle-school. Chris was never more himself than when at home relaxing with family and friends. He truly knew how to have a good time.

When Chris learned of his diagnosis, he attacked the problem in characteristic fashion, educating himself extensively, questioning everything and everyone, and trying novel and radical approaches to therapy, when it became apparent that conventional medical and surgical treatment had little to offer. He remained a critical realist to the end, and never gave in to despair or fell back on sentiment.

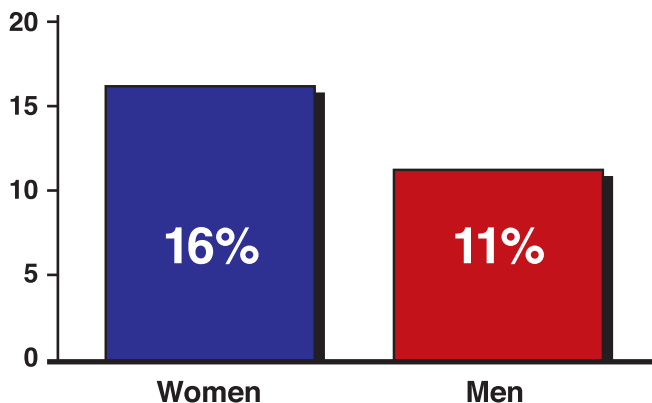
Chris led a busy, productive, and happy life. Chris' death seems tragically unfair, but he would have been the first to proclaim that the world is unpredictable and unjust. Chris didn't believe in divine justice here or hereafter. He had no expectation of "pie in the sky." Chris Heward made his own meaning and created his own purpose for being. He set a magnificent example of how to live life courageously to the fullest without illusion. He will be sorely missed.

*S. Mitchell Harman*  
S. Mitchell Harman, MD, PhD  
Director and President

## ALZHEIMER'S, CONTINUED

Figure 1

### Percentage of People Age 71+ with Dementia by Gender, ADAMS, 2002.



Currently, 14 percent of all people age 71 and over have dementia. As shown in Figure 1, this includes 16 percent of women and 11 percent of men in that age group. This means that in 2008, the number of women age 71 and over diagnosed with Alzheimer's disease exceeds the number of men diagnosed by more than 1.4 million (2.4 million women compared to about 1 million men). In a recent study conducted at the University of California at Irvine, scientists reported that not only are women more likely to become afflicted with Alzheimer's disease, but they are also more likely to live longer after they are diagnosed with the disease. In an interview with the New York Times, Dr. Maria M. Corrada-Bravo, the lead investigator of the study, stated that "increasing numbers of people are living to a very old age, especially women." Dr. Corrada-Bravo added, "basically we are seeing that there are going to be millions and millions of people with this condition."

The Alzheimer's disease epidemic does not only touch those women unlucky enough to be directly afflicted by the disease. In the family dynamic, women are often the primary caregivers. First, they are wives and mothers, sometimes caring for their children long after they are technically 'adults.' For many women, these years represent only a portion of their lifelong

caregiving responsibilities. The fact is, many women are also the primary caregivers when a parent or sibling is diagnosed with Alzheimer's disease, adding to the burden on women overall.

The Family Caregiving Alliance recently reported that the typical caregiver is a 46-year-old woman, married and working outside the home. Overall, she spends as much as 50 percent, or more, of her time giving care than male caregivers, providing an estimated \$148 to \$188 billion in unpaid care annually. Lisa P. Gwyther, the Director of the Bryan Alzheimer's Disease Research Center at Duke University Medical Center, recently reported that middle-aged and older women who provide care for an ill or disabled spouse are six times as likely to suffer depressive or anxious symptoms as compared to women who are not caring for an ill family member. Gwyther goes on to explain that the stress on women's health doesn't end, even when primary caregiving responsibilities subside. Researchers have reported that the changes in a woman's immune functioning may continue for up to two years after the person they were caring for dies. Additionally, moving a family member with Alzheimer's disease into a nursing home does not relieve the majority of stress on the primary caregiver. One recent study found no difference in depression, anxiety and the overall burden on families during or after the transition to a long-term care setting. Thus, not only do women constitute a disproportionate number of Alzheimer's disease cases, but they also bear the caregiving responsibility when those close to them are diagnosed.

At present, drugs designed to treat Alzheimer's disease are mainly cholinesterase inhibitors, which work by preventing the breakdown of acetylcholine in the brain. However, cholinesterase inhibitors alleviate only some symptoms and a positive response to treatment is seen in a considerably small subset of patients. An ideal treatment for Alzheimer's disease should be directed towards multiple mechanisms, have minimum

side-effects, and should result in clinically significant improvements in symptoms of Alzheimer's disease. Based on the above statistics and research, formulating a treatment strategy is of the utmost importance to women in particular.

### **How does estrogen affect cognition during menopause?**

Estrogen has been shown to have numerous beneficial properties. The discovery that estrogen may help the brain was made early in the 1970's when it was shown to promote development of axons and dendrites in brain slices. This growth helps brain cells communicate to each other by maintaining connections, promoting survival of neurons and improving brain circulation. Put another way, estrogen is considered to be extremely 'neuroprotective.'

The term "menopause" comes from two Greek words that mean "month" and "to end." It translates as "the end of the monthlies." The medical definition of menopause is the absence of menstruation for 12 months.



## ALZHEIMER'S, CONTINUED

In the United States, the average age for menopause is 51, but it can occur between a woman's late 30's and her late 50's. Surgical menopause occurs when a woman's uterus and ovaries are surgically removed, the result of which is an almost complete cessation of natural estrogen production. During natural menopause (menopause without surgery) estrogen levels still drop to very low levels, but the decline in estrogen production is not as dramatic. No matter the mechanism of menopause, it is widely recognized that the decline of estrogen across the lifespan and the drop during menopause is largely responsible for the acceleration of aging effects on cognition. This decline has received much attention and has led, in large part, to the investigation of multiple hormone therapy techniques.

During the menopausal transition, many women report problems with memory, such as difficulty recalling names, although few women rate these complaints as serious. Women attribute memory problems to increased responsibilities and stress, advancing age, physical health problems, inadequate concentration, and emotional changes. However, there is little doubt that estrogen protects women's brains in multiple ways. Thus, a plausible hypothesis is that the decreasing levels of estrogen during the menopausal transition are related to the subtle memory changes experienced during this time in a woman's life.

The issues surrounding Alzheimer's disease and menopause are of particular importance when we take into account the statistics on increasing age discussed earlier in this article. As mentioned previously, women live, on average into their 80's. If the average age of menopause is 51 years, this means that women will spend 30 years of their lives in a postmenopausal state. Figure 2 illustrates this statistic.

This factor is important because if estrogen is in fact neuroprotective, what happens as women continue to live longer and the proportion of their lives spent in the postmenopausal state, when they are not exposed to estrogen, continues to grow?

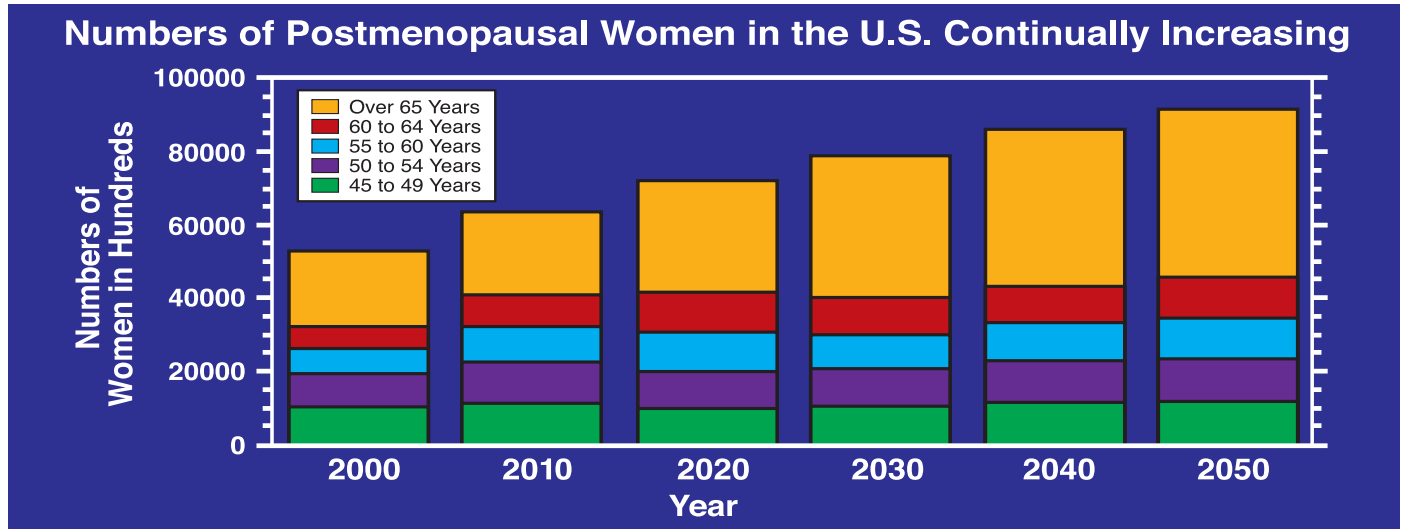
Hormone therapy regimens have been widely investigated in hopes that delaying the decline in estrogen (menopause) will keep women's brains and bodies healthier longer. For example, if a woman who goes through menopause at age 57 is healthier than a woman who goes through menopause at age 49, why not offer estrogen therapy to the 49 year old in order to delay the decline in estrogen until she is 57 years old? This is the rationale behind hormone therapy. The question is: does hormone therapy actually improve cognition and/or cardiovascular factors. Research thus far says yes, but it depends on when a woman begins taking estrogen and which type of hormone therapy she takes.

### **The Link between Alzheimer's disease and Estrogen**

The regions of your brain that are sensitive to estrogen (such as the hippocampus) are also involved in cognition, particularly memory. When activated by estrogen, these regions, in turn, activate processes that are beneficial to the brain. In addition, estrogen may, in effect, raise levels of certain brain chemicals, called neurotransmitters such as acetylcholine (implicated in memory), serotonin (implicated in mood), noradrenaline (implicated in mood and other autonomic functions), and dopamine (implicated in cognition and motor coordination). Thus, estrogen facilitates communication between nerve cells, promoting their ability to "talk to" one another.

Importantly, the brain regions most sensitive to estrogen are among the most affected by Alzheimer's disease. Alzheimer's is characterized by the emergence of certain abnormalities in the brain. Upon autopsy, a patient with Alzheimer's disease almost always presents with two specific anomalies – 1) senile plaques and 2) neurofibrillary tangles. These two aspects of Alzheimer's disease are often found in selective brain regions, including the hippocampus. As discussed above, the hippocampus is a brain region not only directly affected in Alzheimer's disease, but it is also selectively affected by estrogen.

Figure 2



We believe that maintaining the level of estrogen across the menopausal transition will facilitate hippocampal activation, and in turn improve memory and possibly prevent Alzheimer's disease.

### Research with Estrogen and Cognition

There have been a large number of studies investigating the effect of estrogen on the female brain. Although still controversial, the majority of results suggest that the estrogen component of hormone therapy enhances cognition and mood and lessens memory complaints in healthy perimenopausal and recently postmenopausal women.

In addition to healthy women, estrogen appears to provide cognitive benefits to women diagnosed with Alzheimer's disease. For instance, comprehensive reviews have shown that postmenopausal women with Alzheimer's have lower levels of naturally occurring estrogen than women who do not have the disease. In a recent, comprehensive review paper, Dr. Carey Gleason compared the effects of various estrogen formulations on cognition in postmenopausal women. Gleason's review of the scientific literature showed that estrogen has cognitively beneficial properties both in non-demented and Alzheimer's disease patients.

Clinical trials have been conducted in order to test the impact of estrogen on cognition and Alzheimer's disease. Estradiol, the type of estrogen used in the transdermal estrogen patch, has been linked to improved attention, spatial ability, learning and memory, especially verbal ability. Some of the first studies examining the effects of estrogen on cognition in patients with Alzheimer's disease were performed in the laboratories of Dr. Sanjay Asthana. Dr. Asthana conducted a series of clinical trials to evaluate the effect of the transdermal estradiol patch on cognition in postmenopausal women with Alzheimer's disease. Results of this study showed that women who were on the transdermal patch for 12 weeks performed better on three different cognitive tasks, including tests of verbal memory and attention, than women who were not taking estrogen. In this study, performance on the three tasks was directly related to the amount of estrogen in women's bodies. In other words, women with the highest estrogen levels were performing best on these tasks, while women with lower estrogen levels were performing more poorly. These studies indicate that estrogen has cognitively beneficial properties both in healthy women as well as in women who have already been diagnosed with Alzheimer's disease.

### **The Women's Health Initiative (WHI) and the Women's Health Initiative Memory Study (WHIMS)**

It is important to know that there have been studies which have reported that estrogen does not protect the brain. One such study is the Women's Health Initiative Memory Study (WHIMS). This study was a substudy of the Women's Health Initiative (WHI) trial, designed to examine the risk of cognitive decline and dementia. In this study, initial reports stated that women over the age of 65 who used estrogen with a progestin were at greater risk of dementia, including Alzheimer's disease.

One of the major methodological issues related to the WHI and WHIMS was the form of hormone therapy that was used. Conjugated equine estrogen (CEE), the form of estrogen given to the participants in the WHI and WHIMS, is the most widely used estrogen for hormone therapy in the United States. Interestingly, CEE is extracted from the urine of pregnant mares (female horses) and is primarily composed of estrone sulfate and at least ten other hormones, some of which are non-human. Estradiol is an alternative to CEE that is quickly gaining the support of scientists and clinicians. Estradiol is comprised of 17 $\beta$  estradiol, the most potent and natural human form of estrogen. Additionally, CEE and estradiol may have different effects on a woman's brain cells. Thus, estradiol may be more effective than CEE formulations of hormone therapy, especially in older populations.

Estrogen differs not only in the type of formulations, but also in the manner in which the drugs are administered. The CEE used in the WHI and WHIMS was an oral formulation (a pill). As is the case with

all oral medications, oral estrogens must first pass through the liver. This process, called hepatic metabolism, breaks down some of the compounds in the medication, which has been known to alter the drug's effects. This process can also increase the risk of blood clots. Some researchers have proposed that the CEE used in the WHI and WHIMS may have caused the increased risk for dementia described by WHIMS data. Another method of estrogen administration that is quickly gaining the support of scientists and physicians is transdermal administration, also known as the skin patch. In contrast to oral formulations, transdermal estrogen administration bypasses the liver and results in a steady-state concentration of estradiol levels, close to the levels seen in women prior to menopause. Thus, research findings to date suggest that not only is the



estrogen formulation influential, but the route of administration is equally critical.

### **Additional Variables in Estrogen/Alzheimer's Disease Research**

In addition to the differential effects of various routes of administration and doses of estrogen, there are a few additional factors that need to be mentioned when discussing estrogen's effects on a woman's risk of developing Alzheimer's disease. Some of the most important factors include the effect of concomitant progestin therapy, hysterectomy status, prior history of estrogen exposure, the multiple stages of Alzheimer's disease pathology and ApoE status. Additionally, very little data exists on women with other types of dementia (e.g. vascular dementia), or age of dementia onset

(early Alzheimer's disease). A woman's age is another variable that could potentially impact the results of an investigation enrolling patients with Alzheimer's disease. Specifically, Alzheimer's disease patients are generally much older than the age of menopause. It has been suggested that beginning an estrogen regimen many years after menopause eliminates the possible protective effects of estrogen. We would like to know whether starting estrogen therapy around the time of menopause, rather than at age 65 or older (as was the case in the WHI and the WHIMS), will protect memory or prevent Alzheimer's disease. This theory is called the "critical period" hypothesis. The critical period hypothesis is based on the belief that by initiating estrogen early (i.e. during menopause), we will be able to combat or perhaps prevent the incidence of cognitive decline and Alzheimer's disease.


Although there is much support for estrogen's favorable effect on cognition in older participants with Alzheimer's disease, the well-designed and important studies examining the effects of CEEs cannot be ignored. But, again, these findings should not be generalized to all forms of estrogen, an unfortunate consequence of which would be the failure to examine a viable treatment option for a devastating disease. Furthermore, it is possible that the cognition-enhancing effects of estrogen might only be observed in patients with mild to moderate dementia or mild cognitive impairment, rather than those with advanced Alzheimer's disease.

### **Final Thoughts**

Though we have yet to find a cure for Alzheimer's, we know a great deal about the disease. One caveat that seems to be consistent across the vast majority

## ALZHEIMER'S, CONTINUED

of diseases, whether it is cancer, cardiovascular disease or osteoporosis, is that it is much easier and less expensive to prevent a disease than it is to cure it. Delaying the onset of the disease by as few as five years is projected to have a substantial beneficial effect, reducing the prevalence of Alzheimer's disease by 50% in one generation.



With the goal of prevention in mind, scientists and physicians have placed increasing emphasis on factors that can be changed during midlife, before Alzheimer's disease develops. Research suggests that some characteristics of Alzheimer's disease likely occur several decades before the clinical symptoms of Alzheimer's disease, such as memory impairment. If physicians are able to control factors that have been associated with Alzheimer's disease, we will more effectively target the earliest disease-associated changes. As discussed above, a potentially modifiable midlife risk factor for women is the relatively rapid loss of endogenous hormones occurring during the menopausal transition. Essentially, hormone therapy research scientists predict that if we are able to combat the loss of estrogen at menopause, we may reduce a woman's susceptibility to Alzheimer's disease.

Future research investigating the potential beneficial effects of estrogen in women with, and at all stages of Alzheimer's disease is essential. As the average lifespan in industrialized countries continues to grow, so will the prevalence of Alzheimer's disease. Sixty-eight percent of individuals diagnosed with Alzheimer's disease are women. The

same 68% of women comprises roughly 5 to 10% of our population, and this statistic increases dramatically with age. This reality reinforces the immediate need for basic, translational, observational and clinical research to develop safe and efficacious hormone therapy regimens. Based on the aforementioned research, it is likely that transdermal estradiol formulations of hormone therapy may be useful in terms of Alzheimer's disease prevention or delaying disease progression, as well as combating the cognitive symptoms in Alzheimer's disease patients. While there is support for transdermal estradiol in older postmenopausal women with Alzheimer's disease, it is unclear what proportion of women would likely benefit, and how long the therapy should be administered. In addition, hormone therapy initiated during the menopausal transition (the 'critical period' hypothesis) has been associated with beneficial effects on Alzheimer's disease biomarkers. Thus, it may be crucial to initiate hormone therapy several years before the onset of the cognitive symptoms of Alzheimer's disease in order to evaluate the full neuroprotective potential of estrogen. It is likely that a large scale, longitudinal, cyclical, hormone therapy study with transdermal estradiol would offer much needed information to the field of Alzheimer's disease and hormone therapy research. The KEEPS (Kronos Early Estrogen Prevention Study) and the KEEPS Cognitive and Affective Study (KEEPS C/A) are currently underway and are positioned to address such issues.

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**Figure 1**, Source:

*Plassman, B; Langa, KM; Fisher, GG; Herrings, SG; Weir, DR; Ofstedal, MB; et, al. "Prevalence of Dementia in the United States: The Aging Demographics, and Memory Study." Neuroepidemiology 2007; 29:125-132.*

**Figure 2**, \*Projected estimate:

*US Census Bureau, Statistical Abstract of the United States. 2000:16. US Census Bureau, National population projections. Available at: <http://www.census.gov/population/www/projections/natsum - T3.html> Accessed 1/3/02.*

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## KRONOS LONGEVITY RESEARCH INSTITUTE 2008

KLRI's mission to understanding the human aging process was realized this year through both promising preliminary research results and new partnerships in research and education.

### **KLRI research highlights for 2008 included:**

- KEEPS (Kronos Early Estrogen Prevention Study) enrollment was completed in June, with 728 subjects spread amongst our distinguished group of collaborators at top universities and research institutions around the country. Some interesting preliminary findings from the baseline data were shared at various scientific meetings, both nationally and internationally.
- Over 25% of TEAAM (Testosterone Effects on Atherosclerosis in Aging Men) subjects have completed the three-year trial bringing this study to a point of 60% completion overall.
- Data collection was completed in April for Effects of Tart Cherry Juice on Oxidative Stress and Inflammation, in Older Men and Women. An abstract by Dr. Traustadóttir describing this work was presented at the Annual Meeting of the Society for Free Radical Biology and Medicine.
- Data analysis for Effects of Age and Estrogen Treatment on Constraint of Oxidative Stress Responses to Forearm Ischemia/Reperfusion, conducted in collaboration with investigators at Vanderbilt University, is complete and a manuscript is being submitted to journal publication for review and possible publication.
- Dr. Tsitouras presented the preliminary findings of Oxidative Stress Survey In Men and Women ages 20-89 at the Gerontological Society of America meeting.

- Vinegar as an Agent for Improving Glucose Tolerance will be completed soon with the inclusion of a few additional participants. If results appear promising, we plan to apply for a grant to use a similar protocol in a population with type 2 diabetes.
- We received NIH grant funding for a two-year study, Systemic and Localized Stress Resilience in Aging: Effects of Physical Fitness. The overall aim of this study is to provide enhanced understanding of the mechanisms by which physical fitness modifies stress resilience in older men and women.

### **New Planned Research for 2009**

- A Pilot Study of the Effects of Saturated Fatty Acids on Insulin Resistance, Endothelial Dysfunction and Systemic Inflammation has received approval and will be conducted in collaboration with Carl T. Hayden Medical Research Foundation and the VA Health Care System.
- Aging is associated with a decrease in growth hormone (GH) secretion. Baclofen, a generic drug used for relief of spasm, has been demonstrated to have the ability to restore suppressed GH secretion in subjects with Spinal Cord Injury (SCI). There are several similarities in the endocrine changes observed in aging individuals with those seen in patients with SCI. Planning for the Baclofen and GH secretion is completed and this study should begin in early 2009.
- Also nearing completion of the planning phase is Thiazolidinedione (TZD) and Omega-3 Effects on Bone Loss, Oxidative Stress, Lipid Profiles, and Insulin Resistance, which will explore whether omega-3 supplementation will synergize with beneficial effects of TZD's (drugs used in diabetes to reduce insulin resistance) on insulin sensitivity and oxidative stress while helping to prevent adverse effects on bone (bone mineral loss) and blood lipids.

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## Education Highlights

One of KLRI's main goals is to educate both the medical and lay communities on important aging issues that affect millions of people. The KLRI staff has submitted ten journal articles, abstracts and manuscripts and presented scientific talks and papers at eight national and international meetings. KLRI reaches thousands of individuals through our educational programs and tools. The KLRI Longevity Kronicle and the KEEPS newsletters were sent out to more than 45,000 homes and offices nationwide. Our E-Kronicle and our Progress in Longevity Seminar Series informs hundreds of medical/research professionals about the latest research in age related disease and prevention. Our website was reformatted and revitalized making it easier to update and more interactive.

## Public Relations Highlights

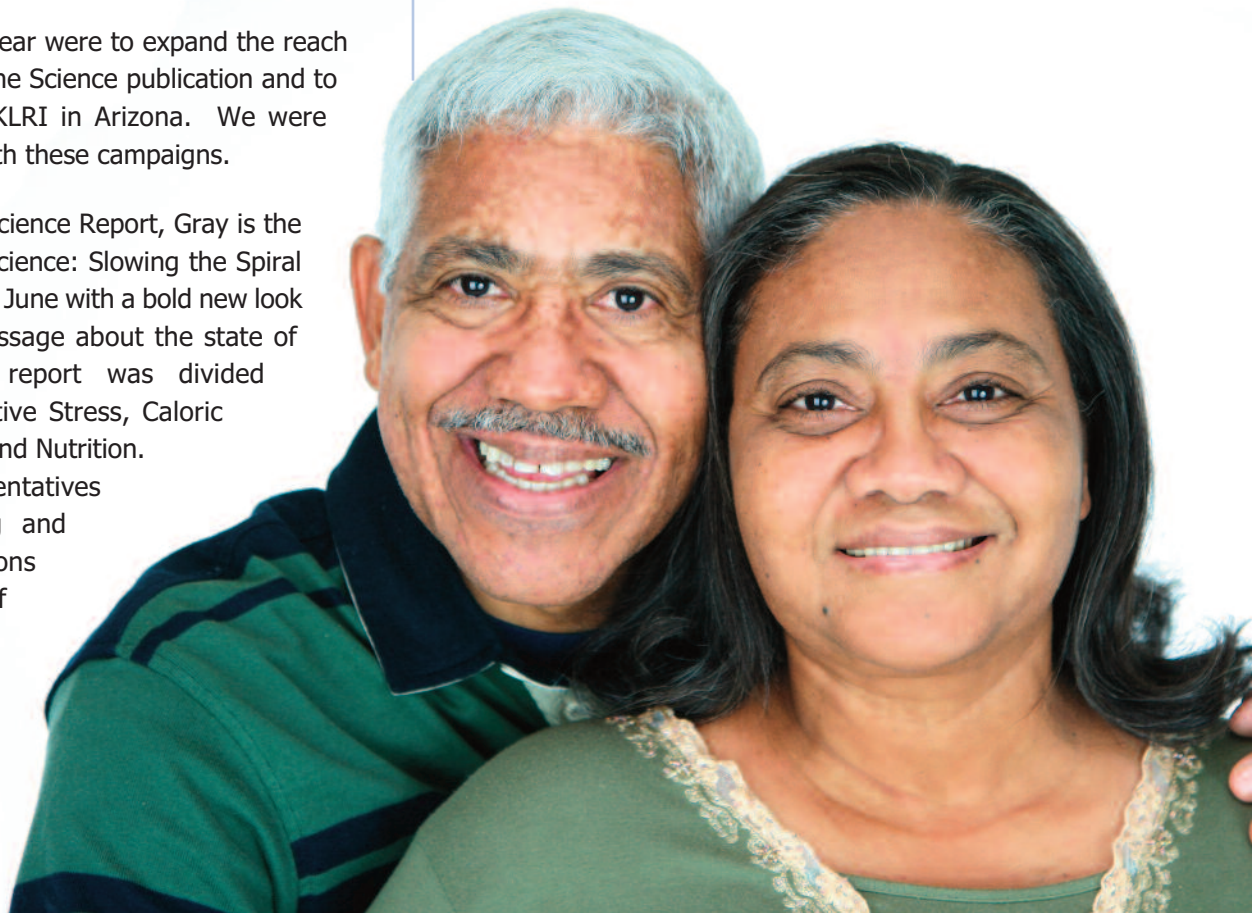
Our major thrusts this year were to expand the reach of our annual State of the Science publication and to expand awareness of KLRI in Arizona. We were extremely successful with these campaigns.

Our 2008 State of the Science Report, *Gray is the New Gold: Longevity Science: Slowing the Spiral of Aging* was released in June with a bold new look and a strong, clear message about the state of aging research, the report was divided into sections on Oxidative Stress, Caloric Restriction, Hormones and Nutrition. Reporters and representatives from other key aging and women's organizations attended the launch of the report for a stimulating discussion on the state of aging research and how we can improve public knowledge

of the science of aging. AARP also launched the report on their website for NRTA: AARP's Educator Community. The report received an impressive amount of publicity as over 60 publications posted the release on their websites.

Locally, KLRI public relations efforts resulted in an Arizona Republic Article titled "Menopause & Effect". Also KLRI coverage included stories on:

- High Statin Doses Do Not Impair Aerobic Activity or Skeletal Muscle Function in Older Adults, Says New Study
- KLRI Receives Grant from NIH To Study Stress Resilience In Older Adults
- Study Shows Benefits of a High Omega-3 Diet in Older Adults



# WORD SEARCH

Instructions: Find these words in the word scramble below.

**Affect**  
**Alzheimer's**

**Brain**  
**Cognitive**

**Dementia**  
**Estrogen**

**Hippocampus**  
**Memory**

**Menopause**  
**Transdermal Patch**

T	E	Y	P	M	B	A	E	V	I	T	I	N	G	O	C
W	R	E	G	V	X	P	W	F	D	K	L	S	V	U	H
N	A	A	L	Z	H	E	I	M	E	R	S	I	P	S	I
P	M	V	N	N	G	T	A	E	V	N	F	I	O	O	P
U	T	P	E	S	U	A	P	O	N	E	M	X	P	H	P
D	C	J	J	P	D	D	R	V	J	A	I	I	L	N	O
R	E	A	P	A	E	E	T	F	G	Z	P	M	O	R	C
T	F	S	D	D	M	T	R	M	H	J	Q	Z	E	J	A
O	F	R	G	K	E	N	R	M	E	M	O	R	Y	V	M
Q	A	V	B	M	N	F	E	G	A	B	N	L	S	A	P
D	E	Z	I	G	T	I	F	B	R	L	E	C	C	P	U
N	E	F	L	W	I	O	R	W	N	V	P	W	X	I	S
F	I	Q	J	P	A	R	V	J	P	P	W	A	K	M	C
N	R	A	A	E	S	T	R	O	G	E	N	Q	T	Y	V
B	F	G	R	Y	R	T	G	B	H	K	A	X	V	C	N
U	K	T	B	B	E	P	Z	L	T	E	B	N	S	K	H

Answer:

H	K	S	N	B	E	T	L	Z	P	E	B	B	T	K	U
N	C	V	X	A	K	H	B	G	T	R	Y	R	G	F	B
V	Y	T	Q	N	E	G	O	R	T	S	E	A	V	R	N
C	M	K	A	W	P	P	J	V	R	A	P	J	Q	I	F
S	I	X	W	P	V	N	W	R	O	I	W	L	F	E	N
U	P	C	C	E	L	B	F	E	I	T	G	I	Z	A	D
M	A	S	L	N	R	A	G	E	F	N	M	B	V	A	Q
P	V	R	L	B	O	M	R	M	N	E	K	G	R	F	O
A	J	E	Z	Q	J	H	M	R	T	M	D	D	S	F	T
C	R	O	M	P	Z	G	F	T	E	E	A	P	A	E	R
O	N	L	I	I	A	J	V	R	D	D	P	J	J	C	D
P	H	P	X	M	E	N	O	P	A	U	S	P	P	T	U
P	O	O	I	N	V	N	A	E	T	G	N	V	M	A	P
I	S	P	I	S	R	E	M	I	E	H	Z	L	A	A	N
H	U	V	S	L	K	D	F	W	P	X	V	G	E	R	W
C	O	G	N	I	T	I	V	E	A	B	M	Y	P	T	E

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## Stress Resilience



Healthy men and women over 60 needed to participate in a clinical trial to study the body's ability to recover when oxidative stress is increased.

**Compensation Provided**

**Call (602) 778-7480 to see if you qualify.**

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